‘AMANZI FOR FOOD’: A SOCIAL LEARNING APPROACH TO AGRICULTURAL WATER KNOWLEDGE MEDIATION, UPTAKE AND USE IN SMALLHOLDER FARMING LEARNING NETWORKS

Heila Lotz-Sisitka, Tichaona Pesanayi (late), Lawrence Sisitka, Luke Metelerkamp, Gamuchirai Chakona, Wilma van Staden, Sarah Durr, Mandelive Matiwane, Lwande Maqwelane, Laura Conde-Aller, Patience Shawarire

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RESEARCH AND DEVELOPMENT REPORT

Report to the
Water Research Commission

by

Heila Lotz-Sisitka, Tichaona Pesanayi (late), Lawrence Sisitka, Luke Metelerkamp, Gamuchirai Chakona, Wilma van Staden, Sarah Durr, Mandelive Matiwane, Lwande Maqwelane, Laura Conde-Aller, Patience Shawarire

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DEDICATION

Dr Victor Tichaona Pesanayi (7/12/1965-16/04/2019)

This report is dedicated to Dr Victor Tichaona Pesanayi, whose PhD work provided an incredibly strong foundation for all of the work reported here. He was instrumental in setting up the social learning networks, and the Training of Trainers programmes. He was also the first 'keeper' of the WhatsApp groups. At the core of his work, which shines through this report, was a deep love of, and respect for Africa's smallholder farmers and household food producers. His PhD transgressively recovers and argues for the significance of supporting expansive social learning as a decolonial education practice with potential to recover the 'cultures of agriculture' in Africa. His PhD articulates the multi-dimensional mediation and support processes that are needed for Knowledge Uptake and Use amongst smallholder farmers and household food producers in ways that a) respect the famers' knowledge base and their experience and practice, while b) introducing them to valuable new knowledge produced out of the scientific community, but in c) ways that are adjusted and adapted to the contexts where the knowledge is most needed. His thesis entitled '**Boundary-crossing expansive learning across agricultural learning systems and networks in southern Africa'** (Pesanayi, 2019) is a true work in boundary crossing learning, and in the thesis and via this project, Tichaona was able to boundary cross between historical and contemporary approaches to agriculture in Africa, unsustainable and sustainable approaches to agriculture, social and cognitive injustices and justices in the agricultural learning sector, between farmers and agricultural training institutes, and between research, education and extension. The work that he left is an enormous legacy for southern African farmers, and agricultural learning and education institutions. As said by Tich "*The study contributes to innovation in agricultural learning systems in southern Africa, in particular to means of engaging across boundaries of previously largely disconnected activity systems in ways that benefit smallholder farmers who have previously been marginalised from mainstream agricultural learning systems"* (Pesanayi, 2019).

Tichaona passed away one week after obtaining his Doctorate in Education on 16 April 2019. He was mentor to many, a kind and humble person, and remains missed by all.

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EXECUTIVE SUMMARY

This final report has detailed the work that went into the use of a Knowledge Uptake Strategy to support agricultural colleges and others involved in education, training and social learning in the agricultural sector's agricultural learning system to make use of the eight sets of WRC material that were the focus of the project. The general objective of this project entitled *"'Amanzi [water] for Food': Developing a social learning network approach to knowledge dissemination and uptake in the agricultural learning system, focusing on the management, use and conservation of water for small-scale farming and household food production"* was:

> To develop a strategy for achieving effective knowledge dissemination and practical training to encourage productive water use for food crop production [amongst smallholder farmers and food growers in South Africa], which in turn, would contribute towards addressing the wider contextual and sustainable development problem of household food insecurity in South Africa.

The Knowledge Uptake Strategy has been developed out of the experience of working with eight sets of WRC Rainwater Harvesting and Conservation (RWH&C) material with a wide range of stakeholders in the agricultural sector, and using a variety of media through which to share the material and the information contained in them. The material that were used to develop the AOS were:

- *Development of a Comprehensive Learning Package for Education on the Application of Water Harvesting and Conservation* (WRC Report No. TT 492/11) [referred to as **WH&C material** (Denison et al., 2011)];
- *Sustainable Techniques and Practices for Water Harvesting and Conservation and their Effective Application in Resource-Poor Agricultural Production: Volume 2 of 2: Farmer and Extension Manual* (WRC Report No. TT 542/12) [referred to as **STPWHC** (Botha et al., 2012)];
- *Guidelines on Best Practice management practices for Rainwater Harvesting and Conservation (RWH&C) for Crop and Rangeland Productivity in Communal Semi-Arid Areas of South Africa* (WRC Report No. TT 590/14) [referred to as **GBMPWH&C** (Botha et al., 2014)];
- *Production Guidelines for African Leafy Vegetables* (WRC Report No. TT 536/12) [referred to as **PGALV** (Jansen van Rensburg et al., 2012)];
- *Sustainable use of Greywater in Small-scale Agriculture and Gardens in South Africa* (WRC Report No. TT 469/10) [referred to as **SUGSAG** (Rodda et al., 2010)];
- *A Manual for Rural Freshwater Aquaculture* (WRC Report No. TT 463/P/10) [referred to as **MRFA** (Rhodes University (DIFS), 2010)];
- *Improving Rural Livelihoods through Biogas Generation using Livestock Manure and Rainwater Harvesting* (WRC Report No. TT 645/15) [referred to as **IRLBG** (Smith & Everson, 2016)]; and,
- *Agricultural Water Use for Homestead Gardening Systems Resource Material for Facilitators and Food Gardeners* (WRC Report No. TT 430/09) [referred to as **AWHGS** (Stimie et al., 2010)].

The full detail of this process is captured in this research report entitled: '**Agricultural water knowledge mediation, uptake and use in smallholder farming learning networks: A social learning network approach'.**

Briefly, **Chapter 1**, builds on the earlier iteration of the project (Lotz-Sisitka et al., 2016) and describes the aims and objectives of the project, and introduces the context and purpose of the Knowledge Uptake Strategy research and development process. It deals with the policy relevance of the Knowledge Uptake Strategy development process, offers a review of the WRC material, and offers a theoretical framework for knowledge dissemination that was oriented towards a systemic, innovation oriented and relational approach to knowledge dissemination. The theoretical framework aligns with recent recommendations towards a social learning approach for extension support, and for a pluralistic model for agricultural extension, training and support.

- ***Innovation:*** Overall, contributing to innovation in the sector, the project adopted a 'STRATEGY-AS-PRACTICE' APPROACH which focusses on people and the interrelations between people and practice in the emergence of strategy; in other words the Knowledge Uptake Strategy was developed via practising it and through this, learning what strategic value exists in the process to share more widely for further development of knowledge dissemination and use practices.

Chapter 2 of the report provides a detailed analysis of the contexts where knowledge of rainwater harvesting and conservation (RWH&C) is most useful, with emphasis on the smallholder farmer and homestead food producer. The SA government extension service is crucial as they directly support smallholder farmers with new knowledge, including with RWH&C practices. It also considers smallholder farmers themselves and how they obtain information on RWH&C practices, and then goes on to review various communication and media approaches that are most appropriate for this level of farming practice in South Africa.

Chapter 3 reports on the contextual profiling and learning network formation process of the project. This chapter provides a report on the design and use of the Contextual Profiling Tools as well as the initial contextual profiling work that was done in three agricultural learning sites to establish learning networks, and to provide an initial 'multi-actor' network map for each of these three learning network areas. The chapter shares insights into the learning network mapping that emerged in the three case study sites.

- ***Innovations:*** The chapter captures work undertaken to establish two of the approaches articulated in the Knowledge Uptake Strategy:
    - CONTEXTUAL PROFILING to identify active role-players in the agricultural learning system and understand their experiences, matters of concern and daily realities, media use and communication and learning channels (i.e. orienting value).
    - ESTABLISHMENT OF MULTI-ACTOR LEARNING NETWORKS which produced a key enabling platform, thereby creating enabling value which made it possible to establish other forms of value via the social learning approach to knowledge uptake and use. The chapter also shares a new methodology tested in the project for social learning network mapping, which was used as a

participatory tool to help further develop the social learning network and to understand the connections and relationships that hold the social learning network together.

- LEARNING NETWORK HOSTING AND SUPPORT: The central learning network hosting role of the three Agricultural Training Institutes (note that ATI here refers to emerging Agricultural Training Institutes, Agricultural Faculties in Universities, and FET ATIs) is elaborated. The data shows that learning centres have a key role to play in knowledge dissemination and uptake, but that there are also other significant sources of knowledge dissemination, indicating the importance of working with ATIs and other knowledge mediation organisations such as NGOs in advancing Knowledge Uptake and Use via multi-actor partnership models. The three Learning Networks are: the Imvotho Bubomi Learning Network (IBLN) in the Eastern Cape, centred on the Fort Cox Agriculture and Forestry Training Institute (FCAFTI); Sinakekele Sibusiso Semanti Learning Network (SSSLN) in Mpumalanga Province, centred on the University of Mpumalanga (UMP) Mbombela campus; and the #PulaWise Learning Network (PWLN) in the North West Province, centred on the Taung Agricultural College (TAC).

Chapter 4 of the report provides information on the ongoing development(s) of Amanzi for Food website (www.amanziforfood.co.za) and associated social media channels and tools that were developed to facilitate and strengthen social learning. The project explored and researched a number of media and communication innovations to strengthen the social learning approach that also produced and contributed to the multi-actor 'social-ecosystem' for learning together, including:

- ***Innovations:***
  - *RESOURCE-BASED LEARNING WEBSITE:* The project developed a resource-based learning website which helped to hold and mediate access to a range of WRC material focussing on RWH&C. The website also shared news items, and facilitated connections between different network groups.
  - *OPEN ACCESS ONLINE TRAINING OF TRAINERS COURSE:* The website also carries an open-access online training of trainers course that was designed so that it facilitates the use of the material on the resource-based learning website.
  - *FACEBOOK PAGE, AND WHATSAPP GROUP:* A project based Amanzi for Food Facebook page was established to direct the public to the Amanzi for Food resource-based learning website and to share project updates. A key innovation was ongoing development and support of a very popular and important social networking tool, namely use of WhatsApp groups. In the project, WhatsApp groups emerged as an important social innovation tool for the earning networks to communicate, share information and engage in discussion, leading to the enabling of a social ecosystem that has emerged over time to characterise the group was mapped.
  - *COMMUNITY RADIO:* The programme also develop community radio programmes and a community radio handbook, which facilitated the sharing of knowledge and included local community radio stations in the social learning model and approach developed in the programme.

- *MO-JO:* In addition to the above social media approaches, the project also developed a Mobile Journalism training programme for smallholder farmers to produce short videos to share knowledge with each other.

Chapter 5 reports on the Training of Trainers programmes in three learning networks, and the subsequent knowledge dissemination and uptake via change projects, and includes information on the launch of the e-learning ToT course. This chapter summarises and synthesises all the information related to the training of trainers courses, which are the main innovation discussed here:

Innovations:

- *TRAINING OF TRAINERS COURSE WITH PRACTICAL DEMONSTRATION SITES AND CHANGE PROJECT INNOVATIONS:* An open access, accredited Training of Trainers Course in rainwater harvesting and conservation practices and social learning was designed, implemented and revised. The ToT course uses a three-step module process which involves 1) contextual profiling and identification of RWH&C needs and change opportunities, 2) co-design and implementation of a RWH&C practical demonstration site in local communities of practice, and 3) evaluation, reporting and review on the practical demonstration in two streams: RWH&C practice and learning support innovations and/or curriculum innovations. The course was also subsequently designed as an open access online course that has been pilot tested.

Chapter 6 introduces and overviews an Agriculture Education and Training Curriculum Innovations booklet for integrating rainwater harvesting and conservation (RWH&C) knowledge for smallholder farming and household food production into agricultural education and training curricula.

Innovation: *FARMER-CENTRED MODEL FOR CURRICULUM INNOVATION TESTED AND ARTICULATED.* A curriculum innovation booklet was developed from the experience of the project that shows how agricultural educators and trainers can integrate rainwater harvesting and conservation approaches into agricultural education and training curricula and programmes with an emphasis on smallholder farmers and household food producers and their RWH&C knowledge needs. The booklet provides guidance on how to implement a farmer-centred approach to curriculum innovation that addresses the national challenge of a disjuncture between research, education and extension.

Chapter 7 covers the development and application of a suitable evaluation model and approach to evaluating social learning in learning networks. The chapter adapts the value creation framework of Wenger, Traynor and De Laat (2011) for the Amanzi for Food project and context, and its social learning activities. It offers an in-depth evaluative analysis of the ToT programmes as this was a key catalytic activity in the establishment of the social learning network approach.

Innovation:

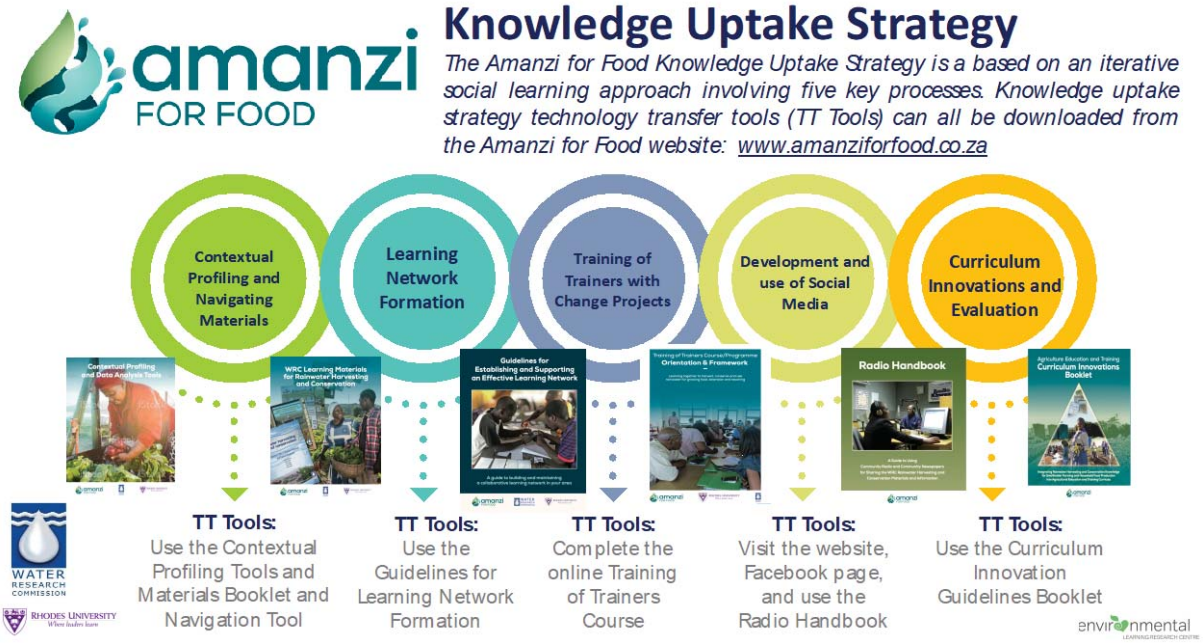
- *VALUE CREATION MODEL FOR SOCIAL LEARNING AND KNOWELDGE DISSEMINATION EVALUATION TESTED AND APPLIED:* The evaluation covers different types of value that are created in social learning with emphasis on immediate, potential, applied, realised and reframed value that lead, via cycles of learning in social-ecological settings, to transformative value over time. The evaluation shows that the ToT course offers strong immediate, potential and applied value that leads to realised and reframed value, especially via the ongoing learning network activities that follow the initial engagement in the ToT course. This leads, over time, to transformative value which is important to achieving the overall objective of making knowledge more useful in the context of a need for improved food security via better use of rainwater harvesting and conservation amongst smallholder farmers. The approach offers a way of evaluating social learning and knowledge dissemination and uptake.

Chapter 8 of the report provides a summary, and ends with recommendations for the Knowledge Uptake Strategy.

- **Innovation:** KNOWLEDGE UPTAKE STRATEGY – The project developed a social learning network approach to knowledge dissemination, which is crucially important for supporting co-learning and a transformative approach in the Agricultural Education, Training and Social Learning system. Such an approach requires a mix of iteratively related different mediation and innovation support processes that work 'in tandem' to enable and support such an approach. As outlined in the innovations above, these include:
    - 1) undertaking contextual profiling to understand the situation and farming realities and activities well;
    - 2) making knowledge more accessible via tools that provide easy access to the knowledge and that allow people to approach the knowledge on their own terms (i.e. not through top down transfer);
    - 3) establishing learning networks that are needs driven; learning centres have an important role to play in hosting such learning networks and in providing new knowledge into the networks and support;
    - 4) supporting training of trainers processes that help to catalyse and build internal strength in the learning networks and a shared 'repertoire' and identity;
    - 5) focusing the course on shared practices (e.g. collaborative demonstration site development) in ways that also benefit local communities and generate interest from them, while also giving students new opportunities to learn from practice and work with communities to learn also from the farmers;
    - 6) work with well-selected social media tools in parallel and in complementary ways to continue the learning process in the networks over time; and
    - 7) track and monitor the value that is being created in the networks in ways that also help to make the value visible to the learning network members so that they can deliberate it and build the network through reflexive engagement on what is working for whom under what conditions.

  It is these 'in tandem' processes that make up the user-friendly Knowledge Uptake Strategy that results from this research.

The Knowledge Uptake Strategy, represented in the diagram below, is based on a social learning network approach to rainwater harvesting and conservation practice amongst smallholder farmers and household food producers. The Knowledge Uptake Strategy is represented on the project website with hyperlinks to the technology transfer tools and innovations that support it.



Technology Transfer Tools – and Appendix links (where applicable)

- TT 1: Contextual Profiling Tools – Appendix 3.1
- TT 2: WRC Learning Material on Rainwater Harvesting and Conservation – Summary Booklet and Navigation Tool – Appendix 1.1
- TT 3: Guidelines for the Establishment and Support of an Effective Learning Network – Appendix 3.3
- TT 4: Amanzi for Food Training of Trainers Course (open source on the website, which leads participants into the website and its tools to support knowledge uptake and use)
- TT 5a: Radio Handbook: A guide to using community radio and community newspapers for sharing the WRC rainwater harvesting and conservation material and information – Appendix 4.2
- TT 5b: Amanzi for Food website (with posters, video material, info cards, news and events and all of the eight WRC material made accessible via a multi-layered knowledge access platform) (www.amanziforfood.co.za)
- TT 5c: Facebook platform for news and updates
- TT 6: Agriculture Education and Training Curriculum Innovation Booklet (including the Options for Integration into College Curricula document) – Appendix 6.2
- TT 7: Methods and approaches to support mediation and learning (Module 1 and 2 of the ToT course) – Appendix 5.1
- TT 8: Applied Knowledge Dissemination and Uptake Evaluation Tool (the KDU Value Creation Framework Evaluation Tool) – Appendix 3.2, Appendix 3.2(a)

Overall, the report and the website-based Knowledge Uptake Strategy, together with the Technology Transfer Tools that support it, represents an innovative community-centred approach to innovation and development that is not patronisingly constituted, nor is it devoid of community agency. It is an approach to learning that foregrounds and supports the development of co-learning and transformative agency of all involved (including the researchers who participate in the process), representing a decolonised transdisciplinary approach to knowledge production and sharing.

Results from the project show that much value is created through such a social learning network process, not only directly for food production and water security outputs, but also for relationship building, social cohesion and social solidarity, and includes women, youth and all other stakeholders in a supportive process of generative co-learning and change. Importantly, this approach makes knowledge in the WRC material 'live' in practice, enabling it to directly contribute to the well-being of those who can and should benefit most from it.

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The project was implemented in a partnership with University of Mpumalanga, Fort Cox Agriculture and Forestry Training Institute, and Taung Agricultural College.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ABN	African Biodiversity Network
ACB	African Centre for Biodiversity
ADM	Amathole District Municipality
AET	Agricultural Education and Training
AFSA	African Food Sovereignty Alliance
AgriSETA	Agricultural Sector Education and Training Authority
AGWHGS	Agricultural Water Use for Homestead Gardening Systems
AIDS	Acquired Immunodeficiency Syndrome
AIP	Association of Independent Publishers
ALVs	African Leafy Vegetables
AOS	Action Oriented Strategy
APP	Annual Performance Plan
ARC	Agricultural Research Council
ASGISA	Accelerated and Shared Growth Initiative for South Africa
ASSAF	Academy of Sciences of South Africa
ATIs	Agricultural Training Institutes
AWARD	Association for Water and Rural Development
AWHGS	Agricultural Water Use in Homestead Gardening Systems
AWUHGS	Agricultural Water Use in Homestead Farming Systems
B Agric	Bachelor of Agriculture
B Tech	Bachelor of Technology
B.Ed.	Bachelor of Education
BAT	British American Tobacco
BCCLW	Boundary Crossing Change Laboratory Workshops
BCMM	Buffalo City Metropolitan Municipality
BSc Agric	Bachelor of Science Agriculture
CBE	Competency-based education
CBL	Competence Based Learning
CBOs	Community Based Organisations
CHAT	Cultural Historical Activity Theory
CHE	Council for Higher Education
CIAT	Cape Institute of Agriculture Training
CL	Change Laboratory
COGTA	Cooperative Governance and Traditional Affairs
COLA	Community of Learning for Agriculture

COP	Communities of Practice
COVID-19	Coronavirus Disease of 2019
CRA	Climate Resilient Agriculture
CRP	Colleges Revitalisation Plan
CS	Case Studies
CSA	Climate Smart Agriculture.
CSA	Climate Smart Agroecology
CSI	Corporate Social Investment
CSOs	Civil Society Organisations
DAF	Department of Agriculture and Fisheries
DAFF	Department of Agriculture, Forestry and Fisheries
DALRRD	Department of Agriculture, Land Reform and Rural Development
DARD	Department of Agriculture and Rural Development
DARDLA	Department of Agriculture and Rural Development and Land Administration
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
DEA	Department Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DFID	Department for International Development UK
DHET	Department of Higher Education and Training
DIFS	Department of Ichthyology and Fisheries Science, Rhodes University
DoA	Department of Agriculture
DRDAR	Department of Rural Development and Agrarian Reform
DREAD	Department of Rural, Environmental and Agriculture Development
DSD	Department of Social Development
DVD	Digital Video Disk
DWA	Department of Water Affairs’
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EC	Eastern Cape
ECRDA	Eastern Cape Rural Development Agency
ELRC	Environmental Learning Research Centre
EO	Extension Officer
ERP	Extension Recovery Plan
FAO	Food and Agricultural Organisation
FCAFTI	Fort Cox Agriculture and Forestry Training Institute
FET	Further Education and Training

GADI	Grootfontein Agricultural Development Institute,
GBMPRWHC	Guidelines on Best Management Practices for Rainwater Harvesting and Conservation
GEF	Global Environment Facility
GMOs	Genetically Modified Organisms
GoSA	Government of South Africa
HEQC	Higher Education Quality Committee
HET	Higher Education and Training
HIV	Human Immunodeficiency Virus
IBLN	Imvothu Bubomi Learning Network
ICT	Information and Communication Technology
IFSS	Integrated Food Security Strategy of South Africa
IRLBG	Improving Rural Livelihoods through Biogas Generation
IRWH	In-field Rainwater Harvesting
IT	Information Technology
IUCMA	Inkomati-Usuthu Catchment Management Agency
K*	Knowledge dissemination and use approaches and processes
KZN	KwaZulu-Natal
LED	Local Economic Development
LEDA	Local Economic Development Agency
MASDT	Mobile Agri Skills Development and Training
Mojo	Mobile Journalism
MRFA	Manual for Rural Freshwater Aquaculture
NCCRWP	National Climate Change Response White Paper
NCV	National Certificate Vocational
NDP	National Development Plan
NEDA	Nkonkobe Economic Development Agency
NFSD	National Framework for Sustainable Development
NGOs	Non-Governmental Organisations
NPC	National Planning Commission
NPC	Not-for-Profit Company
NPO	Not for Profit Organisation
NQF	National Qualifications Framework
NSSD1	National Strategy for Sustainable Development 1
NW	North West
NWRS-2	National Water Resources Strategy 2
OBE	Outcome-based Education
PAC	Potchefstroom Agricultural Colleges

PCA	Potchefstroom College of Agriculture
PGALV	Production Guidelines for African Leafy Vegetables
PLAAS	Institute for Poverty, Land and Agrarian Studies
RDC	Rural Development Centre
RDDA	Research Develop Disseminate Adopt
RIA	Registered Implementing Agents
RMDA	Raymond Mhlaba Development Agency
RMEDA	Raymond Mhlaba Economic Development Agency
RSA	Republic of South Africa
RU	Rhodes University
RWA	Rural Women's Assembly
RWC	Rural Wealth Creation
RWH	Rainwater Harvesting
RWH&C	Rainwater Harvesting and Conservation
SADC	Southern African Development Community
SAFL	Southern Africa Food Lab
SALGA	South African Local Government Association
SANParks	South African National Parks
SAQA	South African Qualifications Authority
s-as-p	Strategy-as-Practice
SDGs	Sustainable Development Goals
SEL	Socio Economic Levels
SETAs	Sector Education and Training Authorities
SGB	School Governing Body
SMS	Short Messaging System
SMT	School Management Team
SSSLN	Sinakekela Sibusiso Semanti Learning Network
StatsSA	Statistics South Africa
STPWHC	Sustainable Techniques and Practices for Water Harvesting and Conservation
SUGSAG	Sustainable Use of Greywater in Small-scale Agriculture and Gardens
TAC	Taung Agricultural College
TACATI	Transformation of Agriculture Colleges into Agricultural Training Institutes
TAPs	Transformative Agency Pathways
ToT	Training of Trainers
TV	Television
TVET	Training and Vocational Education and Training

UFH	University of Fort Hare
UK	United Kingdom
UKZN	University of KwaZulu-Natal
UMP	University of Mpumalanga
UMPSAS	University of Mpumalanga School of Agricultural Sciences
UNISA	University of South Africa
VCF	Value Creation Framework
WAR	Water Access Rights
WH&C	Water Harvesting and Conservation
WQC	Water Quality Course
WRC	Water Research Commission
WUA	Water Users Association
WWF	World Wide Fund for Nature

LIST OF APPENDICES

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CHAPTER 1
INTRODUCTION AND BACKGROUND

1.1 Background

The Rhodes University (RU) Environmental Learning Research Centre (ELRC) was first contracted in April 2013 by the Water Research Commission (WRC) to undertake development work focussing on an action oriented strategy (AOS) for knowledge dissemination and training for skills development of water use in homestead gardening and rain water harvesting for cropland food production for smallholder farmers and food growers in South Africa, focussing on two sets of WRC material (project K5/2277). The purpose was to develop and test elements of such a strategy using action research approaches, to inform the design of an action oriented strategy for further roll out.

The K5/2277 project was initially situated in one main pilot site where in-depth AOS development work took place, with initial extensions to other sites, but due to the complex nature of developing a strategy from action processes (i.e. via an implement, test and reflect approach), it was not possible to develop the same level of in-depth engagement in more than one site, especially since supporting material to facilitate access and use of the material also had to be produced. The project first commenced in April 2013 as and was completed in July 2016 and was fully reported on within the WRC system of reporting (cf. Lotz-Sisitka et al., 2016 a, b). The results and the model that informed this project, are captured in the following two WRC Research Reports, released in 2016:

1. Lotz-Sisitka, H., Pesanayi, T., Weaver, K., Lupele, C., Sisitka, L., O'Donoghue, R., Denison, J., and Phillips, K. 2016. Water use and food security: Knowledge dissemination and use in agricultural colleges and local learning networks for home food gardening and smallholder agriculture. VOLUME 1: RESEARCH AND DEVELOPMENT REPORT. WRC Research Report No. 2277/1/16. 198 pp.
2. Lotz-Sisitka, H., Pesanayi, T., Weaver, K., Lupele, C., Sisitka, L., O'Donoghue, R., Denison, J., and Phillips, K. 2016. Water use and food security: Knowledge dissemination and use in agricultural colleges and local learning networks for home food gardening and smallholder agriculture. VOLUME 2: ACTION ORIENTED STRATEGY. WRC Research Report No. 2277/1/17. 45 pp.

Building on this earlier research, in 2017, the WRC funded a new project, conceptualised as an extension of, and further research on knowledge dissemination and uptake of WRC material under the project entitled, 'Amanzi [water] for Food': Developing a social learning network approach to knowledge dissemination and uptake in the agricultural learning system, focusing on the management, use and conservation of water for small-scale farming and household food production' (K5/2713/4). The intention was to build on, and use a learning network approach (as developed in project K5/2277; cf. Lotz-Sisitka et al., 2016) to expand the use of WRC learning material from two sets to eight sets, as well as to expand the learning network model to two other provinces to further test and develop the social learning approach to knowledge dissemination and uptake. The focus was on developing, via action learning and

practice, a Knowledge Uptake Strategy for these material. This report therefore also draws on the earlier research report (cf. Lotz-Sisitka et al., 2016), in many ways offering an updated, and more extensive view of the knowledge dissemination and uptake approach that was pioneered and reported on in the 2016 Lotz-Sisitka et al. research report. The intention was to consolidate, extend and deepen the model and approach piloted in the earlier research project, hence these two projects should be seen as integrally connected rather than as separate projects.

The eight sets of WRC material that were mediated into use provided the 'core focus and content' focusing on two main agricultural water management, conservation and use practices around which the knowledge dissemination and uptake strategy was developed which are: Practice 1: Homestead Water Use and Food Production, and Practice 2: Rainwater Harvesting and Conservation. Both these practices and the eight WRC material were used to support small-scale farming and household food production.

These eight WRC material that were supported in the project were:

1. Denison, J., Smulders, H., Kruger, E., Ndingi, H., and M. Botha (2011). *Development of a Comprehensive Learning Package for Education and Training on the Application of Water-Harvesting and Conservation.* Report No. TT/492/11, Water Research Commission. Gezina, South Africa. **(WH&C)**[1]
2. Botha, J.J., Anderson, J.J., Joseph, L.F., Snetler, R.M., Monde, N., Lategan, F., Nhlabatsi, N.N., Lesoli, M.S., and Dube, S. (2012). *Sustainable Techniques and Practices for Water Harvesting and Conservation: Farmer and Extension Manual*. Water Research Commission Report No. TT 542/12. **(STPWHC)**
3. Botha, J.J., van Staden, P.P., Anderson, J.J., van der Westhuizen, H.C., Theron, J.F., Taljaard D.J., Venter I.S., and Koatla, T.A.B. (2014). *Guidelines on Best Practice management practices for Rainwater Harvesting and Conservation (RWH&C) for Crop and Rangeland Productivity in Communal Semi-Arid Areas of South Africa*. Water Research Commission Research Report No.TT 590/14. **(GBMPWH&C)**
4. Jansen van Rensburg, W., van Averbeke, W., Belts, Y. and M. Slabbert. (2012). *Production Guidelines for African Leafy Vegetables*. Report to the Water Research Commission and Department of Agriculture, Forestry and Fisheries. WRC Report No. TT 563/12. September 2012 **(PDALV)**
5. Rodda, N., Carden, K., and Armitage, N. (2010). *Sustainable Use of Greywater in Small-scale Agriculture and Gardens in South Africa.* Water Research Commission Research Report No. TT/469/10 **(SUGSAG)**
6. Rhodes University (DIFS). (2010). *A Manual for Rural Freshwater Aquaculture*. Water Research Commission Research Report No. TT 463-P-10. **(MRFA)**
7. Smith, M.T., and Everson, T.M. (2016). *Improving Rural Livelihoods through Biogas Generation using Livestock Manure and Rainwater Harvesting*. Water Research Commission Research Report No. TT 645/15 **(IRLBG)**
8. Stimie, C.M., Kruger, E., De Lange, M., and Crosby, C.T. (2010) *Agricultural Water Use for Homestead Gardening Systems Resource Material for Facilitators and Food Gardeners*. Water Research Commission Research Report no. TT 430/09 and 431/09. **(AGWHGS)**

[1] **Note**: the text in brackets in bold is a 'short reference code' used in the project to refer to the different sets of material.

Figure 1.1. Covers of the eight sets of material that formed the focus of the knowledge dissemination strategy development process

In seeking to develop a **Knowledge Uptake Strategy** focussing on knowledge dissemination and training for skills development of water management, conservation and use practices for *small-scale farming and household food production*, as supported by these eight sets of material, the research process continued to adopt a 'Strategy-as-Practice' (s-as-p) approach to strategy research and development. As highlighted in the earlier research project (Lotz-Sisitka et al., 2016), 'Strategy-as-Practice' research is a recognised research field that brings people back into the centre of strategy processes (Weick 1979; Whittington et al. 2003). As noted by Jarzabkowski and Spee (2009) in a comprehensive review of strategy-as-practice research, "the developing field of research has taken this concern seriously, bringing *human actors and their actions and interactions* to the centre stage of strategy research". Furthermore, the project addressed a research problem identified in the agricultural learning system, namely the problem of knowledge flow from research institution to knowledge users. Within this project, a systems oriented approach to knowledge flow and dissemination was designed to further test and develop the model established in the earlier project as was reported on in Lotz-Sisitka et al. (2016).

To develop the model established earlier, we have developed a theoretical framework for conceptualising knowledge flows that argues for a systems approach to knowledge flow and mediation. In the knowledge flows literature much is said about knowledge mediation, but there is little guidance on *mediation processes* for knowledge flow within a systems approach

to knowledge flow that supports social learning and social innovation approaches. The project therefore surfaces *five iterative mediation processes*, and illuminates key features of these as important for supporting knowledge flow and uptake within a social learning network. Surfacing these five iterative mediation processes enables deeper insight into a systems approach to knowledge flow, and shows how social learning network formation can be enabled amongst multi-actors engaged in the small-scale farmer and household food production agricultural learning system. The five mediation processes are:

- Contextual profiling and learning network formation (cf. Chapter 2 & 3)
- Development and use of social media tools for social learning in learning networks (cf. Chapter 4)
- Training of Trainers programmes (cf. Chapter 5)
- A farmer-centred approach to curriculum innovation in the agricultural learning system (cf. Chapter 6)
- Change Laboratories and multi-actor engagement across the other mediation processes (cf. Chapter 7)

Furthermore, the project also focused on the development and application of a novel approach to evaluating knowledge uptake and use in a multi-actor learning network. This framework, named the 'knowledge uptake and use value creation framework' (VCF) was designed in this study for monitoring and evaluation of knowledge dissemination and uptake in social learning networks. A brief overview is given of evaluation theory and methodology, used to position and introduce the choice of a value creation framework (VCF) approach for evaluating social learning processes (cf. Chapter 8) and we then share how this approach was adapted for the Amanzi for Food project, and show how this was applied to data generated from some of the mediation processes in the three learning network sites that were established for the project.

This VOLUME 1: RESEARCH AND DEVELOPMENT REPORT forms one of the outputs of the project, and covers the work that has gone into the knowledge uptake process that was used to inform VOLUME 2: KNOWLEDGE UPTAKE STRATEGY which forms a second output of this project. Accompanying Volume 2 is a set of nine Technology Transfer Tools that are designed to support the KNOWLEDGE UPTAKE STRATEGY:

- TT 1: Contextual Profiling Tools
- TT 2: WRC Learning Material on Rainwater Harvesting Summary Booklet and Navigation Tool
- TT 3: Guidelines for the Establishment and Support of an Effective Learning Network
- TT 4: Agriculture Education and Training Curriculum Innovation Booklet
- TT 5: Radio Handbook: A guide to using community radio and community newspapers for sharing the WRC rainwater harvesting and conservation material and information
- TT 6: Amanzi for Food Website (with posters, video material, infocards, news and events and all of the eight WRC material made accessible via a multi-layered knowledge access platform)
- TT 7: Amanzi for Food Training of Trainers Course (Open source on the website, which leads participants into the website and its tools to support knowledge uptake and use)
- TT 8: Facebook platform for news and updates

- TT 9: An applied Knowledge Dissemination and Uptake Evaluation Tool (the KDU Value Creation Framework Evaluation Tool)

1.2 Overall Objective and Outcomes

The OVERALL OBJECTIVE of this project was to develop a social learning network approach to knowledge dissemination and uptake in the agricultural learning system, focusing on the management, use and conservation of water for small-scale farming and household food production that would inform a Knowledge Uptake Strategy and tools that could support knowledge uptake and use of WRC material.

OUTCOME 1: Development and expansion of three knowledge dissemination learning networks in three provinces and a Training of Trainers programme to embed WRC generated research-based knowledge, material and approaches relevant to two key agricultural water management and use practices (noted above) in the mediating and training practices of agricultural colleges, extension agents and field-worker change agent practices.

OUTCOME 2: Development of expanded media-based knowledge dissemination approaches for strengthening the dissemination of WRC generated agricultural water management and use knowledge relevant to the two practices (noted above) that can also be used to strengthen outcome 1

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OUTCOME 3: Enhanced curriculum innovation in ATIs and agricultural water management change projects and demonstrations in all sites.

OUTCOME 4: Evaluation and national sharing of a learning network based social learning model of knowledge dissemination and uptake to expand the model and approaches to knowledge dissemination practised across the three learning networks to a national scale, in order to reach a wider range of knowledge dissemination agents, especially training and media practitioners, and the beneficiaries, in particular women growers and youth development organisations.

1.3 Aims

There are six specific aims that were used to guide the project:

No.	Aim
1	To activate and facilitate use of agricultural water management knowledge associated with four key agricultural water management and use of practices contained in WRC material for small-scale food production through networked expansive learning approaches in the agricultural learning system involving multi-actors in the agricultural learning systems (ATIs, NGOs, farmers, youth, LED officers and other relevant actors)
2	To establish and expand multi-actor networks linked to Agricultural Training Institutes (ATIs) for knowledge exchange, uptake and use and learning pathway development for youth.

No.	Aim
3	To facilitate curriculum innovation in colleges of Agriculture and universities using a Training of Trainers approach in an expansive learning network context which supports college lecturers to use content and processes in WRC material in their curricula.
4	To facilitate learning support innovations and productive demonstration site development for colleges and universities (ATIs), amongst NGOs, farmers, extension services and LED officers using a Training of Trainers approach in an expansive learning networks context which supports collaborative development of productive demonstration sites that can be used for training in-situ learning, while also contributing to food production outcomes.
5	To facilitate wider mediation and sharing of agricultural water management and use knowledge via extended media platforms associated with the learning networks established and with national e-learning platforms such as the Agrisuite Online platform.
6	To evaluate and identify value created by a social learning network model for knowledge dissemination and use in the agricultural water sector with emphasis on value created for multi-actors in the learning networks, but especially for women farmers and youth participating in small-scale and household agricultural food production systems.

1.4 Context and Purpose of the Knowledge Uptake Strategy Development Process

This research project sought to address the challenge of getting greater uptake of available research and training information to homestead food-growers and smallholder farmers who are keen and able to use it. The project also sought to develop a social learning network approach to knowledge dissemination and uptake in the agricultural learning system, focusing on the management, use and conservation of water for small-scale farming and household food production. Household food security in South Africa remains a national challenge with an estimated 59% of 13.7 million households being food insecure in 2002, with hunger and chronic malnutrition being widespread within this group (Hart, 2009; Wenhold and Faber, 2008 in Backeberg and Sanewe, 2010). StatsSA (2019) reported that “in 2017, 6,8 million South Africans experienced hunger. While the number has dropped from 13,5 million in 2002, it still affects 1,7 million households across the country”. The COVID-19 pandemic has precipitated economic decline with 2.2 million people losing jobs, creating conditions for furthering food insecurity. However, it is not only the COVID-19 pandemic that contributed to increased food insecurity in 2020, but other factors such as drought have also recently impacted on agriculture and food production.

Agriculture contributes significantly to food security in South Africa (Chakona and Shackleton, 2017) and the livelihoods of an estimated 4.5 million people who have access to small portions of agricultural land (Vink and Van Rooyen, 2009), estimated at 6-12% of household income in

a rainfed context and 21-60% in an irrigated context. In this context, StatsSA (2019) emphasises the importance of agriculture for household food security as follows:

“The involvement of households in agricultural activities for subsistence farming can play an important role in reducing the vulnerability to hunger of rural and urban food-insecure households. The results show that of 16,2 million households, about 2,5 million households (15,6%) were involved in agricultural activities in South Africa in 2017. Provinces that are predominantly rural with high levels of poverty such as Limpopo (25%), Eastern Cape (20%) and KwaZulu-Natal (20%) had the highest proportions of households that relied on agricultural activities to supply their own food. Most households involved in agricultural activities were involved in the production of fruits and vegetables, grain and other food crops, as well as in livestock and poultry farming. Although the main source of income for these households was social grants, most households involved in agricultural activities indicated that the main reason for their involvement is to supplement food for the household.” (StatsSA, 2019).

Despite critical issues associated with food security, and a large number of poor households getting more involved in small-scale agriculture to supplement food for the households, utilisation of available land water resources for smallholder farmers (0.5-10 ha), both in home-gardens and fields remain low (Backeberg and Sanewe, 2010). Furthermore, gender inequality and marginalisation of women presents a major challenge to women farmers who rely more on agricultural activities to meet up with household food and nutrition security (Robin and Andrew, 2010). As it is mostly women who are responsible in the majority of cases for farming decisions, they are a key group to target in initiatives aiming for increased crop-production and food security.

It seems to be a massive contradiction in the knowledge production and uptake system that farmers are struggling to improve food production and that so many households are hungry, when there is a substantial body of research-based knowledge and training information in the public domain (in this case in the form of some of the WRC material used in this study) which responds to the need to strengthen available land water resources to address some of the multi-faceted crop-production challenges faced by small growers and household food producers. The challenge seems to be to make these knowledge resources more widely available to better support smallholder farmers and household food producers to improve and upscale household food production. As argued in Lotz-Sisitka et al. (2016), such a process needs to be contextualised and situated in the realities of the farmers, and requires development of social learning tools and approaches to facilitate the knowledge uptake and dissemination. This is the main focus of this project.

To develop this approach, the eight sets of material introduced above were used in the project as they provide valuable knowledge that can be used by smallholder farmers and household food producers. They were carefully selected and prioritised to form the focus of this research and development initiative. Some of these material were targeting home-food production (Stimie et al., 2010; Rhodes University (DIFS), 2010; Jansen van Rensburg et al., 2012); others focussed more directly on water-harvesting and conservation techniques for smallholder farmers or household food producers (Rodda et al., 2010; Denison et al., 2011; Botha et al., 2012; Smith and Everson, 2016; Botha et al., 2014).

Issues associated with inadequate knowledge transfer are reflected in relevant WRC publications. For example, a report by Denison et al. (2011) on the Comprehensive Learning Package for Water Harvesting and Conservation noted that seven of the 11 agricultural colleges expressed substantial interest in using the course material developed with funding from WRC, but they had limited or no capacity to embed these into their existing curricula. Furthermore, the content of water-harvesting and low-external input sustainable agriculture was largely unfamiliar to their lecturers who would have to be sensitised and trained in order to effectively lecture/facilitate such content (ibid.). Similarly, the Agricultural Water Use in Homestead Gardening Systems publication (Stimie et al., 2010) is a highly informative resource pack for facilitators, with detailed illustrations for food-growers in English, isiZulu and seSotho, and parts can be selected and used in different learning situations. While the latter publication was successfully being used in a UNISA food security and UKZN Department of Agriculture courses at the time of the first phase of this project's initiation, there was an opportunity for more effective and wider uptake.

A Manual for Rural Freshwater Aquaculture (Rhodes University (DIFS), 2010) highlights the potential contribution of aquaculture to rural livelihoods, which is a new and significant field of learning in South Africa. It has a focus on small-scale farmers and household food growers, small-scale and large-scale commercial fish growers, and the agricultural extension services. This was also produced as a useful resource material in the field when interacting with farmers and for government officials, individual farmers, agricultural colleges, and universities. Additionally, Jansen van Rensburg et al. (2012) produced guidelines for the production of African Leafy Vegetables (ALVs) in South Africa as an additional approach to food and nutrition security that has a low demand for land-based agricultural water and can grow with simple water harvesting and conservation approaches. This focuses on optimising production in homestead gardens and stresses the utilisation of locally available resources through the consumption of ALVs at household level.

A manual on Sustainable Techniques and Practices for Water Harvesting and Conservation and their Effective Application in Resource-Poor Agricultural Production was produced by the WRC as Volume Two for farmers and extension (Botha et al., 2012). This manual has a focus on rainwater harvesting for food production and is very wide-ranging, with the inclusion of soil and water conservation elements, including in-field RWH&C and roof water collection. It also has extensive coverage of crop production, including weed and pest management and fertilization is also included in the manual with very extensive illustrations using diagrams, figures and photographs, with relatively short sections of text. The material are intended to benefit small-scale and emerging commercial cropland (mostly vegetable) farmers, and these have been developed for use within the formal education and training system. Thus, the material can be used at agricultural colleges/training institutes (in the FET band) in their training of agricultural extension officers and others with professional involvement in the agricultural sector, and by training providers accredited by the AgriSETA.

Similarly, WRC material on sustainable use of greywater in small-scale agriculture and gardens in South Africa was produced to provide detailed information on the use of greywater for irrigation (Rodda et al., 2010). The material provides guidance for the sustainable use of greywater in small-scale agriculture and gardens in rural villages, peri-urban and urban areas of South Africa, mostly in the form of text and illustrations of some useful figures and tables. The main intended audience are farmers at different scales (subsistence, semi-commercial

and commercial) and household food growers. The material can also be used by residents of low-income settlements with backyard gardens, extension workers, agricultural education and training institutions, farmer trainers from both the government and NGO sectors, and members of the public who need guidance on irrigation using greywater on their properties.

The importance of RWH&C knowledge dissemination/transfer has also been shown through the publication of the WRC material on Guidelines on Best Management Practices for Rainwater Harvesting and Conservation (RWH&C) for Cropland and Rangeland Productivity in Communal Semi-Arid Areas of South Africa (Botha et al., 2014). The material provides detailed information on in-field rainwater harvesting and rangeland management. To aid understanding, these practices are also described using case studies (from the Eastern Cape, Limpopo, and the Free State) and are illustrated using useful diagrams and images. The material are intended to provide decision makers, land-use planners, extension officers and farmers with the basic guidelines/ principles on how to maintain/improve the productivity on croplands and rangelands in semi-arid areas where rainfall is the most limiting factor for production.

The issues associated with inadequate knowledge transfer are also reflected in a WRC publication in the guidelines report Improving Rural Livelihoods through Biogas Generation using Livestock Manure and Rainwater Harvesting (Smith and Everson, 2016). Detailed information on the principles of biogas production using manure and (rain)water and the setting up of a biodigester for biogas production on a relatively small, household/homestead scale is provided in this material. The material used case studies which focused on key aspects of the process, problems encountered and recommendations for biogas production in rural areas, illustrated throughout with tables, diagrams and photographs. The material are also appropriate for the scientists and engineers who may be involved in supporting the homestead owners to establish biogas production units. They may have some value too in supporting theoretical training and discussions on small-scale biogas production in rural areas, as part of high-school, college/training institute and university curricula.

All eight WRC material are accessible at:
http://amanziforfood.co.za/downloadble-resources/
They are summarised in and made accessible for use in the WRC Learning Material on Rainwater Harvesting Summary Booklet and Navigation Tool.

These valuable and well constituted material are intended for use by farmers at a household level, but importantly can also be used by other groups, such as extension workers; lecturers/teachers in high schools, agricultural schools, agricultural training institutions, colleges and universities; and farmer trainers (from CBOs and NGOs) who all form part of the agricultural learning and knowledge dissemination system. Hence, in this project we did not only work with farmers, but with the entire agricultural learning and knowledge dissemination system that had an interest in, and/or a mandate to work with smallholder farmers and

household food producers. As will be shown later in this study, this is a richly textured 'network' of diverse stakeholders that can be brought together via local social learning networks.

In order to reach the target audience of primarily women farmers, in many cases elderly women, a wide concept of 'training organisation' was adopted in this strategy development programme. This included agricultural education organisations that train extension staff who work with this constituency; as well as those community-based organisations that have an education and communication role at grassroots level (e.g. NGOs, community radio producers; churches, local schools and CBOs). This more accurately reflects the realities of local agricultural learning systems (Lotz-Sisitka et al., 2016). Thus, at the start of the programme, it was proposed that an effective knowledge uptake strategy is one that targets: a) organisations where trainers and extension services are trained; and b) radio, communication and practice organisations that also directly target or engage with the end-users (farmers, home-food growers), including state extension services as they have a mandate to service smallholder farmers (commercial extension services tend to mainly service larger scale commercial agriculture enterprises).

The primary beneficiaries of the project are women farmers, youth groups and people who have underutilised natural and other resources for agricultural production at their disposal and have an interest in crop production; in gardens and on small farms or plots; hence they also needed to be involved as primary agents in the development of the social learning approach. Improved water management and food production practices are key contributors to more productive, lower risk and profitable farming for this group, and the WRC material have potential to further benefit them in terms of knowledge development, as well as farming practice outcomes. It was the work of this project to articulate how this can be done via a social learning approach.

1.5 Policy Relevance of Knowledge Uptake Strategy Development Process

1.5.1 General macro-level policy relevance of the Knowledge Uptake Strategy development process

There is a vast array of policy that emphasises knowledge dissemination for improvement of smallholder farming practices, with a focus on agricultural water use and conservation practices. This policy is spread across different government departments, making up the major national stakeholders who may have an interest in the WRC material and their use and the Knowledge Uptake Strategy. The policy is also spread across national, provincial and local government level policy making for a complex policy set-up. In the analysis below, the relevance of the Knowledge Uptake Strategy development process to key policies and policy processes is outlined in brief, with a more detailed analysis in this project.

When this project was initiated in 2017, the international Millennium Development Goals implementation cycle had just ended, and the Sustainable Development Goals Agenda 2030 had recently been approved. In September 2015, the South African government, along with governments around the world, agreed to a new global development agenda which sets out a plan of action for people, planet and prosperity. This agenda was implemented and commenced from 1 January 2016. The document entitled *Transforming our World: The 2030*

Agenda for Sustainable Development (United Nations, 2015), was produced to guide governments in implementing this plan at their national and departmental levels. Agenda 2030 stresses that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development. The South African government, with other governments in the world, also highlighted the need for them to be bold, and to take transformative steps which are urgently needed to shift the world onto a sustainable and resilient path and pledged to "not leaving anyone behind". This document sets out a number of Sustainable Development Goals (SDGs) (17) with 169 targets which build on the Millennium Development Goals to complete what they did not achieve. The means of implementation is also included in the document. Importantly for the Knowledge Uptake Strategy, the 2030 Agenda for Sustainable Development, in paragraph 17, highlights the importance of "continuing development priorities such as poverty eradication, health, education and food security and nutrition," and it also notes that "there are deep inter-connections between and many cross-cutting elements across the new Goals and targets" which requires an integrated approach. Within this integrated framing, the Knowledge Uptake Strategy addresses especially the following SDGs:

- Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- Goal 5: Ensure availability and sustainable management of water and sanitation for all

Additionally, the Knowledge Uptake Strategy contributes to a number of the other SDGs such as reducing poverty (Goal 1), empowering women (Goal 5), promoting well-being (Goal 3), and addressing climate change impacts (Goal 13). The intentions of the SDGs are aligned with the intentions of the South African Constitution, which, in Section 24 and Section 27 respectively, reflects South Africa's commitment to "secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development", and ensure that "everyone has the right to have access to...sufficient food and water..." (RSA, 1996). These provisions make it very clear that food and water security are paramount rights, and that these must be achieved in balance with sustainable use of the natural resources and that efforts related to these provisions should also be oriented towards addressing poverty.

Also relevant to the Knowledge Uptake Strategy, is the focus in the National Development Plan: Vision for 2030 (National Planning Commission (NPC), 2011). Chapter 6 of this document on inclusive rural economy seeks to promote ways of enabling rural communities to participate more actively in the economic, social and political life in the country. Key to this is an envisaged expansion of smallholder agricultural development, involving increased support and conversion of opportunities for smallholder farmers, coupled with successful land reform, employment creation and strong environmental safeguards. The National Development Plan (NDP) emphasises skills development in the agricultural sector, including entrepreneurship training. This would include the training of a new cadre of extension officers to respond to the needs of smallholding farmers and contribute to their integration into the food value chain. Key amongst the skills needed by the agricultural extension officers would be knowledge mediation and sharing of knowledge on agricultural water use and conservation.

With the right approach, the NDP emphasises that this can improve smallholder agriculture, improve food production and raise rural income and levels of employment. The NDP suggests that farmer-to-farmer skills transfer and knowledge networks need to be considered to help develop a new generation of farmers, and with other initiatives move towards a deracialised agricultural sector. Another issue noted in relation to the development of smallholder agriculture is the *empowerment of women*, and black and gender economic empowerment have been identified as a priority in the formation and expansion of new businesses, including agri-business with emphasis on value adding (Denison et al., 2015). In setting out the basis for a strategy, the Commission highlights the risks of industrialised agriculture to the country's unique ecosystems and calls for attention to be paid to ecological approaches to sustainable agriculture. These would include greater attention to alternative energy, soil quality, minimum tillage and other forms of conservation farming. The emphasis on ecological sustainability does however omit water harvesting and conservation technologies, which are shown to support resilience and increased food security in the rainfed context (Denison et al., 2015).
The emphasis placed in the NDP on the need for extension services with a 'new cadre of extension officers' is of particular relevance to the proposed Knowledge Uptake Strategy. It calls for innovative means for agricultural extension and training by the state, although it does not suggest how this should be done in practice. The Knowledge Uptake Strategy put forward by this project contributes directly to the development of model approaches that can feed into contemporary discourses and practices of building a 'new cadre' of extension services using new models, methods and approaches of training and extension. Thus the Knowledge Uptake Strategy seeks to be innovative in its knowledge dissemination and uptake approaches.

1.5.2 Sectoral and cross-sectoral policy relevance of the Knowledge Uptake Strategy development process

Agriculture plays an important role in the process of economic development and can contribute significantly to household food security. The overlapping mandate of the national Department of Agriculture, Land Reform and Rural Development (DALRRD) is premised on effective cooperative governance, in particular alignment of regional and local efforts around agreed programmes and projects. One of the programmes which is supported by the Department to improve food security and safety was the allocation for the Ilima/Letsema projects grant, which was used to promote the Fetsa Tlala food production initiative, which forms part of National Policy on Food and Nutrition Security. Agriculture, when extended to irrigation and water-harvesting, requires in addition the involvement of the Department of Water and Sanitation. Alignment of policy, financial and practical efforts of these Departments remains a primary challenge. Practical institutional solutions that give effect locally are needed, hence the focus on design and promotion of multi-stakeholder learning networks in the Amanzi for Food project was crucial for the development of the Knowledge Uptake Strategy. The Knowledge Uptake Strategy is related to the wider context of policy on land reform, as land reform influences *the contexts of practice of smallholder farming, the security of their enterprises, and longer term sustainability of smallholder farming enterprises.* Therefore, the Knowledge Uptake Strategy can be of value to the Department of Agriculture, Land Reform and Rural Development (DALRRD), especially as an asset for the Department's initiatives to support land reform and rural development. This includes initiatives to address food security and to expand access to food production in rural and peri-urban areas, such as the Comprehensive Rural Development Programme which was introduced in 2009.

DALRRD has made efforts to bolster extension services in support of rural development, boosting of various agricultural sectors and practices, as well as improving smallholder agriculture. These programmes can also benefit from the knowledge and approaches promoted via Knowledge Uptake Strategy. Furthermore, as DALRRD seeks to accelerate land reform, catalyse rural development and improve agricultural production to stimulate economic development and food security, knowledge dissemination and uptake of the practice of rainwater harvesting and conservation to promote innovative sustainable agriculture and sustainable livelihoods is mandatory. As South Africa is a water scarce nation, DALRRD policies show an awareness of the pressing and complex challenges of scarcities of water, and that bringing agricultural development into more remote and rural areas to stimulate equitable livelihood practices, is an act of good governance. They also show awareness of the need to strengthen the capacity of extension services through the development of appropriate agricultural skills.

Significant to the model developed for knowledge dissemination via this project and the Knowledge Uptake Strategy is the critical review of extension services produced in the *Presidency Fifteen Year Review Project: Review of agricultural policies and support instruments 1994-2007* by the Department of Agricultural Economics University of Stellenbosch (Tregurtha, Vink and Kirsten, 2010). Some less helpful policies, including the decentralisation of extension offices, have become less effective over time as those employed are not provided with proper training, nor adequately prepared to take on broader roles with the growing sector (ibid.). The sector needs more accountability and the institution of a feedback system to help with implementation and monitoring and evaluation of such initiatives in order to improve on extension support, for it to thrive (ibid.). Also, the document states that commercial farmers are critical of extension practices as they position themselves as more skilled than their extension officers (ibid.). In this project, discussions with the agricultural colleges have shown that the commercial farmers make little if any use of government extension services, relying instead on advice from the private sector, their agricultural equipment and material manufacturers and suppliers. Farmers also agree that extension personnel lack basic project management skills. Due to the poor performance of extension officers, there has not been real progress in the delivery of extension services. Therefore, the government extension services are generally restricted to advising smallholder subsistence and emerging farmers, and this important function is not adequately resourced or supported.

The Agricultural Policy Action Plan (2015–2019), the Integrated Growth and Development Plan (2012), and the Strategic Plan for the Department of Agriculture Forestry and Fisheries (2015–2020) provide the overarching framework for strengthening the government's commitment to support smallholder producers, promote climate-smart agriculture, protect indigenous genetic resources, and redirect trade to sustainable markets, among others.

The Strategic Plans of 2015-2020 of the Department of Agriculture, Land Reform and Rural Development, Republic of South Africa (DALRRD, 2015) provides for more refined and structured planning for aligning current and past ideology to create a more just and sustainable South Africa. The documents highlights the issue of climate change, which could derail the food security strategy (ibid). There is also acknowledgment of rising population pressures (the current estimate is that there will be 9 billion people globally in 2050), which will place considerable strain on current food growing practice and supplies if there is not a serious push

forward to increase smallholder/small-scale production (ibid.). The most recent DALRRD Annual Performance Plan (DALRRD, 2020) emphasises the important role of subsistence agriculture in food security for the nation as about 75.6% of South African households seek to secure additional sources of food through subsistence activities. The Strategic Plan includes a full programme on Farmer Support and Development (Programme 3) which aims at providing support to farmers and rural communities through agricultural development programmes. The objectives of the strategic plan are:

- To provide support to more than 10 000 smallholder farmers for sustainable agricultural development.
- To provide extension and advisory services to 25 000 farmers.
- To support, advise and coordinate the implementation of the Integrated Food Security Strategy of South Africa (IFSS) which supports 10 000 food insecure households. This could be achieved through the implementation of the Comprehensive Food Security and Nutrition Strategy.

Overall, the Strategic Plan's main focus is on household food production and food security through targeted support to subsistence and smallholder producers and/or processors. Optimum production by smallholder farmers/producers will ensure that a third of what they produce is for their own consumption, a third for storage, while the last third will be for national and international markets. Furthermore, the Strategic Plan indicates that the DALRRD will also support agricultural training colleges to become centres of excellence. Therefore, the Knowledge Uptake Strategy and the approach developed could be used directly to support these most recent policy intentions.

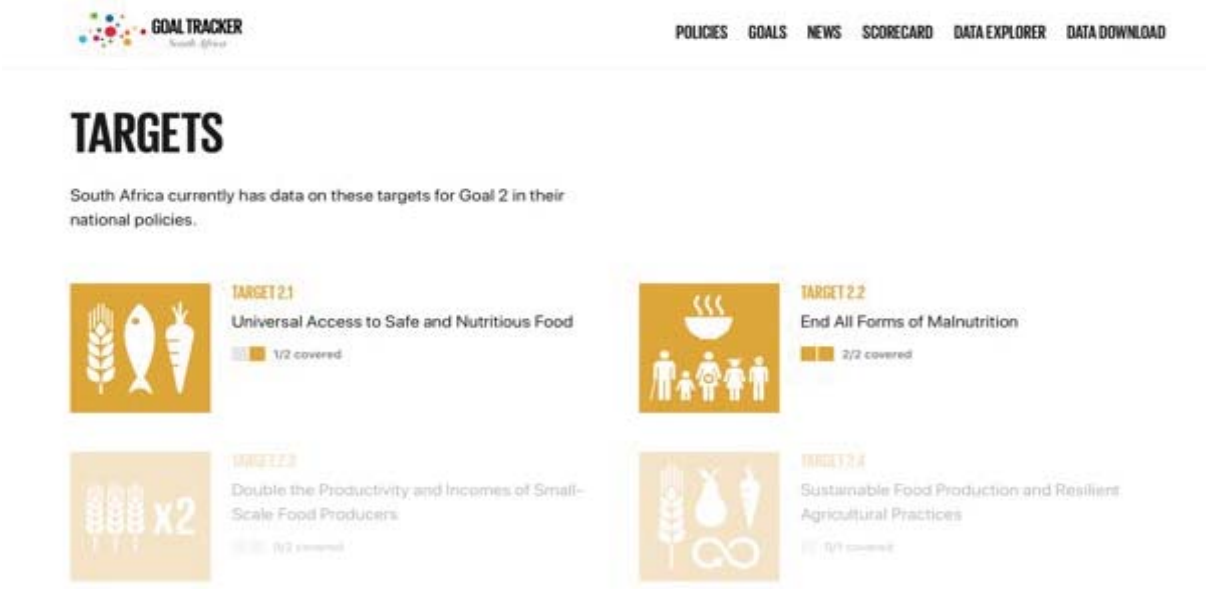
The Knowledge Uptake Strategy is also relevant to water sector policy, especially those policy aspects related to smallholder farmers. For example, if smallholder farmers need access to recognised and regulated sources of water beyond simple rainwater harvesting, the National Water Act (RSA, 1998), in relation to Water Access Rights (WAR), requires the Government to:

- Take proactive steps to meet the water needs of historically disadvantaged individuals (i.e. 'blacks and women');
- Ensure participation of the poor and historically disadvantaged individuals;
- Work with other agencies to help build capacity to use water productively;
- Promote the sustainable use of water resources; and
- Promote beneficial and efficient use of water in the public interest.

The NWA, through its focus on water access rights, is also committed to provide support to resource-poor farmers, mainly through the provision of a range of subsidies for bulk water infrastructure, operational subsidies and rainwater harvesting storage systems. Therefore, the Knowledge Uptake Strategy can be helpful in supporting learning networks that facilitate the development and use of these rainwater harvesting storage systems at local levels. The 2013 National Water Resources Strategy (2): Managing Water for an Equitable and Sustainable Future (DWA [now Department of Human Settlements, Water and Sanitation], 2013) highlights the need to promote smallholder and resource-poor farmers and households. However, the very low usage of water entailed by these groups may end up effectively putting them on the margins of the main thrust of the NWRS-2, which has a macro focus in setting a framework for the management of both the supply and demand sides of water usage and allocation in this country. The Knowledge Uptake Strategy can potentially assist with implementation of the

NWRS-2 via establishment of learning networks to mediate the water knowledge needed for implementation of water policy.

The National Framework for Sustainable Development (NFSD) (2011-2014), which is now also influenced by the government's commitment to the SDGs, is aimed at promoting the effective stewardship of South Africa's natural, social and economic resources. The framework is linked to the 2012 Rio+20 process and the SDGs to promote the emergence of green economies for poverty reduction and sustainable development. One of the objectives of the National Strategy for Sustainable Development and Action Plan (NSSD1) 2011-2014 is on 'building sustainable communities' (NSSD1, 2011), which suggests the need to strengthen community awareness and participation in working together to change behaviour for using resources more sustainably, and also for supporting building self-sufficient farming strategies through using indigenous knowledge and sustainable production approaches. Within this strategy, issues related to job creation within the 'green economy' and effective adaptation to climate change are considered. Key to this is the smallholder farmer and their support within a sustainable development, green economy growth path. For this to be achieved, NSSD 1 states: "*The need to ensure that there is capacity to implement sustainable development remains critical across all sectors in South African society, especially in the public sector*" (which would include the agriculture and water public sectors). It specifically suggests that there is a need to "*build capacity to enhance the effectiveness of government agencies to empower communities*" (under Priority 1 of the NSSD 1). StatsSA has recently (2019) introduced a new reporting tool for tracking South Africa's commitments to the SDGS (https://www.goaltracker.org/countries/south-africa/) which will carry updated information on the connection between the NDP and the SDGs. As can be seen from the extract from the StatsSA goaltracker website below (in February 2021), the goal tracker platform will carry data on Targets 2.3 and 2.4 which are of particular relevance to the uptake and use of agricultural water knowledge amongst smallholder farmers and household food producers with Targets 2.1 and 2.2 as over-arching targets indicating increased food security and well-being of all in South African society. Of interest is that the Targets 2.3 and 2.4 are not yet populated with data. This would be an important platform for future engagement for the WRC and its agricultural water projects could usefully inform and support this platform.



Another national policy that also has significant implications for sustainable agricultural water use knowledge dissemination is the *National Climate Change Response White Paper (NCCRWP)* (RSA, 2011). It identifies the key issue of vulnerability to climate change that affects South Africans, which is mainly due to extreme weather events including increases in overall temperature causing more intense and longer droughts and changes in rainfall patterns including increased frequency of heavy rainfall. All these have impacts on agriculture and food security, especially amongst smallholder and more vulnerable farming communities. The NCCRWP consequently outlines a number of commitments to mitigation and adaptation, with a stated commitment that adaptation plans will be integrated into major national plans such as the Strategic Plan for South African Agriculture, and the National Water Resources Strategy (amongst others). Furthermore, the NCCRWP states that South Africa is a water scarce country with a highly variable climate and with the lowest run-offs in the world, a situation significantly exacerbated by the effects of climate change. Current projections show that South Africa will exceed the limits of economically viable land-based water resources by 2050, and thus knowledge on rainwater harvesting and conservation practices is an important type of knowledge to be disseminated especially to smallholder farmers and household food producers. It is noted that water availability in South Africa is a key climate-change related vulnerability and negative impacts on the availability of water directly affect people, ecosystems and the economy, including smallholder farmers. Although climate change significantly impacts agriculture, agriculture is identified as a key adaptation priority in the NCCRWP. Also, the climate resilient sectoral plans have the potential to directly address the plight of those most impacted by climate change, especially the rural poor, and issues of strategic national importance such as food security, water, health and land reform are discussed in the document. It is said further that “under-resourced, small-scale and subsistence farmers are particularly vulnerable to the impacts of climate change”. Significant to the relevance of the Knowledge Uptake Strategy is that the adaptation priorities defined for agriculture in the NCCRWP include investing in and improving research into water, nutrient and soil conservation technologies and techniques, use of climate resistant crops and livestock, agricultural production, to promote the development of ‘climate-smart agriculture’. Climate smart agriculture is defined by FAO (2010) as agriculture that contributes to the development of sustainable development goals. It integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. It is composed of three main pillars: 1) sustainably increasing agricultural productivity and incomes; 2) adapting and building resilience to climate change; 3) reducing and/or removing greenhouse gases emissions, where possible. The CSA approach is designed to identify and operationalise agricultural development within the explicit parameters of climate change (FAO, 2013).

There is a need to invest in education and awareness programmes in rural areas and link these to agricultural extension activities to enable both subsistence and commercial producers to understand, respond and adapt to the challenges of climate change. In the light of this, the Knowledge Uptake Strategy can be integrated into wider imperatives for ‘climate-smart’ agriculture, and the activities and knowledge promoted via learning networks can help with

addressing climate resilient development.[2] The Long Term Adaptation Scenario (DEA, 2013) also recommends integration of climate smart approaches to agriculture in agricultural curricula, research on improved education and awareness programmes in rural areas. *The work of developing the Knowledge Uptake Strategy as conducted via this WRC Phase addresses this need directly.*

While these commitments to smallholder farming and improved access to, and more effective water use approaches are evident at policy level across a number of sectoral policies, programme design at farm level and in agricultural education and training systems still persist with centralised, state-driven farming initiatives. This is evidently failing to promote an environment where individual smallholder enterprise is nurtured through strategic interventions that build knowledge-based institutions, reduce farmer risk and increase profitability through better access to value-chains. The work of this project, the WRC material it is mediating, and the model it provides in the Knowledge Uptake Strategy may significantly contribute to the proposed re-orientation process in national sustainable development and related sector-based policies.

1.5.3 Agricultural Education and Training (AET) system policy relevant to the Knowledge Uptake Strategy

The National Education and Training Strategy for Agriculture, Forestry and Fisheries by the former Department of Agriculture, Forestry and Fisheries (DEFF, 2015) was adopted and updated from the National Education and Training Strategy for Agricultural and Rural Development in South Africa: (AET Strategy) produced by the Directorate Education and Training, Department of Agriculture (DoA, 2005). The AET strategy was designed to build and otherwise strengthen human capacity needed to ensure the successful transformation and advancement of the agricultural sector. Clearly, attaining the goals set for the agricultural sector would require greatly expanded knowledge and skills in agriculture and related fields. This strategy is instructive in relation to some of the complexities of agricultural education, training and social learning in the agricultural learning system, which the Knowledge Uptake Strategy proposed in this project, seeks to address. This strategy, intended to guide both formal and informal education and training in the agricultural sector, also identified the need for substantial improvements to address six key pressing challenges faced by the AET sector:

- Fragmentation and lack of co-ordination,
- Poor and inconsistent quality control,
- Ineffective and non-responsive education and training system,
- Poor access to AET by emerging farmers and new entrants into the agriculture sector,
- Agriculture's negative career image, and

[2] One of the post-doctoral scholars partially supported by the Amanzi for Food project during her PhD and post-doctoral studies, designed and tested a curriculum review tool for ATIs to review their curriculum from a CSA vantage point (Van Staden, 2018, 2020). The Curriculum Review Tool (Van Staden et al., 2018) is available on the Amanzi for Food website, for use by ATIs. Van Staden (2018) found in her study that adopting a wider lens of CSA can facilitate greater consciousness of agricultural water efficiency and use in the curriculum review and innovation process, which is an important insight for the Knowledge Uptake and Use Strategy development and for agricultural water use efficiency and sustainability research and practice more broadly.

- Shortage of critical skills.

To address these key challenges as well as advancing rural development, repositioning agriculture on the international stage and transformation of the sector, the AET strategy set out to achieve three strategic goals, each with corresponding objectives:

1) Development and maintenance of an effective and well-coordinated AET that is integrated and responds appropriately to South African Agriculture to ensure that:
    - policy and curriculum development are coordinated and harmonised,
    - AET delivery at provincial level is well coordinated,
    - AET learning is mobile and transferable from one AET institution to another and articulates with hierarchies of AET qualifications,
    - AET curricula are aligned with urgent challenges facing South African agriculture (e.g. sustainable development and land care, food security and water harvesting and rural wealth creation) and ensure these are incorporated into the formal AET system.

2) Enhancement of equitable access and meaningful participation in AET for all South Africans to:
    - develop and recommend a systematic plan to identify, prioritise and remove access barriers to AET,
    - improve the image of agriculture as a career and livelihood choice: develop and implement a high-impact public education programme that promotes the image of agriculture, particularly among children and the youth,
    - encourage higher-level studies (Masters and PhD) in the Agricultural Sciences (especially those sought-after skills that the majority does not possess) to produce highly qualified scientists who add value to the agricultural science knowledge base.

3) Ensuring the application of an effective quality assurance of AET at all levels to:
    - ensure that AET at all levels is accredited and resourced, with the appropriate number of teachers and trainers with relevant skills.

In this project, the Knowledge Uptake Strategy model creates a learning network environment in which knowledge and skills can be shared across stakeholders in the learning network (including agricultural extension officers) with potential to also support them, create platforms for stronger ‘demonstration practice’ focussing on agricultural education and training that is community engaged, at smallholder farming level and that helps to integrate theory and practice in agricultural education.

There has been a process to develop National Policy on Extension and Advisory Services to Agriculture, Forestry and Fisheries since December 2012 where a draft version was reviewed, with comments on its presentation to Parliament in March 2015). This draft policy (which is yet to be adopted) was developed in recognition of the absolute centrality of a fully functional extension service to the imperative of transforming the agriculture, forestry and fishery sectors.

It had been developed for the previous DAFF by the Chief Directorate of National Extension Support in response to a commitment in the department's strategic plan (2012/2013-2016/2017) to prepare an integrated extension policy to support the three sectors.

Box 1.1: Extension and advisory services as framed in the draft policy

1. For the purpose of this policy, extension and advisory services refer to the active collaborative engagement of all stakeholders, actors and role-players involved in the agricultural, forestry and fishery value chains to support wise decision-making about the socially, economically and environmentally sustainable use of resources in the pursuit and advancement of their livelihoods to ensure the optimal contribution of each sector to the economy and the welfare of society.
2. Active collaborative engagement includes, among other things, facilitating access to knowledge, information and technologies, fostering learning and practical partnerships, and assisting all parties to develop their technical, organisational and management skills and practices. Participants include primary producers, agri-businesses, processors and research, education, and other relevant institutions.
3. Unlike traditional top-down approaches, the extension and advisory services proposed for agriculture, forestry and fisheries in this policy focus on the provision of services that respond to users' expressed needs, ambitions and circumstances, which are linked to participatory, shared research and learning through combined efforts of extension and advisory personnel, producers and processors. Those involved in providing extension and advice play facilitation roles, helping individuals, groups and organisations to access a wide range of information, advice and services within, and sometimes beyond, these sectors with the express aim of aiding the farmer, fisher or forester and others in the respective sectors to make wise decisions about the resources at their disposal. Rather than promoting simple adoption, a key outcome of any engagement with extension and advisory services is to share knowledge and strengthen individual and collective capacity to work with greater self-reliance and confidence. This enables producers and processors to contribute to, and benefit from the prosperity of South Africa while pursuing their chosen livelihoods.
4. Modern strategy for extension and advisory services is pluralistic, recognising that there are roles for the state, the private sector, non-profit organisations and for producers themselves in delivering services. The new approaches thus reflect a reduced operational role for the state, which, in addition to providing policy direction appropriately fills certain extension and advisory niches, but leaves other functions which can be better performed by the private sector, by NPOs, through public-private partnerships and, indeed, by producers and producer organisations themselves.
5. In South Africa, there are serious questions about the effectiveness of extension and advisory services delivered by government and about the coherence of services delivered by the private sector and NPOs. A new strategy is needed that reflects current economic, environmental and social realities and aspirations, and assigns appropriate roles to all elements of society engaged in agriculture, forestry and fishing. Global trends in extension and advisory services emphasise the need for new thinking about how best to deliver extension and advisory services. In South Africa this policy represents the first step in that direction.
6. The policy commits South Africa to developing, delivering and maintaining a pluralistic, harmonised, co-ordinated extension service for agriculture, forestry and fisheries sectors

that operates on a common set of principles and values and which responds to the needs, aspirations, opportunities and other circumstances of the many actors in the respective value chains.

Making the Knowledge Uptake Strategy particularly relevant in this context, and in discussing the current approaches to extension (in contrast to traditional 'top-down' approaches), the draft policy states:

1.5.4 Current approaches

1. In recent decades, the concept of extension has broadened. Rather than simple technology transfer from the informed to the 'ignorant', current approaches emphasise the concepts of advice, facilitation, empowerment and learning within a revised understanding of the roles of the state.
2. Facilitation and learning-based extension places the extension worker in a more responsive role as 'knowledge broker' or guide through unfamiliar institutional or technical landscapes to the advice or information that the user needs. She or he may help build systems of mutual learning among groups of interested people, or help identify sources of expertise from the state or private sectors. Building capacity among farmers to learn and to develop and share their own solutions also comes into the mix.

This draft policy provides the principles and the framework within which the Knowledge Uptake Strategy for the WRC material must ultimately operate. It is interesting to note that the social learning role of extension is more strongly emphasised in this draft policy, and also the notion of 'knowledge brokering'. It is also encouraging to note that there are no inconsistencies between the approach articulated here and the approaches proposed by the Knowledge Uptake Strategy as developed via the learning network approach. This is also significant as ATIs now also have new mandates for training of agricultural extension services as also indicated below by a debate on the draft Policy in March 2015 in Parliament, outlined below.

Significant to the work done in developing this AOS, in his address to Parliament on the above mentioned policy in March 2015, the Minister of DAFF, Mr Senzeni Zokwana reiterated the perspective above that the concept of extension has broadened to emphasise a more responsive, engaged social learning role for the extension worker. Additionally, and important for the focus on multi-media platforms in the AOS, Mr Mokutule Kgobokoe, Deputy Director-General, Department of Agriculture, Forestry and Fisheries, in the parliamentary debate on the policy stated that "the policy sought to design user-friendly Information and Communication Technology (ICT) knowledge sharing platforms, such as social networks, to effect mass communication which would ensure free accessibility to research outcomes", and that there was need for giving attention to "how the transformation of the core competencies of extension practitioners" would emerge. He noted that "the officers must be the 'reservoir of information' that was needed by producers". He also communicated the Department's plans to institute a four-year qualification in agriculture before an extension officer could be appointed, and explained that the Department was supporting agricultural curriculum transformation that would embrace a competence-based model, and a concept of a multi-disciplinary curriculum. He noted too that processes were underway to revitalise agricultural colleges, with colleges in the Eastern Cape, Limpopo and North West provinces receiving attention

(https://pmg.org.za/committee-meeting/20459/, 10 March 2015). It is a bit concerning to note, however, that in the last policy period there appears to have been little progression of this policy.

Critical comments on the agricultural extension policy document indicate that inadequate attention has been paid to *how* the policy suggestions will be implemented to give effect to international trends in favour of farmer focused, demand-led, experiential approaches (www.extensionpolicy.za.net). Researchers working on agricultural extension policy development also refer to this draft policy in development as an incomplete process, and note the danger of policies being drafted without adequate attention to implementation: "One danger in developing extension policies is that they remain only on paper and are not implemented due to political change, lack of political will or lack of resources and capacity to do so" (Davis et al., 2016, p. 235).

In terms of the South African extension policy environment, Davis and Terblanché (2016) noted that:

> "According to the National Development Plan for South Africa and its Vision for 2030, South African's rural communities should have greater opportunities to participate fully in the economic, social and political life of the country. Rural economies will be supported by agriculture and possibly by mining, tourism, agri-processing and fisheries (see Chapter 6: An integrated and inclusive rural economy). The following aspects were identified as essential, with special reference to extension and advisory services in South Africa:
>
> - "Improve and extend skills development and training in the agricultural sector, including entrepreneurship training and the training of a new cadre of extension officers that will respond effectively to the needs of smallholding farmers and contribute to their successful integration into the food value chain.
> - For these extension officers to be successful, it is necessary to investigate whether extension and other agricultural services are appropriately located at provincial level. Innovative means for agricultural extension and training by the state in partnership with industries should be sought'" (National Planning Commission, 2012, cited in Davis and Terblanché, 2016, p. 235).

They (ibid.) also noted that there are increasing calls for "'demand-driven' and 'farmer-led' rural advisory services using participatory approaches" (p. 235), and that there is need to develop a 'pluralistic' approach to extension service provisioning. They stated:

> "Pluralism of extension providers, involving coordinated partnerships with non-profit non-governmental organisations. Pluralism is much touted amongst development practitioners … Pluralism can be promoted in extension by involving public, private, and civil society institutions (Qamar, 2005). Pluralism in advisory services provides the opportunity to capitalise on the comparative advantages of different types of providers. However, *coordination of such providers is challenging, particularly in ensuring that vulnerable sectors of the farming population have access to services and avoiding duplication of efforts* (Christoplos, 2010: 6). … A pluralistic extension pattern demands

that programmes/projects be jointly planned, implemented and evaluated by all service providers, in active collaboration with farmers (Rivera & Qamar, 2003). For pluralism to work, extension implementers, especially national extension services, *must ensure effective operational linkages between extension and research and other key relevant institutions* (Qamar, 2005)" (Davis and Terblanché, 2016, p. 235, our emphasis).

The Knowledge Uptake Strategy and social learning network model developed in the Amanzi for Food project, reported on here and in Lotz-Sisitka et al. (2016), therefore potentially offers a 'demonstration' of how aspects of the policy could be implemented in a way that builds responsive, social learning capacity amongst agricultural extension and education systems, via engaging across the agricultural learning system in order to be more responsive to farmer needs and interests via experiential approaches; conceptualised within the pluralistic paradigm outlined above by Davis and Terblanché (2016). To more fully understand this recommended approach, there is also a need for a critical, theoretical understanding of knowledge dissemination and flow within this paradigm. This is the focus of the following discussion.

1.6 Knowledge Dissemination, Flow and Uptake

1.6.1 Identifying an approach

As outlined above, there is a substantial body of training information in the public domain which responds to the multi-faceted crop-production challenges faced by small growers, which formed the focus of this research and development initiative and the project reported on in Lotz-Sisitka et al. (2016). While this is the case (i.e. relevant material and knowledge resources exist for supporting small-scale farmers and household food producers) a problem was identified around the uptake and use of this knowledge in practice, especially in the context of the agricultural learning system, including, but not limited to Agricultural Training Institutions (Denison et al., 2011). This is essentially a *knowledge flow* problem which we approached as described below in developing an action-oriented knowledge dissemination strategy which meant developing the strategy via a research-based co-engaged approach to working with the knowledge to demonstrate alternatives to traditional knowledge flow paradigms that also developed social learning system knowledge. Such a project needed to be grounded in the theoretical landscape of knowledge dissemination and mediation processes, as also argued in Lotz-Sisitka et al. (2016). We briefly summarise the insights from literature (also noted in Lotz-Sisitka et al., 2016) that helped to interpret the research problem from a theoretical perspective, while at the same time offering guidance for our project design, as outlined below.

It is widely appreciated that information on its own does not lead to capability development, and education, training, knowledge dissemination and communication involving a range of knowledge dissemination and mediation processes (Blackmore et al., 2011; Shaxson et al., 2012) are required for information to translate into action. Research outputs and information resources are usefully disseminated through academic papers, popular articles and in some cases targeted workshops, but there is potential for much greater uptake and impact. The challenge of achieving traction from research outputs is a global one and is related to what is

now recognised as inadequate Research-Develop-Disseminate-Adopt (RDDA) assumptions of how knowledge is / ought to be mediated in society (Robottom, 1991).

Contemporary theories of learning and change indicate that for knowledge or information to become meaningful, there is 1) a need for the information to be related to the situation and experience of the user; and that this needs to 2) be mediated in context; in addition to 3) providing new knowledge or information that can expand existing knowledge and/or practice. These are increasingly referred to as knowledge co-production processes, and can be described through use of social learning theory (Blackmore et al., 2011; Shaxson et al., 2012). Social learning theory and knowledge co-production processes are being rapidly developed in adaptive natural resource management contexts; and in participatory agricultural development (Lotz-Sisitka, 2012; Mukute, 2010; Masara, 2010; Lindley and Lotz-Sisitka, 2019; Lotz-Sisitka et al., 2017). Social learning is interested not only in the cognitive gains that accrue from learning, but the actual social and practical changes that result from the learning; and also how such change can be facilitated through experiential and change oriented learning interactions, and agency development and knowledge exchange (ibid.).

Aligned to these understandings of learning and change, is a growing body of knowledge on the issue of knowledge dissemination, as scientific organisations around the world begin to confront problems of dissemination and uptake. The UK DFID for example, launched a 'Knowledge-in-use' programme (2006-12), and there is also burgeoning practitioner literature on information intermediation, knowledge translation and knowledge brokerage (Blackmore et al., 2011; Shaxson et al., 2012) as well as burgeoning academic literature on transdisciplinary practice (Regeer and Bunders, 2009; Colvin et al., 2011; Lang et al., 2012; Fam et al., 2016) which seeks to mediate knowledge in practice through knowledge co-production processes involving researchers and practitioners working together on knowledge and practice problems or innovations. Shaxson et al. (2012) defined these in a continuum which has been adapted here to provide a foundation that helped us test out (Lotz-Sisitka et al., 2016) and further develop diverse strategies for knowledge dissemination in this research programme (see also Figure 1.2 below):

1. *Information intermediary* – helps people to access information from one or more sources (e.g. community radio; local resource centres)
2. *Knowledge translator* – helps people make sense of and apply information (e.g. agricultural colleges)
3. *Knowledge mediator* – works with others to use knowledge in decision making processes and in knowledge co-production processes (i.e. in participatory practices) (e.g. extension officers, NGO fieldworkers)
4. *Knowledge innovator* – works with existing knowledge in contexts of practice to facilitate new knowledge production and social innovation (e.g. action researchers / communities of practice)

The continuum outlined above (1-4) shows a shift in focus from linear dissemination from knowledge producer to knowledge user (at 1) to co-production of knowledge, social learning and social innovation (at 4). At 1, the primary function is informational, while at 2/3 the function shifts to become more relational, and at 4 the function shifts to become more systemic (Shaxson et al., 2012). This framework, complemented by recontextualisation theory that explains *how* the knowledge dissemination actually takes place (Bernstein, 1990) provided a potentially useful way of examining knowledge dissemination strategies using the WRC

material in different contexts of practice and use. The examples of recontextualising agents (e.g. agricultural colleges, media, extension services, action researchers) linked to the four types of knowledge dissemination listed above, shows that there are different mediation agents involved in knowledge dissemination along this continuum, and for a comprehensive knowledge flow process to be articulated, use of the WRC material needs to be extended in these different contexts with the agents concerned.

Insights into this approach to a co-produced, systemic approach to knowledge dissemination are being produced by researchers around the world, as the same knowledge flow problem is identified out of a history of uni-directional knowledge flow assumptions in the sciences. For example, Polk (2015) – referring to this as a 'transdisciplinary co-production process' – noted:

- Transdisciplinary co-production is based on joint ownership, responsibility and commitment of both researchers and practitioners.
- Five focus areas for knowledge co-production include inclusion, collaboration, integration, reflexivity and usability.
- Capturing multiple framings, integrating knowledge diversity and contributing to societal change are three core challenges for knowledge co-production.

Similarly, Harris and Lyon (2014) described this more systemic type of knowledge flow as a transdisciplinary process that "promotes collaboration between academic research and practice, between different disciplines, and between different types of organisations. This is achieved by crossing the boundaries between different disciplines, and through engagement with different types of knowledge: scientific knowledge, lay knowledge and practitioners' experience. Transdisciplinarity engages with a wide group of stakeholders; listening to the public voice as well as engaging with policy makers. Participants become co-creators of knowledge" (p. 3). Thus, overall, and within the wider knowledge landscape, the approach developed here via the Knowledge Uptake Strategy can also be viewed as a strong case example of transdisciplinary praxis.

1.6.2 Knowledge flow and project design

As indicated in Lotz-Sisitka et al. (2016), the WRC Amanzi for Food project design was initially based on the conceptual framework for knowledge dissemination adapted from Shaxson et al. (2012) model, which proposes a 'continuum' of knowledge dissemination approaches, contexts and relations (see Figure 1.2) within a systems approach to knowledge dissemination, which we articulated practically via four components (A-D – see Figure 1.2).

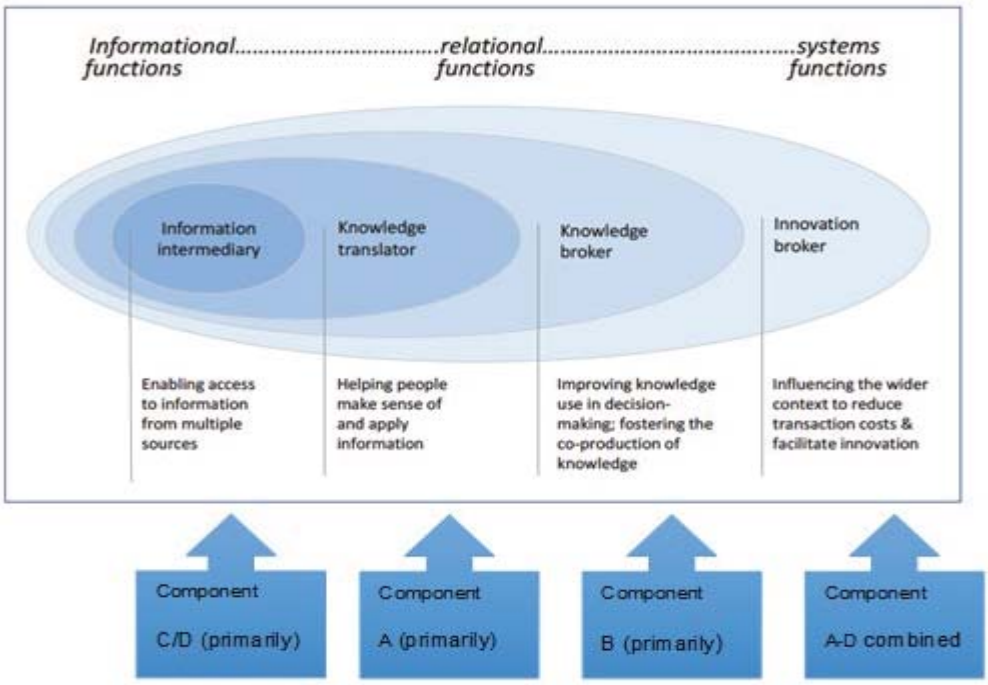


Figure 1.2. Knowledge dissemination continuum (with associated project component foci, from Shaxson et al., 2012)

- **Component A:** Identification of, and individual engagement with learning organisations where the primary form of knowledge dissemination can be typically identified as 'knowledge translator' (Shaxson et al., 2012). In the context of this knowledge dissemination strategy, the primary focus here was on ATIs with possible inclusion of other formal agriculture training providers (universities and/or private training providers).
- **Component B:** Identification of and engagement with government departments, extension services and field-based change agents / fieldwork staff in key organisations (NGOs) identified as being critical to knowledge dissemination in relation to the agricultural water use practices promoted in the WRC material, and the primary target group. In the Shaxson et al. (2012) framework, the typical form of knowledge dissemination in this context would be knowledge mediators and/or social innovators (however, other forms of knowledge mediation may also predominate).
- **Component C:** Design and testing of media enhanced approaches that can strengthen use and application of WRC material relevant to the agricultural water use practices promoted in the WRC material, and to understand how these extend the knowledge dissemination possibilities in Component A and B. Analysis of material-in-use and contemporary trends associated with media expansion led to use of a website (www.amanziforfood.co.za) combined with posters, a short messaging system (SMS) application – WhatsApp – with YouTube video material to maximise the potential of Web2.0 for knowledge dissemination. Building on this, are tools such as mobile journalism (MO-JO) and the use of Facebook as platforms for knowledge sharing and dissemination.
- **Component D:** Design and piloting of a methodology and approach to develop mass media programmes – primarily use of community radio – that directly targets farmers

and food growers using the knowledge content in the WRC material that also complemented other knowledge dissemination strategies.

This model with the four components sought to work within a multi-actor knowledge flow system which directly addressed the problems of the more traditional Research, Develop, Disseminate and Adopt (RDDA) knowledge flow model (see Figure 1.3), which has long since been critiqued for not taking full account of the complexity of societal relations and the structural, cultural and historical conditions that shape and influence knowledge production and dissemination (Robottom, 1991; Lotz, 1995), including the mediation processes that are needed for knowledge engagement and uptake in social settings.

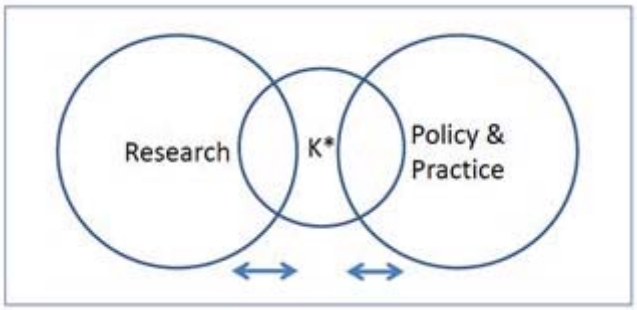


Figure 1.3. Earlier technology transfer views of knowledge dissemination and use (Shaxson et al., 2012)

A systems' view, differently to the RDDA model, sees knowledge 'flow' as being at the intersection or 'nexus' of different lifeworlds. It sees these in 'constant flow' and interaction, and recognises that knowledge flows are influenced by structural, organisational, individual and system challenges – including knowledge mediation challenges – in a range of different contexts. For example, for WRC research knowledge to be used in ATIs, there is a need to analyse and understand the structural, individual, organisational and system challenges faced by agricultural college managers, lecturers and curriculum developers in order to develop strategies that will enhance knowledge flow, mediation or uptake and use of new knowledge in this context. There is also need to consider how the ATIs are linked to other actors in the agricultural learning system for the knowledge dissemination to not be narrowly conceptualised.

Shaxson et al. (2012) referred to K* where the * indicates the variety of knowledge dissemination processes that may take place in any given context (see Figure 1.4). Such knowledge dissemination processes take place at the nexus of policy, practice, and science and in the case of the WRC project, agricultural training organisations, farmers, farmers associations, local government and extension support services and media practitioners (which make up the full agricultural learning system), amongst others. This model is therefore appropriate for the pluralistic, transdisciplinary paradigms for extension and science praxis as discussed above.

As time has progressed and as the learning networks in the WRC project contexts have expanded (currently there are three active learning networks) we have realised that the agricultural learning system is more complex than this, and involves a range of other actors such as commercial extension services with different mandates to state extension services, NGOs, community and faith based organisations, schools, youth organisations and more.

Understanding K*, or diverse forms of knowledge dissemination and flow from this perspective, gives a more holistic view of knowledge dissemination than the traditional model as outlined in Figure 1.3. Figure 1.4 illustrates this systems' view of knowledge dissemination and use.

Figure 1.4. A systems view of knowledge dissemination (adapted from Shaxson et al., 2012)

From the above, **K* [knowledge dissemination and use approaches]** in the context of this research project is a collective term for the set of functions and processes at the various interfaces between science, policy, practice and training organisations that improve the sharing of knowledge and its application, uptake and value in the pursuit of progress towards productive water use for food crop production amongst small-scale farmers and household food producers in South Africa (definition adapted from Shaxson et al., 2012).

In our study, this systems approach to knowledge dissemination was further extended by learning network theory, which led to the development of three learning networks – one in the rural Eastern Cape centred around Fort Cox ATI, one in Mpumalanga centred around the University of Mpumalanga, and a third one in the North West, centred around the Taung College of Agriculture (i.e. centred around learning institutions with a mandate to 'teach' agricultural water knowledge, all of whom also have an expanding mandate to include small-scale farmers in their curriculum. However, while the learning networks were centred around these learning institutions, they were not the only learning network members, as we sought to broaden the concept of 'who learns', informed by the systems approach to knowledge flow outlined above.

Cousin and Deepwell (2005) indicated that a *learning network* is a group of people who have come together to learn about certain topics that are of interest to all members; and that these networked groups are potential platforms for learning to occur (Weaver, 2016). Members of these learning networks bring their own experiences and competences from their diverse backgrounds, creating opportunities for collaborative learning and engaged practice (Wenger et al., 2011). According to Lieberman (2000), educational networks are often constituted as flexible partnerships that develop around common interests, much like in communities of practice (CoP). However, Brown and Duguid (2002, in Weaver, 2016, p. 31) suggested that

"the term network is used when the relations among network members are significantly looser than the relations among those in a CoP". Wenger et al. (2011) have also noted that "people in social networks use connections and relationships as a resource to solve problems, share knowledge and to meet more people" (Weaver, 2016, p. 31) which we also found to be the case in the first phase of the project (Lotz-Sisitka et al., 2016).

Weaver (2016)[3] discussed a case study in the Eastern Cape (Hobeni) which showed that through facilitating and building effective networks, agricultural resources and information can be disseminated effectively (Fay, 2010). It was stated that partners in these networks share a great deal of knowledge even though they may not interact much. Weaver (2016, p. 31) suggested that "for a learning network to be successful, the participants need to be flexible, responsive and continually learning from one another. Furthermore, it is important for the partners to strike a balance between inside (experiential and internal knowledge) and outside (external research knowledge) knowledge to form successful collaborations (Lieberman, 2000)".

Weaver (2016, p. 32) argued further that "a network can be a very effective learning resource when the network is designed in a way that learner differences, such as their diverse competencies, are accepted and utilised (Cousin and Deepwell, 2005) and individuals act as nodes and encourage information flows in the broader network (Wenger et al., 2011)". Knowledge dissemination cannot, however, take place without attention being given to the type of knowledge that is to be dissemination, intended users of the knowledge, and mediation or facilitation approaches that might be used. Descriptions of learning networks, like the descriptions on knowledge flow, while recognising the importance of mediation, fail to provide adequate insight into the mediation processes that are required for knowledge flows that lead to the type of co-engaged social learning, social innovation and systems orientation to knowledge flow at 3-4 on the Shaxon et al. model – Figures 1.2 and 1.4 above, or that can actively support the formation of learning networks. This project provides insight into such *mediation processes.*

1.7 WRC Material and their Use

1.7.1 The material

The eight material which were the focus of this project are introduced above in section 1.2. These material are extensive in content and scope, and to focus the Knowledge Uptake Strategy development work, we conducted an in-depth review of these eight material in order to identify the knowledge that was at the core of each material, thus addressing the issue of *what* the knowledge dissemination process would focus on.

Three dimensions of these material were reviewed. These were:

[3] Weaver's masters in Education research (2016) was completed with partial support from the WRC Amanzi for Food programme. The focus of her research was on the Amanzi for Food Course Activated Learning Network in its initial phases.

1. How the material were developed, with emphasis on **intended audiences and uses** for the material and the different dissemination pathways that were chosen, and their appropriateness for future use within an AOS aimed at further activating their use.
2. The **facilitation approaches** being promoted by the material and their appropriateness for the contexts in which they are intended to be used and the relevance of these approaches within the policy context.
3. The content of the material, with specific reference to the technical **agricultural water use practices** they promote and the underpinning knowledge required for these, and whether or not this is provided by the material.

The practices analysis (focussing on the core content of the material) was then linked back to appropriate education and facilitation approaches, and to kinds of work or field-based experiences required to complete the learning.

1.7.2 Intended target audiences and initial experiences of development and use of the material

These eight WRC sets of comprehensive material cover diverse topics, but each of them has a connection to rainwater harvesting and conservation (RWH&C) practices amongst small-scale farmers and household food producers. The audiences and beneficiaries for whom they are intended are different depending on the intended practices and the applications of the material (see Table 1.1 below).

Table 1.1 Eight sets of WRC material showing their focus and intended use

WRC material	Focus and intended use of material
1. Denison J, Smulders H, Kruger E, Ndingi H, and Botha M (2011). *Development of a Comprehensive Learning Package for Education and Training on the Application of Water-Harvesting and Conservation*. Report No. TT/492/11, Water Research Commission. Gezina, South Africa.	***Focus:*** The RWH&C material are intended to benefit small-scale and emerging commercial cropland (mostly vegetable) farmers. They are focused almost exclusively on rainwater harvesting, but also look at soils and water. ***Intended use:*** These material have been developed for use principally within the formal education and training system, in particular by agricultural colleges and training institutes (in the FET band) in their training of agricultural extension officers and others with professional involvement in the agricultural sector, and by training providers accredited by the AgriSETA. The material are also suitable for use by other formal educational institutions, the agricultural extension services, and NGOs and community-based organisations (CBOs) supporting farmers.
2. Botha, J.J., Anderson, J.J., Joseph, L.F., Snetler, R.M., Monde, N., Lategan, F., Nhlabatsi, N.N., Lesoli, M.S., and Dube, S. (2012). *Sustainable Techniques and*	***Focus:*** A wide range of RWH&C practices for different farming scales. ***Intended use:*** The material are intended to benefit small-scale and emerging commercial cropland (mostly vegetable) farmers, and have a strong focus on rainwater harvesting for food production. These

WRC material	Focus and intended use of material
Practices for Water Harvesting and Conservation: Farmer and Extension Manual. Water Research Commission Report No. TT 542/12.	material have been developed for use within the formal education and training system, by agricultural colleges/training institutes (in the FET band) in their training of agricultural extension officers and others with professional involvement in agricultural sector, and by training providers accredited by AgriSETA.
3. Botha, J.J., Van Staden, P.P., Anderson, J.J., Van der Westhuizen, H.C., Theron, J.F., Taljaard D.J., Venter I.S., and Koatla, T.A.B. (2014). *Guidelines on Best Practice management practices for Rainwater Harvesting and Conservation (RWH&C) for Crop and Rangeland Productivity in Communal Semi-Arid Areas of South Africa.* Water Research Commission Research Report No.TT 590/14.	***Focus:*** Quite unusually, this publication has a focus on rangelands, and how RWH&C practices can be used to improve grazing on these. ***Intended use:*** The material are intended to provide decision makers, land-use planners, extension officers and farmers with the basic guidelines/ principles on how to maintain/improve the productivity on croplands and rangelands in semi-arid areas where rainfall is considered to be the most limiting factor for production.
4. Jansen van Rensburg, W., Van Averbeke, W., Belts, Y. and M. Slabbert. (2012). *Production Guidelines for African Leafy Vegetables*. Report to the Water Research Commission and Department of Agriculture, Forestry and Fisheries. WRC Report No. TT 563/12. September 2012	***Focus:*** The book provides guidelines for some popular African leafy vegetables (ALVs) in South Africa as informed by research findings. The focus is on homestead gardens and stresses utilisation of locally available resources to optimise production and consumption of ALVs at a household level. ***Intended use:*** The material are intended for use by farmers at a household level, but can also be used by other groups, such as extension workers; lecturers/teachers in high schools, agricultural schools, agricultural training institutions, colleges and universities; farmer trainers (from CBOs and NGOs).
5. Rodda, N., Carden, K. and Armitage, N. (2010). *Sustainable Use of Greywater in Small-scale Agriculture and Gardens in South Africa*. Water Research Commission Research Report No. TT/469/10	***Focus:*** The material aim to provide guidance for the sustainable use of greywater in small-scale agriculture and gardens in rural villages, peri-urban and urban areas of South Africa. ***Intended use:*** The main intended audience is farmers (subsistence, semi-commercial and commercial) and household food growers. The material can also be used by residents of low income settlements with backyard gardens, extension workers, agricultural education and training institutions, farmer trainers from both the government and NGO sectors, and members of the public who

WRC material	Focus and intended use of material
	need guidance on irrigation using greywater on their properties.
6. Rhodes University (DIFS). (2010). *A Manual for Rural Freshwater Aquaculture*. Water Research Commission Research Report No. TT 463-P-10.	***Focus*:** The main aim of the material was for the WRC to highlight the potential contribution of aquaculture to rural livelihoods. ***Intended use:*** This has a focus on small-scale farmers and household food growers, large-scale commercial fish growers, and the agricultural extension services. The manual is also intended for use as a resource material in the field when interacting with farmers. It is also appropriate for government officials, individual farmers, agricultural colleges, and universities.
7. Smith, M.T., and Everson, T.M. (2016). *Improving Rural Livelihoods through Biogas Generation using Livestock Manure and Rainwater Harvesting.* Water Research Commission Research Report No. TT 645/15	***Focus:*** The focus is clearly on the production of biogas, using manure and (rain)water, on a relatively small, household/homestead scale. ***Intended use:*** The material are intended to be used by homestead owners themselves, but are probably more appropriate for the scientists and engineers who may be involved in supporting the homestead owners to establish biogas production units. They may also have some value in supporting theoretical training and discussions on small-scale biogas production in rural areas, as part of high-school, college/training institute and university curricula.
8. Stimie, C.M., Kruger, E., De Lange, M., and Crosby, C.T. (2010). *Agricultural Water Use for Homestead Gardening Systems Resource Material for Facilitators and Food Gardeners*. Water Research Commission Research Report no. TT 430/09 and 431/09.	***Focus:*** The material are focused on homestead, subsistence level vegetable production. They provide a comprehensive coverage of a wide range of practices, including those associated with rainwater harvesting and conservation. ***Intended use:*** The material have been developed principally for use in the informal training sector by NGOs and CBOs supporting subsistence farmers. However, they are also appropriate for formal education institutions, such as high schools, colleges, training institutes and universities, to use in their teaching. They are further appropriate for agricultural extension services in their work with farmers.

The WRC material were developed for use within both the formal education and training system (in particular by agricultural colleges (in the FET band) in their training of agricultural extension officers and others with professional involvement in the agricultural sector, and by training providers accredited by the AgriSETA). Some were also developed for training in the informal training sector by non-governmental organisations (NGOs) and community-based organisations (CBOs) in their work in supporting subsistence farmers. Each of the eight material has key technical content covering a wide range of technical practices from 'generic',

preparatory activities to a number of different RWH&C practices applicable in different farming contexts and at different scales of farming. The information on these practices is presented in different forms throughout the material, with much in the text (T) augmented by handouts (H) on specific practices or as case studies (CS). A considerable amount of essential 'underpinning knowledge' required for understanding and implementing the practices is also provided.

More detailed summaries of these material, together with the Navigation Tool to aid in finding specific information in them have been collated into the Technology Transfer Booklet: *WRC Learning Material for Rainwater Harvesting and Conservation* (which is an Appendix to the Knowledge Use Uptake Strategy).

1.8 Conclusion

This chapter has outlined the framing of the project from a project history point of view, as well as from a policy and 'core content' point of view. The chapter also introduced the theoretical framework for the social learning approach, linking it to the problem of scientific knowledge flow, and offering a way of resolving which is also aligned with recent policy developments in the area of agricultural extension and support services, and recommendations for a more pluralistic, systemic approach to extension engagement and support of farmers.

The chapter also introduces the eight sets of WRC material indicating their usefulness to small-scale farmers and household food producers, indicating the work that was necessary to analyse and identify how these material may be of use to the farmers, and those who support them in the agricultural learning system. This background work on the material themselves, and the associated development of one of the key Technology Transfer Tools for the Knowledge Uptake Strategy – namely the Booklet: *WRC Learning Material for Rainwater Harvesting and Conservation* provides a strong foundation for the development of the Knowledge Uptake Strategy.

In the process of analysing different WRC material and associated material, it has become clear that irrespective of the quality of the material and the relevance of the information, and the knowledge dissemination, flow and uptake processes, there are some critical factors that need to be well understood. For example, in terms of dissemination of the WRC material and associated material, the 'profile' and formal credibility of the practices themselves in the different agricultural sectors, including the agricultural training sector are crucial factors. Understanding the contexts within which uptake will be located is also crucial to the development of an effective strategy, hence we turn next to the ongoing contextual profiling work undertaken in the project, and the role of contextual profiling and its importance in supporting Knowledge Uptake and Use.

CHAPTER 2.
TOWARDS A KNOWLEDGE UPTAKE STRATEGY PART 1: Analysis of key contexts where WRC material / knowledge resources can be used

2.1 The South African Agricultural Sector: Smallholder Farmers and Household Food Producers

2.1.1 Smallholder farmers and homestead producers in the SA agricultural sector

The South African agricultural sector is in a process of transformation. It is highly complex, encompassing farming activities ranging from very small-scale 'subsistence' level production to highly sophisticated and capitalised commercial enterprises serving the export market. Agricultural policies developed since 1994 have striven to create frameworks within which these vastly diverse activities can be supported, with an increasing emphasis on the need to support small-scale farmers, particularly women, to increase their productive capacities and move towards more income generation. The purpose of these agricultural policy reforms is to ensure that agriculture contributes to these national objectives through the following:

- an increase in agricultural productivity and output which will enhance the sector's contribution to national economic growth;
- an increase in the incomes for the poorest groups in society, through the creation of opportunities for small and medium-scale farmers to raise their production for own consumption and the market;
- the creation of additional employment opportunities in agriculture; and
- an improvement in household food security through expanded production and a more equitable distribution of resources.

This emphasis reflects the focus of this project, in which homestead level and small-scale commercial farmers, especially women, are foregrounded.

The most recent DAFF Strategic Plan (2015-2020) (DAFF, 2015) states that "the challenge of growing the smallholder sector (small-scale farmers who produce for the purpose of deriving an income) is closely linked to the challenge of making smallholder agriculture more remunerative. Currently, more than half of all smallholder households live below the poverty line". It states further that,

> Presently, about three quarters of smallholders farm within the former homelands, and the rest of them are split between urban areas and commercial farming areas. There is scope to increase the size of the smallholder sector in each of these areas. In the former homelands, there are thousands of hectares of underutilised arable land that can be put back into production, especially with a concerted support for input access, mechanisation services, technical support and linkages to markets. Smallholders in urban areas are poorly supported at present, but could contribute to local vegetable production in particular. (DAFF, 2015, p. 12).

DAFF (2015) went on to say that "while the 2013 General Household Survey report indicated that between 2002 and 2013 the percentage of households that experienced hunger decreased from 29,3% to 13,4% and while households with inadequate to severely inadequate

access to food decreased from 23,9% in 2010 to 23,1% in 2013, the need to ensure increased availability and affordability of food for all South Africans remains critical" (p. 12), a point that has been recently confirmed again by StatsSA (2019) that in 2017 6.8 million South Africans still experienced hunger, despite drops from 13.5 million in 2002. 1.7 Million households across the country are still affected by hunger. Of concern is the high level of disproportionate impact on mainly Black African and Coloured households with more than eight household members. According to the StatsSA (2019) report,

> … just under a third (29,6%) of households that comprised more than three children reported that food access was inadequate…. Child hunger is still a challenge in South Africa. More than half a million households with children aged five years or younger experienced hunger in 2017. Northern Cape and KwaZulu-Natal had the highest proportion of households that experienced hunger. According to the report, more than half of households with young children that experienced hunger were in urban areas.

This indicates that there is a strong need to support household food production in urban areas, and also in the schooling and education sector more generally to support children's nutrition.

The Agricultural Policy in South Africa (Ministry for Agriculture and Land Affairs, 1998) states that "while there is adequate food at national level, some 30 to 50% of the population has insufficient food, or is exposed to an imbalanced diet, as a result of low incomes. Emphasis will therefore be placed on food security at household level. Increasing the production of small-scale farmers will improve the availability and nutritional content of food, and hence food security generally among the poor." The policy also emphasised the inclusion of female farmers in the programmes to ensure that "women at least have equal access". As can be seen from the above, the emphasis on women farmers is crucial given the relationship between women household food producers and children's nutrition. In their 2019 study *The Extent of Food Insecurity in South Africa,* StatsSA indicated that subsistence or small-scale and household food production is an important safety net that complements social grant income in many households. They noted further that,

> The involvement of households in agricultural activities for subsistence farming can play an important role in reducing the vulnerability to hunger of rural and urban food-insecure households. The results show that out of 16,2 million households, about 2,5 million households (15,6%) were involved in agricultural activities in South Africa in 2017. *Provinces that are predominantly rural and with high levels of poverty such as Limpopo (25%), Eastern Cape (20%) and KwaZulu-Natal (20%) had the highest proportions of households that relied on agricultural activities to supply their own food*. Most households involved in agricultural activities were involved in the production of fruits and vegetables, grain and other food crops, as well as in livestock and poultry farming. (Our emphasis)

This recent data shows that there is need to emphasise support for household food production and small-scale farming in those provinces where poverty levels are highest (Limpopo, Eastern Cape, and KwaZulu-Natal), but also in urban areas and in the Northern Cape and KwaZulu-Natal where child hunger is greatest.

High levels of poverty and deep inequality remain major challenges in post-apartheid South Africa. Rural areas in the former homelands continue to be most affected by these persistent

challenges. Since the 1960s external sources of income are the main sources of income for rural households in these areas (Hebinck et al., 2007). Agriculture only makes a modest contribution to household income, and on average 'own production' of food contributes little to food security at household level (Vink and Van Rooyen, 2009). For example, the 2019 General Household Survey (StatsSA, 2019) highlighted that a greater percentage of South African households (75.4%) involved in agricultural activities are also involved in an attempt to secure additional sources of food. This situation *under-represents* the potential for increased household food security and enterprise development through smallholder agriculture and household food production processes. This is more especially so when one considers the context of such farming practices from a social justice and redress perspective.

According to Aliber and Hall (2010), there are approximately 4 million Black Africans involved in agriculture at some level. About 92% of these people are subsistence-oriented smallholders while 8% are commercially oriented smallholders. Women make up 61% of all those involved in farming and contribute to food production (Denison et al., 2015). Women are most disenfranchised when it comes to landholding, which in turn affects their capacity for participation in more sustainable and expansive forms of agricultural production. It is this context of agriculture and this segment of agricultural practice in South Africa that this project targets.

As indicated in Chapter 1, section 1.5, the National Development Plan (NPC, 2011) includes an envisaged expansion of smallholder agricultural development, involving increased support and conversion of opportunities for smallholder farmers, coupled with successful land reform. These approaches are expected to increase food security and empowerment of these communities. It proposes:

> To achieve this (job creation and poverty reduction impact), irrigated agriculture and dry-land production should be expanded, with emphasis on smallholder farmers where possible. The 1.5 million hectares under irrigation (which produce virtually all South Africa's horticultural harvest and some field crops) can be expanded by at least 500 000 hectares through the better use of existing water resources and developing new water schemes.

This vision suggests 500 000 ha of new smallholder irrigation and suggests that smallholder irrigated agriculture will be the 'driving force' of growth and change in the country's rural areas to achieve job creation and poverty alleviation. The NPC states explicitly that the expansion of irrigated agriculture, supplemented by dry-land production where feasible, is the main strategy for addressing underdevelopment, including in the former homelands (NPC, 2011:218). Denison et al. (2015), however, suggested that

> The only way the target of 500 000 ha could be attempted seems to be to adopt a more expansive definition and extend 'irrigation' to 'agricultural water', thereby including smallholder irrigation plus all water-harvesting interventions in the programme. The reach of these combined technologies is much greater than formal irrigation, which requires a massive budget, and a target of 500 000 ha is also within the practical soil and water resource limitations of the country.

This also builds on earlier policy discussion in the Department of Agriculture, where it was noted that

One of the encouraging developments in recent years has been the growth in support for home gardens, especially in peri-urban and urban areas, where small plots, of vegetables in particular, can contribute significantly to both livelihoods and nutritional standards. (Ministry for Agriculture and Land Affairs, 1998)

2.1.2 Considering the WRC material in relation to differentiated contexts of smallholder farming practice

This context and level of agricultural practice in South Africa is also differentiated, and differentiation tends to occur as shaped by farmer aspirations and levels of resources including land holding size. Similarly, the contribution that own production can make to alleviating rural poverty is restricted by factors such as the availability of land and the difficulties of obtaining water. For the Knowledge Uptake Strategy the project followed the framework which was developed in the earlier piloting of the project (Lotz-Sisitka et al., 2016), to describe this segment of the agricultural sector further. In order to provide access to the WRC material and their use in these contexts, three different farming scales are provided:

- **Scale 1: Umzi/garden/homestead, where focus is on subsistence production**

This is the smallest scale band and includes homestead gardens and shared community gardens, with the focus very much on production for own use, although with potential for sharing, barter, and limited sales. This scale of agricultural practice can include keeping small numbers of small livestock. The production sites are either attached to or quite close to the farmers' (or gardeners') homes. This context of food production is unlikely to involve employment of farm workers from outside the family. It is characterised by low input costs, with little or no financial income. Areas involved are usually less than 1 ha, and can be simply a backyard garden. This scale of farming also generally uses low-cost water harvesting technologies:

- Technologies – basic gardening equipment
- Skills and understanding – as required for basic gardening
- Cost R0 – R1000
- Maintenance – none, one or two days a year, simple repairs

- **Scale 2: Small arable (field), where focus is small-scale commercial production**

This mid-scale band includes larger shared community/co-operative gardens, and dedicated arable plots, with the focus on production for income generation, with some for own use, sharing and bartering. The focus is generally on producing fresh produce, although with potential for processing and value-adding. The produce market tends to be focused on supplying local and nearby, and potentially some national markets. These enterprises can also include small livestock production. Production areas may be some distance from the farmers' homes and may involve employment of workers from outside the family. This scale of farming generally involves increased input costs with generation of some income. Farming area sizes are generally areas of 1-2 ha. This level of agricultural practice generally uses medium range water harvesting technologies:

- Technologies – simple testing or measuring kits, tanks, pipes
- Skills and understanding – as required for small-scale business
- Cost R1000-R10 000
- Maintenance – regular but infrequent checking/repair, 7-10 days/year, technical repairs

- **Scale 3: Large arable and livestock (farm), focussing on full commercial arable production, and differing levels of (small and large) livestock production**

This level of agricultural practice is focussed on production for income generation with little, if any, for own consumption. The products include some fresh produce, but also produce grown for mass processing. This can include production of crops not consumed locally, for national or international markets. Production areas may be some distance from the farmers' homes. Almost invariably this scale of production involves employment of workers from outside the family. There is a relatively high input cost, producing a reasonable income. Farm sizes are generally areas of more than 2 ha (2-20 ha). This scale of farming can make use of more extensive or a higher level of water harvesting practices and technology:

- Technologies – specialised equipment (tractors, mechanical pumps, laboratories, etc.)
- Skills and understanding – as required for professional specialists
- Cost >R10, 000
- Maintenance – essential regular and frequent checking and repair, up to 50 days/year, complex technical repairs

For each of these three levels there are relevant RWH&C practices outlined in the WRC material which can be used. The review of the eight sets of RWH&C material (Chapter 1) pointed to the following in terms of context of use, and relevance of the RWH practices being promoted in the WRC material. There are also different types of RWH&C practices and skills that are relevant at the different scales of farming practice, although some may be related. These are practices and skills to *catch*, *store* and *use* water. The different practices and skills for all levels are:

- **General Skills:** Activities or practices that are generally used to help prepare for the main RWH&C practices,
- **Catching, Reducing Loss and Holding Rainwater:** Activities or practices that help bring more rainwater into cropping areas and hold it in the soil for longer,
- **Storing Rainwater:** Activities or practices that help store rainwater for later use, and
- **Using Water:** Watering (Irrigation) Practices: Activities or practices that help use the water that has been stored more efficiently.

This provided a framework for considering how the WRC material under study could be used in the South African agricultural sector, with emphasis on the smallholder farmer, and household food producer, which as noted above, form a critical part of the agricultural sector from a transformation and social justice perspective, as well as a food security perspective. This also formed the framework for sharing the WRC material on the Amanzi for Food Website (www.amanziforfood.co.za).

However, as noted by the review of the WRC material, and the contextual, policy and knowledge dissemination process reviews in Chapter 1 of this report, material cannot simply be introduced out of context, without consideration for the social-ecological dynamics in such contexts. For this reason, we considered that material and tools were needed to understand community and farmer aspirations and stories, that practical demonstrations of the practices would need to be visualised and made visible, that the WRC material would need to be made accessible in this context, and that there should also be information on agents and knowledge networks surrounding the practices. Thus, we framed the use of the WRC knowledge within a wider social-ecological context of use. In doing this, we were able to begin to gain wider insight into the WRC material and their use in the context of smallholder farming and household food production contexts of practice. This framework provided the foundation for further

understanding the contextualisation of the WRC material and their use as shown in Figure 2.1 below.

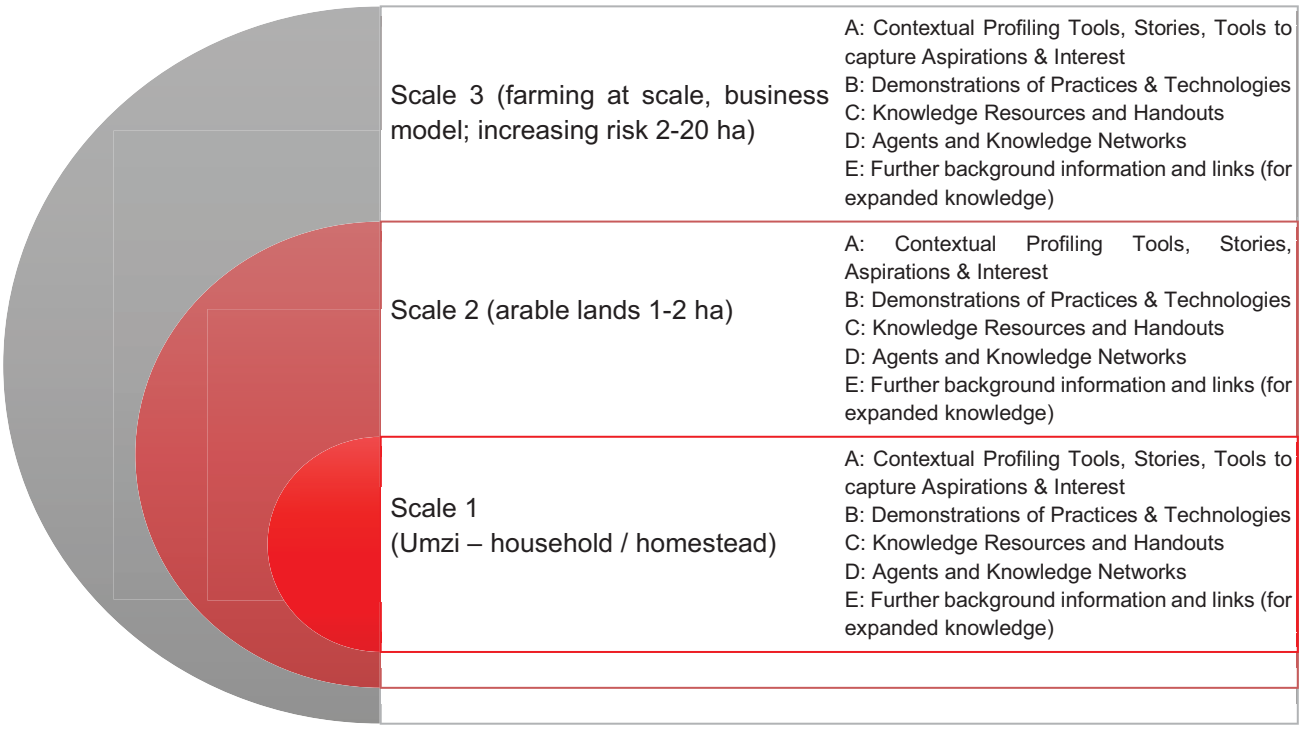


Figure 2.1. Framework accessing 'Amanzi [Water] for Food' knowledge resources and tools for changing practice and learning (adapted from Denison et al. 2015, also included in Lotz-Sisitka et al., 2016)

Using this framework, the eight sets of WRC material were analysed for their potential match to these levels of farming, and the skills needed for RWH&C at these different levels, and gaps. This was used to construct the navigation tool.

The differentiating of these three scales of agricultural practice in relation to the RWH&C practices promoted in the WRC material, helped with identifying relevant material for the different scales of farming, the most useful and accessible for each of the three scales of farming. An initial analysis for example showed that:

- The AWGHS material are particularly suitable for the Umzi (scale 1)
- The STPHWC material are well suited to scale 2
- The IRWH material are well suited to scale 2 and scale 3 farming practice, but can also be used at scale 1.
- The RWH&C material move across the scales, and also cover practices at scale 3, etc.

This analysis informed the development of an extended *navigation tool* that was used for the mediation of the WRC material with agricultural colleges, and other stakeholders in the learning network formations. The construction of the navigation tool is outlined in Figures 2.2 and 2.3 below.

Type of practice

Relevance to scale of farming activity

Main purpose of practice

Factors to consider w.rt. the practice

Where to find information on the practice in the material

General Activities Applicable to and Underpinning Many of the Key Practices				
Practice (and other names)	**Type and Scale (1,2 or 3)**	**Main Purpose and Description**	**Other Factors**	**WRC Materials: Text (T), Case Studies (CS), Handouts (H)**
Constructing and using 'A-frame'	Preparatory Activity 1 and 2	To set levels and help mark out contours Constructing a simple tool for assessing levels	*Low technology, local materials, low level skills and understandings, low cost, low maintenance	WH&C (**T**: Pp115-121 & **H**), AWHGS (**CS**: Vol.2, Part1, P2-83 and **H**: Vol.2, Part2, Chap.5,H1, P5)
Constructing and using a 'line-level'	Preparatory Activity 1 and 2	To set levels and help mark out contours Constructing a simple tool for assessing levels	*Low technology, local materials, low level skills and understandings, low cost, low maintenance	WH&C (**T**: Pp116,122-123 & **H**), AWHGS (**CS**: Vol.2, Part1, P2-83)
Identifying soil types	Preparatory Activity, All	To identify soils appropriate for different RWH&C practices Fairly simple methods for assessing soil types	Low to **medium technology, some specialised materials/equipment, low to medium skills and understandings	WH&C (**T**: Pp79-108 & **H**),AWHGS (**T**: Vol.2,Part3, Pp.6-3 to 6-10),
Calculating slope	Preparatory Activity, All	To calculate the slope of the land Simple method for calculation of slopes	Low to medium technology, some specialised materials/equipment, medium skills and understandings	WH&C (**T**: Pp113-118 & **H**), AWHGS (**T**: Vol.2,Part2, Pp5-38 to 5-42),
Establishing precipitation (rainfall) amounts	Preparatory Activity, All	To calculate the amount of rain falling on the land. Fairly simple methods for rainfall calculations	Low to medium technology, some specialised materials/equipment, medium skills and understandings	WH&C (**T**: Pp31-33), AWHGS (**T**: Vol2.Part1, P1-23),
Calculating storage requirements	Preparatory Activity, All	To estimate how much rainwater storage is needed. Quite detailed calculations of storage volume needs	Medium skills and understandings	WH&C (**T**: Pp158-160 & 163), AWHGS (**T**: Vol 2 Part 2, Pp 5-80 &5-81)
Calculating irrigation (watering) requirements	Preparatory Activity, All	Estimation of crop water needs Quite complex calculations for estimating water needs	Medium to ***high skills and understandings	WH&C (**T**: Pp161-162), AWHGS (**T**: Vol.2,Part2, Pp 5-70 to 5-79)

Figure 2.2. Original Framework for construction of the navigation tool (Lotz-Sisitka, 2016)

This same framework was used to provide access to different types of activities as shown below and extracted from the expanded navigation tool.

Firstly, a summary of each of the eight books was prepared to provide orientation to the material, using this framework. Following this a navigation tool was prepared and presented based on the types of practices involved, and providing orientation to the most suitable contextual application of the material. Detailed guidance on where to find relevant information in the material was also provided in the Material Booklet with Navigation Tool. Extracts below in Figure 2.3 illustrate the work done to construct this access tool for use of the material. This forms a key start-up Technology Transfer Tool for the Knowledge Uptake Strategy, and is available on the Amanzi for Food website – c.f. Appendix 1.1.

GENERAL ACTIVITIES (SKILLS) APPLICABLE TO AND UNDERPINNING MANY OF THE KEY PRACTICES

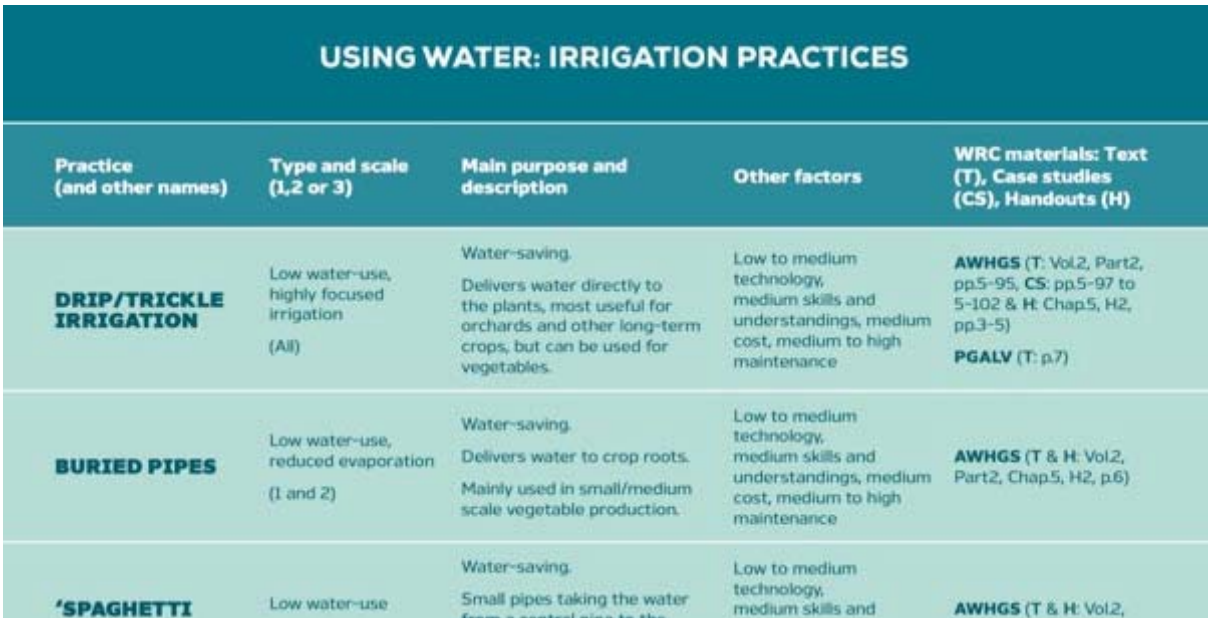
Practice (and other names)	Type and scale (1,2 or 3)	Main purpose and description	Other factors	WRC materials: Text (T), Case studies (CS), Handouts (H)
CONSTRUCTING AND USING AN 'A-FRAME'	Preparatory activity (1 and 2)	To set levels and help mark out contours. Constructing a simple tool for assessing levels.	*Low technology, local materials, low level skills and understandings, low cost, low maintenance	**WH&C** (T: pp.115-121 & H) **AWHGS** (CS: Vol.2, Part1, p.2-83 and H: Vol.2, Part2, Chap.5, H1, p.5)
CONSTRUCTING AND USING A 'LINE-LEVEL'	Preparatory activity (1 and 2)	To set levels and help mark out contours. Constructing a simple tool for assessing levels.	*Low technology, local materials, low level skills and understandings, low cost, low maintenance	**WH&C** (T: pp.116, 122-123 & H) **AWHGS** (CS: Vol.2, Part1, p.2-83)
IDENTIFYING SOIL TYPES	Preparatory activity (All)	To identify soils appropriate for different RWH&C practices. Fairly simple methods for assessing soil types.	Low to **medium technology, some specialised materials/ equipment, low to medium skills and understandings	**WH&C** (T: pp.79-108 & H) **AWHGS** (T: Vol.2, Part3, pp.6-3 to 6-10) **MRFA** (T: p.19) **STPWHC** (T: pp.1-3)

COLLECTING, REDUCING LOSS AND HOLDING RAINWATER

Practice (and other names)	Type and scale (1,2 or 3)	Main purpose and description	Other factors	WRC materials: Text (T), Case studies (CS), Handouts (H)
SAAIDAMME (Wadi floodwater system, flood spate)	Harvest, conserve and use Floodwater harvesting (3)	Involves the diversion of floodwater from non-permanent rivers into a series of flat basins which are used for cropping. Diverted water from the flooding river is channelled into the fields and completely submerges the land for 1 to 3 days, where it fully saturates the soil.	Medium to high technology, medium skills and understandings, medium to high cost (depending on scale), medium to high maintenance	**WH&C** (T: pp.169-170, **CS**: p.7)
DOME WATER HARVESTING (rock catchment)	Harvest, on a large (macro) scale for diversion to where the water is needed (3, possibly 2)	Used to intercept and direct rainwater runoff from impermeable rock domes into a reservoir, or directly to a field where the water is stored in the soil. The method provides valuable drinking water in arid areas. Can be very effective for agricultural use where rock surfaces are located close to agricultural lands.	Low to medium technology, low to medium skills and understandings, low to medium cost, medium maintenance	**WH&C** (T: pp.167-168)

STORING RAINWATER

Practice (and other names)	Type and scale (1,2 or 3)	Main purpose and description	Other factors	WRC materials: Text (T), Case studies (CS), Handouts (H)
DAMS	Harvest and store Simple storage of runoff in purpose-built ponds (3 and 2)	Generally fairly large-scale storage ponds from which water can be taken for either crops irrigation or used directly for livestock (or aquaculture)	Medium technology, specialised equipment, medium skills and understandings, medium to high cost (depending on scale), medium to high maintenance	**WH&C** (T: p.18) **AWHGS** (CS: Vol.2, Part2, pp.5-85 & H: Vol.2, Part2, Chap.5, H1, p.11) **MRFA** (T: pp.19-26)
MATAMO/IPITSI (homestead ponds)	Harvest and store Simple ponds for homestead gardens	Small-scale storage ponds to catch and store surface run-off.	Low technology, basic equipment, low skills and understandings,	**WH&C** (T: p.18, **CS**: pp.2-6) **AWHGS** (H: Vol.2, Part2,



USING WATER: IRRIGATION PRACTICES

Practice (and other names)	Type and scale (1,2 or 3)	Main purpose and description	Other factors	WRC materials: Text (T), Case studies (CS), Handouts (H)
DRIP/TRICKLE IRRIGATION	Low water-use, highly focused irrigation (All)	Water-saving. Delivers water directly to the plants, most useful for orchards and other long-term crops, but can be used for vegetables.	Low to medium technology, medium skills and understandings, medium cost, medium to high maintenance	**AWHGS** (T: Vol.2, Part2, pp.5-95, **CS**: pp.5-97 to 5-102 & **H**: Chap.5, H2, pp.3-5) **PGALV** (T: p.7)
BURIED PIPES	Low water-use, reduced evaporation (1 and 2)	Water-saving. Delivers water to crop roots. Mainly used in small/medium scale vegetable production.	Low to medium technology, medium skills and understandings, medium cost, medium to high maintenance	**AWHGS** (T & H: Vol.2, Part2, Chap.5, H2, p.6)
'SPAGHETTI	Low water-use	Water-saving. Small pipes taking the water	Low to medium technology, medium skills and	**AWHGS** (T & H: Vol.2,

Figure 2.3. Different types of practice covered in the navigation tool (extracts from the full Navigation Tool – see Appendix 1.1)

From the above it is clear that the analysis of the agricultural context provided a way of beginning to align the WRC material to the actual contexts of practice, and that this provided a means of supporting selection of material, and access to the knowledge contained in the material. This was an important starting point for mediation of the material in the Knowledge Uptake Strategy.

2.2 Agricultural Education and Training Provisioning and the Agricultural Learning System

2.2.1 Options for integrating RWH knowledge from WRC material into the AET curriculum

The Knowledge Uptake Strategy scoping process provided foundational understandings of the AET context, with specific reference to how the RWH&C knowledge could be disseminated via college curricula. These insights helped to inform an 'Options Document' which was subsequently used to engage ATIs in curriculum deliberations on how to begin to approach integration of the information from the WRC material into the curriculum.

Six options were proposed for integrating the WRC material into the AET curricula, as outlined in Table 2.2 below. This was included in a document entitled *Possible Options for Integration into Colleges / ATI Curricula* which was circulated to all the colleges consulted. The document was also used in the Training of Trainers course to provide guidance for college lecturers in adapting their curricula to incorporate the WRC information, as described in section 6.1 (below), and has proved to be an important 'start up' orientation tool for colleges, ATIs and universities to consider how to begin to integrate RWH&C knowledge into their curricula.

Table 2.1 Possible options for integration of RWH knowledge into college curricula

Options	Audience(s)	NQF Level(s)	Benefits	Challenges
1. Within appropriate existing curriculum course modules – ideally within mandatory (foundational or core) modules	Pre and In-service professionals, including extension officers and commercial farmers	Any (levels 4 – 6), although will require some careful selection of and adjustment to elements of the material especially for level 6	• Formal and secure integration • Appropriate for closely related modules such as 'Soil and Water Conservation' • Requires no re-registration of courses • Minimal disruption to curricula • Relatively little additional training needed for lecturers • Exposure to ideas for all trainees/learners (relevant for all contexts) • Maintaining links between practice and knowledge within one module • Relatively simple to avoid duplication of information • Funded through existing funding mechanisms	• Need to align with NQF, NCV, DHET, CHE and other requirements • Need to 'make space' in curricula by removing existing information • Need careful selection of material for exclusion and inclusion • Possible conflict between new and old information/orientation • Limit to amount of new practices and understandings that can be introduced • Accessible only to those who can undertake full qualification training
2. As an additional (elective?) course module	Pre and In-service professionals, including extension officers and commercial farmers	Any (levels 4 – 6), although will require some careful selection of and adjustment to elements of the material especially for level 6	• Formal and secure integration • Opportunity to introduce wide range of practices and associated understandings • No need to reduce existing curriculum content • Limited curriculum development capacity required • Maintaining links between practice and knowledge within one module • Funded through existing funding mechanisms	• Need to align with NQF, NCV, DHET , CHE and other requirements • Exposure to ideas only for those choosing elective (may be interpreted as only relevant for those working with emerging farmers) • May require re-registration – at least of new module • Quite considerable training in new practices and understandings required by lecturers • Possible conflict between new and old information/orientation (in other modules) • Need to avoid duplication of material in other modules • Quite considerable curriculum development capacity required • Accessible only to those who can undertake full qualification training
3. Integrated into a number of different modules, not necessarily only those with obvious and immediate relevance	Pre and In-service professionals, including extension officers and commercial farmers.	Any (levels 4 – 6), although will require some adjustment to elements of the material especially for level 6	• Formal and secure integration • Opportunity to integrate resource (water) conservation philosophy, principles and practices across range of disciplines/topics • Little (although some) need to reduce existing curriculum content • Probably no requirement for re-registration of qualifications • Funded through existing funding mechanisms	• Some need of alignment with NQF, NCV, DHET , CHE and other requirements • Risk of de-linking practices from knowledge (in different modules) • Possible conflict between new and old information/orientation • Requires high-level curriculum development capacity • Quite considerable training in new practices and understandings required by lecturers • Accessible only to those who can undertake full qualification training

Options	Audience(s)	NQF Level(s)	Benefits	Challenges
4. As 'stand-alone' short courses	In-service professionals, including extensionists, commercial farmers, NGO personnel. Also emerging and subsistence farmers, smallholders, home gardeners	More appropriate at lower levels (2-5), some adjustment required for lower levels	• Can be tailored to meet needs of particular audiences • Readily adaptable as new information/practices become available • Accessible to wide audience • Can be offered as un-registered, informal courses • Can draw on existing short-course development expertise • Maintaining links between practice and knowledge within course	• Considerable adjustment required for different level audiences (qualifications?) • Quite considerable training in new practices and understandings required by lecturers • Funding issues (especially for non-registered, unaccredited courses)
5. As additional resource material	All	All - Careful selection and adjustment required for different levels	• Opportunity to select most appropriate and relevant information for different needs and contexts • 'Packaging' of appropriate support material in accessible ways • No major changes required to curriculum • No changes to alignment with official requirements	• Profound understanding of material, needs and contexts required in order to make appropriate selections • Potential conflict with existing curriculum information • Risk of decoupling practices and knowledge
6. As a combination of any of the above	All	All	As above for each element. Can broaden benefits through appropriate combination	As above for each element. Can reduce challenges through appropriate combination

NB1: This list of options is clearly not exhaustive and any other options suggested by the colleges would be welcome additions.

NB2: An essential requirement for all options is access to working demonstrations of the main practices being introduced. These can either be established on the college grounds or on local farmers' lands. Some of the initial courses could involve students in the practical design, development and establishment of these demonstration sites.

[This tool has been integrated into a Knowledge Uptake Strategy Technology Transfer Tool focussing on Curriculum Innovation in Agricultural Education and Training – see Appendix 6.1 and 6.2)

In sum, the AET context significantly influences the way in which the WRC material can be disseminated into this part of the wider system of agricultural learning. The initial analysis found that the qualifications and accreditation system influences what is possible in colleges, yet there is possibility for integrating RWH&C techniques into college curricula via four different options (cf. Lotz-Sisitka et al., 2016), a finding that was confirmed again in this project period. There is little detailed information available on college curricula, thus curriculum innovation requires engaged interaction with college lecturers *in situ*, as well as via wider systems of curriculum innovation support (such College Principals Association or curriculum committees – see Chapter 6).

Currently, there is little consistency between curricula, with each structured in very different ways to the others, which makes curriculum innovation in situ also more complex. This is often because agricultural contexts differ, but also because there is / has been flux in the curriculum and qualifications system, and an institutional transfer for many colleges from DoA to DHET and a current re-orientation for some into Agricultural Training Institutes (ATIs) (ASSAf, 2017).

Currently, there is no easily identifiable 'fixed place' in the curricula for the integration of the information from the WRC material as any integration will need to be very context (and

curriculum) specific. Furthermore, there are concerns on the different levels at which various courses are run, and the notion that information in material developed at one (often notional?) level is not perceived as being suitable for another level. Due to these issues mentioned above, a knowledge progression 'mapping' document that can be used to deal with the relevant knowledge at different levels would be required. There is also a possibility that the new information (in the WRC material) may in fact conflict with existing information, particularly that concerning water needs and irrigation schedules. Again, care must be taken to ensure consistency between information provided in different parts of the curricula.

This may especially be the case where most agricultural training is oriented towards commercial agriculture, while needs for agricultural training and extension are within the smallholder and emergent farming system (also as outlined in the National Development Plan, (NPC, 2011). As noted in the interviews and as confirmed again in this project period, the re-orientation of thinking in the agricultural system towards smallholder farmers and their needs is not strongly established, and there are significant contradictions in the AET system in this regard as found by Pesanayi (2019) and Maqwelane (2021) in their studies linked to the Amanzi for Food project. This affects what is perceived to be relevant 'curriculum innovation'. As found in the study of Van Staden (2018),[4] the emphasis on climate smart agriculture in policy (DAFF, 2015) may help with this problem in the shorter term, especially in relation to the introduction of RWH&C knowledge in the context of smallholder farming. This was confirmed in this project reporting period, also in the context of NGO and Extension training. In other words, coupling RWH&C knowledge with a wider interest in the Agricultural Learning System on responding to climate change challenges offers a more substantive 'way in' for curriculum innovation praxis.

Attempts to incorporate entire sets of material into existing curricula may be over-ambitious, and careful selection of appropriate, relevant information, including activities from the material may be the more pragmatic and manageable approach. Whatever the route taken, however, some room will need to be made within curricula, inevitably involving removal of some existing information. The transfer may take the form of updating or upgrading existing information, which would be the easiest route, but it may in some cases entail the complete jettisoning of existing information, a far more challenging approach (see Chapter 6). Selection of material to be updated or removed may well prove to be a greater challenge than the selection of the new material to be integrated. This would need to be guided by qualifications and knowledge progression mapping that occur via the regular curriculum and qualifications review processes in the AET system. The development of short courses out of the material, seemingly the preferred route of the developers, may well prove to be the more manageable route, although we have found through the research in this programme that the most viable route for curriculum innovation is to start with integration into existing curricula, which over time leads to more substantive curriculum transformations (see Chapter 6). There would also be challenges associated with fitting another course into college programmes, and the

[4] The studies of Pesanayi (2019), Maqwelane (2021) and Van Staden (2018) have all been undertaken with partial support from the Amanzi for Food programme over the course of this programme. Valuable findings from these studies on *how best* to approach the integration of new knowledge to better support priorities such as new approaches to agricultural water knowledge uptake under conditions of climate change, and historical neglect of the smallholder farmer, and now also the Black small to medium scale farmer who is intending to transition to commercial farmer can be addressed. We propose developing an academic paper focusing on these lessons from the project following this reporting cycle (see also a summary of insights in Chapter 6).

registration and funding of these courses. From the latter perspectives, the integration into existing full courses would be considerably simpler and less disruptive.

2.2.2 Agricultural Colleges and Agricultural Training Institutes

The initial analysis of the state of agricultural colleges and ATIs was conducted in the early stages of the project (cf. Lotz-Sisitka et al., 2016). The initial focus was on the agricultural colleges, and a comprehensive analysis of the situation with regard to these colleges, and their curricula was conducted and is reported in more detail in Lotz-Sisitka et al. (2016). This process opened up critical questions on Knowledge Uptake in the AET system. Some key areas that were explored included the identification of knowledge dissemination pathways, the intended audiences for the WRC material, the ways in which the WRC material could be used, and the appropriate facilitation approaches when using the material. Based on the analysis in Lotz-Sisitka et al. (2016), the work in this project included eight WRC material in the analysis and also explored the same key areas with a strong focus on identification of knowledge dissemination pathways and the development of the Knowledge Uptake Strategy.

The Republic of South Africa originally had twelve Colleges of Agriculture when this project started in 2013. The twelfth college which was located in the Mpumalanga Province has been incorporated into the University of Mpumalanga. Also, as per norms and standards in South Africa, colleges are changing to become Agricultural Training Institutes (ATI). Currently there are eleven ATIs in South Africa that provide both Higher Education and Further Education and Training bands in agriculture. The ATIs are located in six of the nine provinces of the country as follows:

- KwaZulu-Natal: Cedara and Owen Sithole Colleges
- North West: Potchefstroom and Taung Colleges
- Western Cape: Cape Institute of Agriculture Training (CIAT), Elsenburg
- Eastern Cape: Fort Cox College, Tsolo College and Grootfontein Agricultural Development Institute (GADI)
- Free State: Glen College
- Limpopo: Madzivhandila and Tompi Seleka Colleges

The Northern Cape, Mpumalanga and Gauteng provinces are the only provinces without ATIs. Of the eleven ATIs, ten are in principle all administered by and are reporting to their respective Provincial Departments of Agriculture with the exception of Grootfontein in Middelburg which was under the National Department of Agriculture, Forestry and Fisheries (DAFF) (now DALRRD) as a fully-fledged Directorate. The ATIs provide agricultural vocational education and training. They offer an Agricultural Diploma as a three-year qualification (NQF level 5-7) and the vocational skills training to the farming community and the youth as NQF levels 1-4 qualification in partnership with the relevant Sector, Education, Training Authorities (SETAs). Unlike Training and Vocational Education and Training institutions, formerly FET Colleges, ATIs deal with practical agriculture aspects such as training agricultural practitioners not only academic graduates, providing first level skills training to farmers, providing short practical courses for farmers and their employees and enhancing production in farming practices.

In 2009, a study to assess the level of compliance of the eleven ATIs (then colleges) to proposed Norms and Standards (DAFF, 2011) revealed that no single college complied fully with the established Norms and Standards albeit with differing degrees. These Norms and Standards were intended to serve as the main instrument for ensuring alignment between the programme offerings of these Agricultural Education and Training Institutions and the strategic

development of the agricultural sector. The main purpose of these norms and standards was to create, “a framework for ensuring consistent quality of AET, the sound management of public funds, and establishing and maintaining equity among the Agricultural Training Institutes” (DAFF, 2011).

Based on the approved Norms and Standards (DAFF 2011) and the Governance and Financing Framework for ATIs, and findings of the compliance study, a Colleges Revitalization Plan (CRP) of Agriculture was developed and the plan was guided by the five critical pillars:

- Improvement of infrastructure and equipment
- Curriculum review with emphasis on value addition
- Accreditation and registration of colleges
- Leadership development and change management
- Strengthening of Information and Communication Technology including college governance

The Colleges Revitalisation Plan (CRP) was partly addressed by the TACTI project which ran from 2013-2015 and introduced the COLA system and competence-based learning (DAFF, 2015; Chaminuka et al., 2016). Despite the above processes, the agricultural colleges and their governance structures have continued to remain a provincial department responsibility (AgriSETA, 2014), despite recommendations of the ASSAf (2017). A Cabinet memorandum of 2013 indicating that the National Department of Higher Education and Training (DHET) should incorporate the agricultural colleges as part of their post-schooling institutional mandate, is likely to bring about change to the agricultural college sector (AgriSETA, 2014). However, at the time of writing this report these institutions had not yet been transferred to the DHET and are still operating under the Department of Agriculture, Land Reform and Rural Development which has the mandate to enrol students for a Diploma in Agriculture at agricultural colleges (DHET Strategic Plan 2020-2025, 2020).

A mix of qualifications at NQF Level 5-7 are offered at nine of the agricultural colleges. These qualifications include national certificates, higher certificates, diplomas and degrees in a range of subject areas such as animal production, crop production, agribusiness, irrigation and mixed agriculture (AgriSETA, Prospectus of Taung and Potchefstroom Agricultural Colleges, in Van Staden, 2018). The qualifications of these agricultural colleges are accredited by the Council for Higher Education (CHE). However, Madzivhandila College, Tompi Seleka College and Tsolo College’s NQF 1 to 4 short courses and learnerships are accredited by AgriSETA (AgriSETA, 2014) and these operate as farmer training centres.

While all agricultural college training programmes are framed by national qualifications, they are fundamentally flexible to contextualisation as the colleges orient their courses towards supporting the agricultural activities practised in their respective region (DAFF 2008; PCA 2014 cited in Van Staden, 2018). Agriculture curricula were mostly based on teaching commercial agriculture and production pre-2005, as this addressed the needs of the Agriculture Sector at that time (AgriSETA 2014; DAFF 2008; DoA 2005a). Since 2005 there has been a reorientation towards including conservation of natural resources and commercial production (DoA 2005) and in recent years the AgriSETA has noted the need to incorporate sustainability and green economy dimensions into Agricultural Education and Training (AgriSETA, 2014).

Competency-based education (CBE) also recently emerged in the agriculture educational and training system in South Africa (AgriSETA 2014; DOE, 2008 cited in Chaminuka et al. 2016).

However, as reported in Lotz-Sisitka et al. (2016), the focus of the agriculture curricula is mostly on competence development for conventional methods of agriculture, which exclude an engagement with climate change, climate change adaptation and water conservation supported farming (DAFF 2008; PCA 2014; TAC 2014, cited in Van Staden, 2018). After an evaluation of the agricultural education and training curricula of South Africa in 2008, it was recommended that the Agriculture curriculum should be adjusted and upgraded to be more responsive in addressing the critical challenges of the South African agricultural sector. This led to the Transformation of Colleges of Agriculture into Agricultural Training Institutes (TACTI) project (reported on in more detail in Lotz-Sisitka et al., 2016) which in this project period (2017-2021) unfortunately appears to have ended due to the ending of the donor funding in 2016.

In the initial stages of the scoping process of the project (cf. Lotz-Sisitka et al., 2016), the following AET providers were consulted on how knowledge of RWH&C could be integrated into their curricula: Fort Cox Agriculture and Forestry Training Institute), Cedara College of Agriculture, University of Fort Hare, University of Mpumalanga (former Lowveld College of Agriculture), Elsenburg Agricultural Training Institute, Grootfontein College of Agriculture and Taung College of Agriculture. These in-field consultations were further informed by Internet-based review of curricula (where these existed) and through this, additional information on the Universities of Technology (Mangosuthu and Venda) was found.

Additionally, in this project we also worked with the recommendations of the 2017 national synthesis study on Agricultural Education and Training in South Africa, which strongly recommended curriculum innovation, and development of a farmer-centred approach to curriculum innovation (ASSAf, 2017). The ASSAf study is a consensus study that was initiated by the ASSAf Science, Technology, Engineering and Mathematics (STEM) Education Standing Committee, deriving from a deep concern about the status of Agricultural Education and Training (AET) in the country. The study sought to

> identify and address the challenges facing the AET sector in South Africa. It is a timely study given the important role that this sector needs to play in meeting the United Nations' Sustainable Development Goals. The study aimed to provide evidenced-based information and clear recommendations to policymakers and other relevant stakeholders with an interest in agricultural human capital development. Some of the key findings of the study include inadequate funding for practical-level training; weak linkages to industry for understanding training needs; poor quality and inadequate numbers of educators who are appropriately trained to teach agriculture at school level; and poor linkages in the research–teaching–extension nexus. The recommendations are wide-ranging and very practical. (ASSAf, 2017)

Some of the recommendations particularly relevant to this study include:

- The trend towards and need for professionalisation of extension services which includes registration with South African Council for Natural Scientific Professions (SACNASP), which involves the need for ongoing continuous professional development programmes (CPD) and improvement of professional competence, which ASSAf recognises as a key opportunity for the sector. The potential for the Amanzi for Food #OpenAccess, Online course to be recognised by SACNASP as a CPD programme for Agricultural Extension remains an important possibility to consider

emerging out of this extensive WRC research and development programme, but should be considered within the wider focus on Climate Change responsiveness. (See Chapter 9.)

- ASSAf (2017) also noted that across all provinces and levels of education, there was little evidence of the use of ICT and social media in education and extension, despite the numerous opportunities that these present. ASSAf (2017) highlighted "the lack of ICT engagement and at educational level translates into poor skills and weak engagement with these technologies in the workspace, which is a disadvantage for students". The focus on ICTs and social media communications as a core focus in this WRC research and development programme therefore also potentially offers important lessons and contributions to respond to this problem in the AET system. (See Chapter 9.)
- ASSAf (2017) further reported that there are poor linkages in the 'knowledge triangle', noting that "the linkages between research, teaching, and extension are poor, and there is a need for better co-ordination between this research-teaching-extension knowledge triangle. This WRC research and development project was constituted to **directly** address this problem (cf. Chapter 1, Chapter 6, Chapter 9).
- In the light of this problem, ASSAf (2017) further recommended that there be more "effective innovation transfer, diffusion and uptake" especially into the extension and rural advisory services. Again, this WRC R&D project directly addresses this recommendation of ASSAf (2017) with the Knowledge Uptake Strategy offering practical guidance and tools for doing this.

Additionally, the ASSAf (2017) study makes the following recommendations that are specifically relevant to this WRC R&D project:

- **Training the trainers** is an important priority in sustaining a strong AET system. Specifically, persons engaged in the extension and rural advisory services component of the sector are influenced by AET in multiple ways; they are beneficiaries of AET through the training they receive, but then themselves become educators and facilitators of knowledge. For this reason, the training of extension workers should receive substantial focus, as they have the potential to be the primary agents through which innovation is translated from the laboratory into practice.
- **Planning, monitoring, and evaluation** can be connected from the start of a strategy or programme, using state-of-the-art techniques to combine monitoring and evaluation with change logic or 'theory of change' (Funnell and Rogers, 2011; Vogel, 2012). … Throughout all monitoring and evaluation activities, the voices of smallholder farmers including their different groupings in society such as men and women, cooperatives, and so forth – should be heard, respected, and used.
- Finally, **curricula need to be modernised** to include:
  - updated systems, in particular farming systems approaches, with a strong focus on local (social inclusion, environmental sustainability, resilience), regional, and global (trade, climate change) challenges;
  - integrating multi and interdisciplinary foci, thus cultivating both specialists and generalists;
  - synthesising and integrating knowledge in domains such as production, environmental integrity, social benefits, consumer requirements (health and food safety), sustainability science, and others;

- supporting interaction with farmers – providing them with feedback for evaluation, and exposing students to practical application in the field;
- emphasising the implications of global and regional and national policies and value chains, as well as the interface between political and technical issues in areas such as trade, foreign direct investment, international protocols, and controversial technologies;
- co-creating curricula to ensure gender responsiveness at all levels of the AET system and the agriculture sector;
- maintaining entrepreneurship and innovation as central tenets for working both within and outside of agricultural value chains, including work in the area of food and nutrition.

Curricula for entrepreneurship and innovation require a systems orientation, multi and interdisciplinary approaches, and experiential and work-integrated education and training. Prerequisites for success are individual and collective capabilities in innovation and entrepreneurial activities, supportive organisational cultures, external networks, and tailor made pedagogical approaches. In practice it is hard for those who are not innovative and entrepreneurial to teach these characteristics and approaches to others.

Considering that the ASSAf (2017) is the most comprehensive, holistic and progressive national study undertaken on the AET system in the recent past, and as it aligned with the start-up of this project, with clear synergies with the work conducted earlier in the Amanzi for Food project that led to this 2017-2021 project, we drew heavily on these recommendations to further develop the models and approaches to engagement with the AETs and strong connection that is required between these institutions within a wider systemic approach to AET that foregrounds farmers and their contributions, as well as extension, research and curriculum innovations and the professional learning of agricultural educators, extension workers and farmers in the development of an *integrated social learning model.*

2.2.3 Curriculum Analysis

Initial analyses of the curricula of the colleges, ATIs and revealed that they had different contexts regarding the courses and programmes they offered and the competences that they aimed for in their students (Lotz-Sisitka et al., 2016; cf. Table 2.3), a finding that was confirmed in this period of the Amanzi for Food programme. For the ATIs, the latter were influenced by engagement with the TACATI project which aimed at introducing Competence-based Learning in the Colleges (Chaminuka et al., 2016), which as noted above has since not been continued.

Table 2.2 Initial curriculum analysis of selected courses and modules to identify potential RWH&C knowledge dissemination opportunities (from Lotz-Sisitka et al., 2016)

Agricultural Colleges		
College	**Courses**	**Curriculum elements** **Material Component Technical or Facilitation**
Fort Cox	Diploma in Agriculture	Soil and Water Conservation (SS 221) - T Soil Erosion, Reclamation of Degraded Lands, Soil Conservation Techniques, Water Conservation Techniques, Rainwater Harvesting (infield and outfield), Loss of Water in the Field Irrigation Principles (AE 222) - T Sources and types of water, Crop water requirement and Irrigation scheduling, Effect of soil properties on infiltration, drainage, water holding capacity and irrigation, Soil moisture determination, Irrigation systems and their designs.
	Diploma in Forestry	Soil and Water Conservation (SS 221) – T

Agricultural Colleges		
College	**Courses**	**Curriculum elements** **Material Component Technical or Facilitation**
Grootfontein	Higher Certificate in Agriculture	Veld Management (VBS 111) - T Introductory Pasture Science Agricultural Management 1 (LBS 121) - T Agricultural Technical Services 1B (ATS 120 – or END 110?) - T C, levelling: Farms dams, surveying, soil conservation - Basic principles, dumpy levelling. Farm dams and soil conservation structures: Types of storage dams, storage dams as a soil conservation measure, prerequisites for irrigation and stock water dams, the quality and suitability of building material, building costs, natural losses of stored water, catchment and run-off, design requirements, contours, small barriers, reclamation of bare patches Crop Production IIB (GWB 241) - T Irrigation: The suitability of soil and water for irrigation. The different irrigation systems. Crop factors and crop water requirements for scheduling. The principles and practices of sustainable irrigation of saline and alkaline soils. Agricultural Management IIIA (LBS 370) - T Integrated Farm Planning Agricultural Extension IA (LBV 351) - F The communication process in rural development, how adults learn, group extension methods, the communication of innovations, working with people, community involvement and leadership. Agricultural Extension IB (LBV 361) - F Environmental Management IIIA (OMG 351) - T Pollution and other environmental problems. Environmental conservation. Environmental management in the agricultural context. Environmental measuring. Drought risk management. Drought management practices.
Taung	Diploma in Agriculture in Irrigation	Soil Science (CSSC 118) – T (all) Fundamentals of irrigation (IFIR 116) Natural Resource Management (INRM 116) Soil and Water Conservation (ISWC 218) Irrigation Equipment and System Design (IIED 228) Irrigation Management Practices (IIMP 318) Maintenance of Irrigation Dams (IMID 318)
Elsenburg	Sustainable Resource Management: Landcare, Farm Planning Farmer Support and Development	No curriculum details at present
Universities and Universities of Technology		
University	Courses	Curriculum elements Material Component Technical or Facilitation
Mangosuthu	National Diploma – Community Extension National Diploma - Agriculture	Agriculture Extension IA, IB, IIA, IIB, IIIA, IIIB - F Extension IA, IB, IIA, IIB - F Land Use Planning III - T Agricultural Extension I and II - F Soil Science I and III – T Communication I – F Agricultural Production Techniques I, II, III - T
Venda	Agriculture and Rural Engineering (BSc?) Agricultural Economics (BSc?)	Principles of irrigation and drainage – T (all) Soil and water conservation Irrigation and drainage system design Land use planning and management Rural water resource development Soil - Plant - Water Relationships and Irrigation Natural resource and Environmental economics -T Introduction to agricultural extension - F Advance agricultural extension education - F

(NOTE: See Chapter 6, and Appendix 6.2 for further examples developed in this project period)

However, this curriculum analysis together with consultations with colleges, universities and ATIs showed that further development of curriculum content focussing on RWH&C needed to be developed with college and ATI lecturers (cf. also Pesanayi, 2019; Van Staden 2018; 2020), drawing on the summary of the knowledge and practices that are promoted in and through the WRC material; and a knowledge progression 'map' outlining how the water use

knowledge for smallholder farmers and household food production can be developed in and across levels. As reported by both Pesanayi (2019) and Van Staden (2018) in their in-depth analysis of how to engage with curriculum innovation in the AET system, ultimately this will need to be aligned with qualifications and the knowledge progression standards as embedded in qualifications, with national priorities that are in focus in policy such as climate change and poverty reduction, and with practice-based demonstrations within a competence-based curriculum model that is at the same time a farmer-centred curriculum innovation model as promoted by ASSAf (2019) that addresses the gap in relations in the 'knowledge triangle' discussed above. It is this that was further pilot tested and developed in this phase of the programme (see Chapter 6; Pesanayi, 2019; Van Staden, 2019). Maqwelane's (2021) study is also pointing to the need to resolve central policy contradictions at a national level if the issues currently being experienced in the AET system in terms of *how* curriculum innovation that supports a pro-poor orientation to household food production, smallholder farming and small to medium Black farmers transitioning into commercial farming within a sustainable development paradigm is to be realised. All this ultimately shapes how to engage with the AET system.

Undertaking a curriculum analysis can sometimes provide an erroneous view of curriculum, equating curriculum with 'content in a course'. The Knowledge Uptake Strategy took account of possibilities for RWH&C content to be integrated into courses as part of the curriculum development work, but also worked with a definition of curriculum as being ***'the sum total of all aspects that influence a learning process'.*** Lawrence Stenhouse in 1975 noted that the term 'curriculum' is essentially used to explain systematic attempts to regularise courses of study. He explained further that there are many views of curriculum, notably "curriculum as an intention, plan or prescription", and /or "curriculum as the state of affairs in schools or colleges, what does, in fact happen" (Stenhouse, 1975). As noted in Lotz-Sisitka et al. (2016), in recent years many curriculum scholars have critiqued a narrow perspective that sees curriculum as 'documents or blueprints only' noting that such a concept of curriculum is technicist, and does not take account of the social-cultural and process-based nature of curriculum. Scholars such as Cornbleth (1991) and Grundy (1987) suggested that curriculum is a cultural construction; a *social process* that is influenced as much by social, cultural and structural factors as by 'blueprints' or curriculum policies and documents. Recent curriculum research on decolonising the curriculum and making it more relevant for southern African contexts points to a similar way of thinking about curriculum (e.g. Fataar, 2018; Le Grange, 2018), but notes that in such processes African communities and their knowledges should be considered as a central feature of curriculum innovation, and from here scientific and technical knowledge can be adapted for use in relation to local epistemologies and realities. Notable in recent curriculum debates on decolonising curricula is a virtual absence of conceptualising what this would mean for Agricultural Education and Training curriculum innovation in South Africa, with Pesanayi's PhD thesis[5] (2019) being an exception.

In AET curriculum contexts, as argued by Pesanayi (2019), this will decentre monocultural knowledge, will involve a reclaiming of 'cultures of agriculture in African contexts' and will

[5] As noted above Pesanayi's (2019) study was strongly supported by the WRC under this programme, and is a key study contributing to most of the findings of the programme. Much of the value of his work is still to be fully explored and published. Unfortunately, as reported to the WRC at the time, he succumbed to a fatal illness soon after his graduation in 2019.

facilitate greater diversity and plurality in the AET system, and a stronger commitment to sustainability principles. Pesanayi's (2019) work pointed out that significant to decolonising the AET system's curricula is a need to take *local social-ecological* as well as *social-economic* and *social-cultural* dynamics into account. For example, in an agricultural college context, the dominant type of farming activity in or near a college would substantially influence the college curriculum, as would the prominence of smallholder farmers in the area, as would the approaches to teaching used by the lecturers. Along these lines but without a strong focus on 'African cultures of agriculture', the 2016 TACTI report also recommended that "as a general principle any curriculum that is designed for ATIs should conform to the following five pillars of agricultural sustainability defined by Sumaski and Smyth (1994):

- Enhancement of production (including food security);
- Viability (including financial and rural wealth creation);
- Social acceptance (rural and other development);
- Market demand, decreased risk (of production); and
- Conservation of natural resources" (Chaminuka et al., 2016).

The qualifications and curriculum framework would also influence the actual curriculum taught, for example the current Further Education and Training (FET) curriculum is strongly influenced by the outcomes-based policy of the South African National Qualifications Framework which led to the design and use of Unit Standards to guide curriculum development. The work that was undertaken in the TACTI project is influenced by international trends to redesign TVET qualifications using a competence-based curriculum design. "An essential aspect of Competence-based Learning is defining the final product or occupation, and related competencies for which the student is being trained" (Mulder, 2012, cited in Chaminuka et al., 2016). The product must be identified through engagement with the labour market and other relevant stakeholders.

Lotz-Sisitka et al. (2016) also reported on a national Communities of Learning and Action (COLA) process that was supporting cross-institutional curriculum innovation within a commitment to competence-based models. Here there was discussion amongst the ATIs that a generic framework for training a farmer/farm manager is different from that of a graduate who will be employed as an agricultural advisor or extension officer. It was noted that there was a need to develop the occupational profiles for the competence-based model to function adequately as a curriculum model, and the ATIs will have to decide on how these are contextualised in relation to their particular niche areas. This pointed out that much more needed to be done to institutionalise competence-based models in the AET system, especially to achieve better alignment with SETA structures and the occupationally directed approaches that they use for funding AET programmes[6]. Also, the COLA report in 2016 noted that introducing a CBL curriculum requires all stakeholders to work together, and a substantive national curriculum innovation process will need to be supported in the ATIs for a full roll-out of CBL curriculum design and innovation (Chaminuka et al., 2016). While these recommendations were made in 2016 by the TACTI and the COLA programmes, we noted

[6] A new PhD research project (located at RU), affiliated to the Amanzi for Food programme and the VET 4.0 Model emerging (see Chapter 6) has been initiated by Muhangi (2020) with funding from the VET 4.0 Africa project to research classifications and descriptions of extension and advisory type workers in the agricultural sector, and to assess their responsiveness to climate change. This research should provide more systemic indicators of how to engage with this challenge in the AET (Chapter 6) which will ultimately be a powerful influencer of curriculum transformations in the AET.

that in this project development period these two initiatives (previously donor funded) had all but ceased in their momentum and operations, despite the ASSAf (2017) recommendations which could have provided them with further impetus in the AET development system.

2.2.4 Challenges to Curriculum Change

Other factors that influence a curriculum can be, for example, the actual knowledge of the lecturers, the prior knowledge of students coming into the colleges, and the availability of practice demonstration sites. For the Knowledge Uptake Strategy, the focus was not only on curriculum documents for the curriculum analysis and development work, but rather sought to produce a more holistic, nuanced view of knowledge and knowledge integration in agricultural college curriculum development contexts; we sought to innovate a farmer-centred curriculum innovation model (cf. Chapter 6) as this appeared to be the most important contribution that would provide a foundational platform for further development of competence-based models that were also situationally resonant and relevant, and that would address the knowledge triangle gap that ASSAf (2017) identified.

A social-cultural process definition of curriculum was used that also takes the actual context of smallholder farmers and food producers into account reflecting also a socio-material concept of curriculum (Fenwick, 2015), as well as the roles and competences of farmers who are implementing the RWH&C practices, and the extension officers advising farmers on the implementation of RWH&C practices. The focus was also on the development of the curriculum development competences of the college lecturers. Here it is instructive to note that the TACTI project also noted that “developing a CBL curriculum is just one aspect in a mirage of issues, but ensuring that the competences are achieved requires a different type of lecturer. It requires the lecturer to play different roles: that of a facilitator, a trainer, a coach and a networker” (Chaminuka et al., 2016). Using integrated and interactive learning approaches which builds on the trainees’ own experiences and the context in which they are working is recommended (ibid.; cf. Chapter 6).

This view of curriculum was based on the initial findings (Lotz-Sisitka et al., 2016) that despite the material distribution to all colleges, with follow up to establish interest in using the material (which was generally enthusiastic and positive), the scoping process found that the WRC material were not being used. The responses from the scoping phase of the project suggested strongly that the colleges were prepared to integrate the material both into existing diploma and other courses, and run them as stand-alone short courses. However, major obstacles existed for this to occur, with the main challenges identified by the colleges being:

- The lack of people with the requisite knowledge skills and experience in water harvesting and related activities; and
- The lack of skills in curriculum adaptation and innovation amongst college lecturers.

These findings accord with ASSAf (2017) findings on factors impeding curriculum innovation in the AET, and the findings were further confirmed during our interactions with AETs in this phase of the programme.

Another major obstacle that was identified is related to very limited, degraded, or lack of appropriate **demonstration sites, material and technologies for practicals** related to RWH&C knowledge dissemination. For example, at Cedara College, the college lecturers indicated that they would need assistance in establishing structures such as Jojo tanks especially at the hostels, although they indicated ability to establish simple structures such as

using A-frames for swales. Further discussion showed that some Jojo tanks installed in certain Agriculture department buildings on the premises which are neither connected to municipal water supply nor set up to harvest rainwater from rooftops (they were filled years ago from a water tanker, but most are empty at present). At Elsenburg College there was a big challenge relating to the numbers of people who need to be trained, and although the College would prefer to focus on the practical aspects, as this is where people tend to learn best, there are not sufficient resources to provide the necessary infrastructure or equipment required. The college was planning to develop an 'Agricultural Demonstration and Training Park' at Elsenburg, with support from the private sector and would also welcome financial and any other support in developing a RWH&C demonstration area. This could include examples of the technologies employed, and the types of equipment, such as for harvesting and storage of water and for irrigation. In the Cedara and Fort Cox case, there was also a strong appeal for **practice-centred demonstration sites / material** for teaching purposes. It was also interesting to note in this regard, that none of the colleges visited had **functioning rain water harvesting systems on campus;** yet there is an expectation that their students should learn how to use such technologies. Similar findings were identified in this phase of the project development in interactions with Taung College of Agriculture, and with the University of Mpumalanga where significant work was undertaken to develop stronger tools and platforms for practice-based engagements (see Chapter 6).

During the early consultations (cf. Lotz-Sisitka et al., 2016), and in the consultations in this project period), the knowledge flow process was also probed with college staff in investigating suggestions the institutions had for the most appropriate ways to ensure effective flow and dissemination of the knowledge on RWH&C as contained in the material from the material (material developers) themselves and eventually to the small-scale and emerging farmers for whom the information is intended. Initially, it was proposed that a RWH&C knowledge flow through an institutional knowledge pathway could perhaps be considered to go through **three main stages**:

1. From the material (material developers) to the curricula and lecturing staff in the institution
2. From the lecturing staff to students (we can identify who these are likely to be)
3. From the students to the farmers (and others?)

This raised the issue of assumptions related to how knowledge 'flow' was to occur using the RWH&C material. Discussions with staff at Cedara, Elsenburg and Fort Cox ATIs suggested different pathways of knowledge flow at different levels within each college, and that the levels at which the material or the information from them is integrated into existing curricula or used to support the development of short courses should not be constrained by the apparent level at which the material have been developed.

However, the focus of **three main stages for the knowledge flow,** as used in the interview situation, was somewhat linear. The three stages do not represent the full knowledge flow, as this should be considered a cyclic process from needs identified in the field to knowledge drawn from practice and developed through experimentation, then captured in the material, through various mediations (such as the three stages here) and back to the field, where experimentation and practice generate new knowledge to be fed back into the cycle. In the initial project period as reported in Lotz-Sisitka et al. (2106) we found that we needed a model to illustrate this, and from these initial consultations we developed some initial ideas for a knowledge flow and pathway model – specifically for the technical component of the RWH&C material through an agricultural college pathway (see Figure 2.4 below). The facilitation

component may have a parallel but slightly different pathway. We continued to work on advancing this knowledge flow model in this project period.

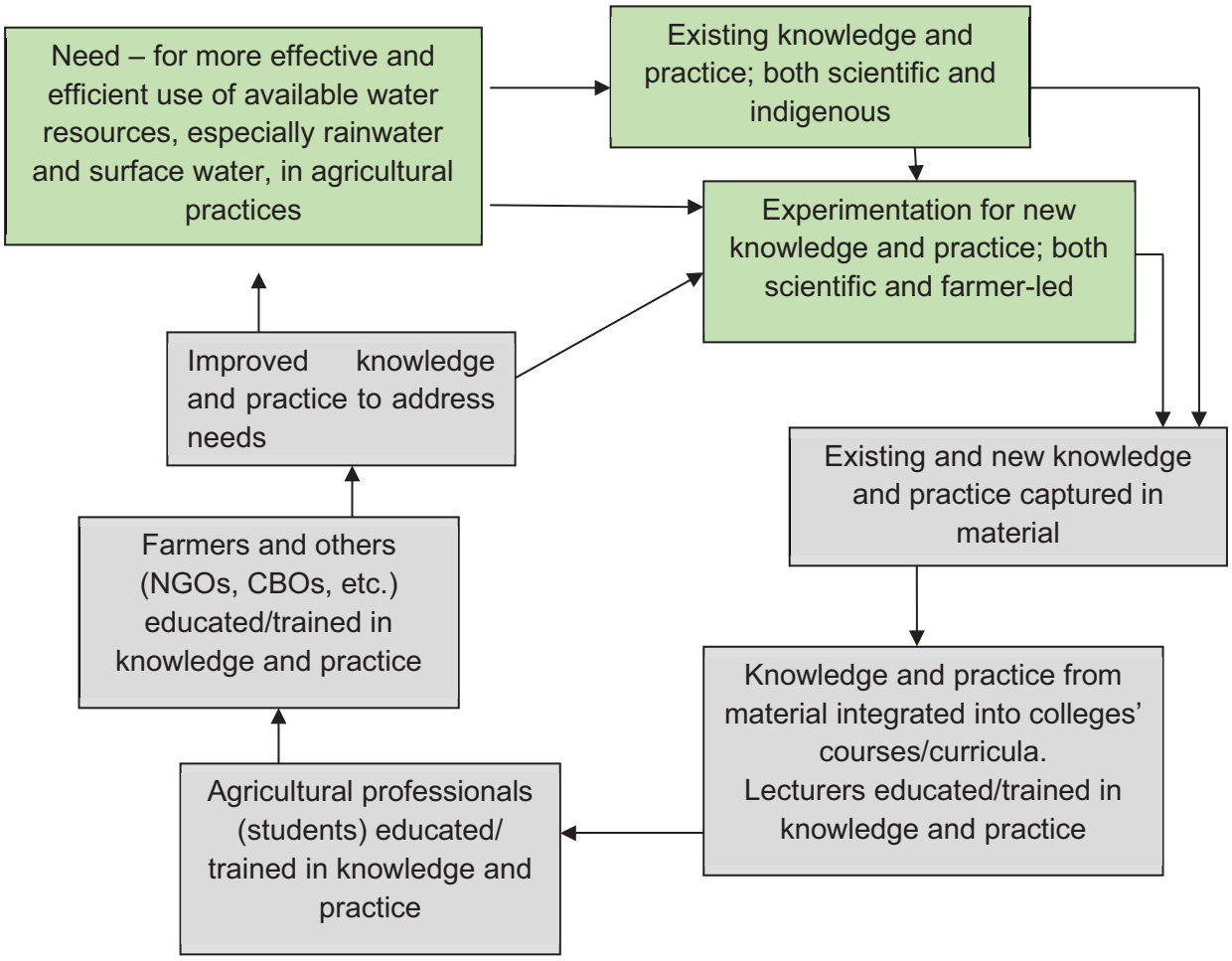


Figure 2.4. Initial knowledge flows model involving RWH material and agricultural college curriculum development processes, with links to practice contexts (Lotz-Sisitka et al., 2016)

2.3 Agricultural Extension Services

2.3.1 Wider contextual and policy relevant dimensions

Skills development is emphasised across the agricultural and water sectors (NPC, 2011). Skills development is necessary for water resources management, for water services delivery, as well as for more efficient and sustainable utilisation of water resources (DWA, 2013). In the Department of Agriculture, Land Reform and Rural Development (formerly DAFF), skills development is needed to strengthen provincial decentralisation activities; and extension service activities that are to provide responsive, engaged and change oriented learning support to smallholder farming communities as emphasised in the DAFF Strategic Plan, and the emerging Agricultural Extension and Training Policy (DAFF, 2011; 2015). From a sustainable development and climate change response perspective, skills development, and especially extension services related skills development is emphasised for building a climate resilient agricultural sector that reduces climate vulnerability of the poor (RSA, 2011). There is a general recognition that extension services skills development requires substantive enhancement, new innovative approaches and that new knowledge needs to be more

successfully and effectively mediated at grassroots level, as also pointed out in Chapter 1 in relation to new developments surrounding extension services policy.

The National Development Plan (NPC, 2012) emphasises skills development in the agricultural sector, including entrepreneurship training. *This would include the training of a new cadre of extension officers to respond to the needs of smallholding farmers and contribute to their integration into the food value chain*. *The NDP suggests that farmer-to-farmer skills transfer and knowledge networks need to be considered to help develop a new generation of farmers, and with other initiatives move towards a de-racialised agricultural sector.*

One of the issues raised repeatedly across policy and studies on extension services is the strengthening of extension services. For example, the South African Long Term Adaptation Scenario Report recommends that the extension services needs to be *significantly strengthened in number and capacity* (DEA, 2013). The National Framework for Extension Recovery Plan (ERP) (DAFF, 2011) states that extension is a systematic process of working with farmers or communities to help them to acquire relevant and useful agricultural or related knowledge and skills to increase farm productivity. The ERP has as its fourth pillar, a focus on re-skilling and re-orientation of extension services, but this does not give attention to the re-orientation and re-skilling of extension services under complex conditions such as climate change (DAFF, 2011). The need for enhancing the role of extension services within rural agricultural systems is well documented with many pointing to the 'knowledge brokering' role of extension officers. According to Islam et al. (2011), extension officers are referred to as bridge builders, as they link researchers who produce scientific knowledge, and practitioners who produce research based knowledge with rural/smallholder farmers. Being knowledge brokers, extension officers are also seen as important role-players in fostering relationships and creating operational farmers capable of producing tangible results and ensuring ongoing agriculture and success in farmer network alliances.

2.3.2 Importance of the Agricultural Extension Services

The knowledge uptake strategy for this project is developed to support the dissemination of knowledge amongst key actors in the agricultural learning system and key amongst these are the agricultural extension services. Globally and in South African policy, agricultural extension is a recognised and important mechanism for sharing information, knowledge and innovations derived from formal and farmer innovation research to farmers who use this information. Extension is one of the key tools in promoting socially and environmentally sustainable farming practices. The need for knowledge of agricultural, appropriate rural development and sustainable practices is intensifying as the field of agriculture is facing challenges in matching the needs of an increasing population, water shortages, food security, and environmental degradation. This will therefore require farmers to be more knowledgeable about these emerging issues and how to address them.

The most recent DAFF Strategic Plan 2015-2020 (DAFF, 2015) states that the footprint of government support services reaching smallholders has been improving. For instance, in 2010, only 8% of smallholders were visited by extension officers, but this increased to 14% in 2012/13, despite the considerably larger number of smallholders in 2012. This momentum must be increased and other forms of support must improve as well. The DAFF Strategic Plan for 2015-2020 (DAFF, 2015) re-affirms the mandate of the agricultural extension services to foster development of smallholder farmers through improved agricultural production

compatible with the natural and other resources available to them. It suggests that climate smart and conservation farming approaches need to be expanded, and this implies the need to mainstream RWH&C in extension services systems, and extension approaches. Extension officers therefore need new skills and knowledge (e.g. rainwater harvesting and conservation) to deal with emerging issues, and to work with farmers to develop alternative solutions.

One major problem in the provision of extension support is the challenge of bridging the technical divide between researchers and farmers, reported as a disconnect in the 'knowledge triangle' by ASSAf (2017). To address this there is the need to be able to identify the existing knowledge and skills of farmers and to be able to present new knowledge and information in appropriate ways so that farmers can translate this into applicable solutions on their farms, a point made in Burt and Berold's (2009) research on knowledge mediation.

Over the years there has been development of many material on more environmentally sustainable farming practices, including the RWH&C material produced by the WRC that form the focus of this Knowledge Uptake Strategy development process as indicated in Chapter 1. However, little of this information has reached the intended audience, the farmers themselves, and it is only through the extension services, together with the colleges and CSOs, that any likelihood exists of wide sharing of the information. The extension services themselves must play a central role in this.

When it comes to sharing knowledge of agricultural water, extension support tends to focus more on irrigation as a means of increasing production. However, conventional irrigation systems are often beyond the reach of many small-scale farmers due to costs and lack of availability of a dependable water supply (Denison et al., 2015). As shown in the initial research informing this project period (Lotz-Sisitka et al., 2016), the implementation of RWH&C practices as espoused by the WRC material can go a considerable way to meeting some of the agricultural water needs of farmers in ways which are appropriate for small and medium scale farmers (Denison et al., 2011), if well mediated and supported into use.

Our earlier research (Lotz-Sisitka et al., 2016) identified a number of factors influencing the knowledge and learning of agricultural extension officers, drawing on the work of Stevens et al. (2012), which were to a large extent confirmed in this project period. Key amongst those that were confirmed and found to be relevant in this project period are (in brief) that extensionists require a high level of both technical and social competences to:

- Mediate between research and researchers, policy intentions, and communities' problem-solving needs;
- Understand and make use of comprehensive *technical knowledge* and skill in both *general and in specialist practice contexts*, and knowledge of human behaviour and socio-cultural settings and practices (i.e. *technical and social competences*);
- Address the specific agro-ecological, farming and contextual demands and needs in a particular local and provincial agro-ecological, and social-agricultural context, for example, extension/farmer ratios 1:250-500, and the size and focus of target audiences which are mostly small-scale farmers, except in the Western Cape and the Free State, different eco-topes influencing agricultural practices and more. This points to a high level of *contextualisation competence.*

The study by Stevens et al. (2012) as also captured in the Lotz-Sisitka et al. (2016) study, provided insight into the gaps in the current system of training of agricultural extensionists that were confirmed in this project period. In brief, these are:

- Current courses do not have the information in the required format, and they do not equip extensionists for the tasks they have to perform – there is little practical 'hands-on' training.
- Most extensionists (80%) have certificate / diploma level qualifications and there is currently a strong move towards expanding these qualifications to degree level. Few of South Africa's extension officers have irrigation or water management specialist skills (only 0.8%). Higher level skills in the agricultural extension service context are scarce (only 2% qualified with honours, and 2% qualified with Masters degrees).
- Despite considerable experience in the field, many extensionists still lack basic knowledge of specialist areas such as irrigation or water resources management. Most learning therefore appears to come from 'in the field' or 'on the job' experience, but this is not matched with the necessary knowledge.
- The most widely practised form of irrigation related extension training currently takes place in the context of diploma courses and /or through short courses. However, it is of concern that few appear to be doing these short courses and almost 50% have not received formal or non/formal training in irrigation, with almost no training in RWH&C for smallholder farming and household food production formally available.
- Another very useful insight for the Knowledge Uptake Strategy development process is related to the information sources that irrigation extensionists tend to use: 'popular literature' (Farmers Weekly, etc.) (25%); DoA (18%); farmers (13%); DWAF (12%); colleges, etc. (16%); industry (13%) and ARC (3%). From this, it is possible to see that popular literature, and material and information provided by government departments, and farmers themselves have an important role to play in 'knowledge flow' to extension officers.
- Training needs and training preferences identified in the Stevens et al. (2012) study show that extensionists by far prefer a combination of formal and in-field experiential learning (45%) with a high level of preference for in-field experiential learning (33%) versus formal learning (18%) and self-directed learning (4%). This shows that the greatest preference is for some formal training, backed with more extensive forms of in-field experiential learning and demonstration.
- There are few social learning platforms or discussion forums for agricultural extensionists where they are able to learn and develop their knowledge from others in the field in ways that are both agro-ecologically and socially aligned to the particular contexts in which they work.

In this project period, Sithole (2018)[7] undertook a master's research study in the Nkonkhobe Municipality to specifically explore the social learning practices of extension workers working in the Amanzi for Food programme as it pertained to their competences and abilities to mediate RWH&C practices to smallholder farmers (thus probing some of the issues above more contextually via qualitative research in the Amanzi for Food project). She found that:

- Extension officers saw themselves as 'bridge builders' between farmers, research and innovation, and saw themselves as the 'main link' between research and farmers. They also communicate farmers' issues to the researchers. In a local context, there is need for extension officers to be closely linked to local research institutions. In the Amanzi

[7] The study by Sithole (2018) was also partially supported under the capacity building component of the Amanzi for Food programme.

for Food programme, this was Rhodes University ELRC and the University of Fort Hare, both important participants in the learning network able to access knowledge from the WRC and the ARC and bring that closer to farmers and extension services to support farmers.

- One of the challenges identified in the field, was bridging the technical divide of the learning material and farmers' knowledge, and it is here that the extension officers played an important role, as they were able to present this knowledge in farmers' localised language (isiXhosa) and advise on using practical examples so that farmers were able to translate this knowledge into practice on their farms
- There is need to develop the capacity of extension services as they are crucial in development of rural smallholder farmers. In the case of the Amanzi for Food project, there were clear indications of the extension officers both contributing knowledge and resources on RWH&C, while also learning more about these and farmers' practices through interactions in the multi-stakeholder learning network and the ToT course, and via use of the WRC material, the navigation tool, and the co-engagement with college lecturers, farmers association members and farmers around the development of the productive demonstration sites.
- The study showed that working closely with extension officers in a multi-stakeholder learning network was one of the best ways to make the RWH&C knowledge of the WRC (that was previously not being used) accessible to the farmers because they have such direct access to the farmers and work with them on regular basis.
- The study also showed that extension officers have to deal with conflict that might arise during the social interactions and this requires certain types of skills and capacity, therefore extension officers need to be team players, reflexive and critical thinkers, who can think 'outside the box' and make the best use of opportunities to support the farmers they are working with. Extension officers' disposition and willingness to engage with new knowledge resources was important for farmers' social learning and their own reflexive learning.
- Knowledge sharing therefore also involves a trusting relationship between farmers and extension services. Such a trusting relationship allows farmers and extension services to come together and learn from each other. In the Amanzi for Food project, this was supported by a wider co-learning process involving college lecturers from Fort Cox College, local municipality officers as well as university researchers from both Rhodes University and Fort Hare University in the learning network.
- Respondents from the Department of Agriculture and Rural Development noted that one of the major challenges facing the extension services is lack of social facilitation skills and participatory rural appraisal tools. This is because the tradition in agricultural extension is technological and input driven and more emphasis is placed on technical knowledge transfer than social learning and social facilitation.
- The study indicated that while there initially seemed to be limited evidence of extension officers taking active steps to build capacity amongst the farmers on RWH&C, and also in promoting participatory learning processes where farmers and extension collectively engage in the learning process, this was expanded as the Amanzi for Food programme and the learning group interactions emerged over time. This allowed the extension officers to more proactively engage in social learning and participatory processes for mediating RWH&C knowledge.
- The collaborative social learning approach using training, dialogue with farmers, and productive demonstration sites in the Amanzi for Food project, allowed for a broadening of the extension officers roles to be more inclusive of participatory

approaches and social learning involving multi stakeholders in the local agricultural learning system. Importantly, this approach allowed extension officers to develop their social learning and participatory approaches to providing extension support.

- There is, however, a lack of support for continuity and maintenance from the extension officers which can result in limited appreciation or potential of rainwater harvesting for the farmers to tackle food insecurity. For farmers to adopt these alternative practices they need motivation and support of social networks and extension services, not only during the establishment phase, but also during the ongoing utilisation and maintenance phases of developing a practice.
- The prior knowledge of farmers and extension officers affected how they perceived new information and knowledge of RWH&C practices. Farmers and extension officers had little prior knowledge with regard to rainwater harvesting and this enabled the farmers and extension officers to accept and understand RWH&C practices. The prior knowledge affected how they organised the new information and knowledge; in this case they had to incorporate the new knowledge into existing prior knowledge and used existing structures to assimilate the new rainwater harvesting and conservation practices. Prior knowledge also affected how farmers made connections to the new information. One of the keys to learning is the richness of the connections related to information. The more connections, the easier it is for farmers and extension officers to engage with RWH&C.
- New knowledge from the WRC material, introduced via the navigation tool and handouts as well as training workshops and lectures in both English and isiXhosa supported the learning process. Through exposure to the new RWH&C practices, farmers were empowered to understand their farming practices from the new perspective and were able to envision better water ways of improving food security. The new knowledge stimulated deeper thinking and farmers' questioning of current ways of knowing and doing. Farmers were encouraged to weigh their current practices and knowledge against the new knowledge and question the practices. The farmers' prior knowledge was valued and used in the learning of new RWH&C practices. They accepted this knowledge because they were able to debate and question and also adapt according to their local conditions.
- In the Nkonkobe case study context, extension officers and farmers were learning from one another and not only viewing extension officers as the 'external expert' and there was a recognition that individual farmers too are experts of their local conditions as also reported by the extension officer.

These findings from Sithole's (2018) master's study provide useful insights into the role of extension services in supporting the learning and practice of farmers when learning new knowledge and practices such as those promoted in the WRC material. They indicate a more nuanced and situated approach to co-learning and support of learning (of both extension services and farmers) in local farming contexts, and indicate that the social learning network approach offers such a platform for co-learning and adoption of new knowledge and practices.

This analysis of the context of the South African government extension services and the need for training of extension officers within this system highlighted the following important dimensions which have been considered in the ongoing development process of this Knowledge Uptake Strategy. In sum, it is government extension services that generally advise small-scale subsistence and emerging farmers. These extension officers require complex technical and social competences, some of which are general and some of which are specialist

(e.g. RWH and small-scale irrigation specialist knowledge). In general, the agricultural education and training system for extension officers is not supporting the development of such training, especially the specialist knowledge needed. Extension officers prefer a mix of formal and in-field learning experiences, and they *do* draw on public media and information from the government for informing themselves of new practices. They require *forums for learning how to apply more general and specialist forms of knowledge to specific contexts of practice*, and as the knowledge that they require is likely to be dynamic and contextually shaped, *such forums need to be responsive and dynamic*. The uptake of RWH&C knowledge as intended by the WRC material, is influenced by this context and these needs of agricultural extension services in South Africa.

2.4 Other Stakeholder Groups and Media Practitioners

2.4.1 Other stakeholder groups

Analysis of stakeholder information and access systems indicated that farmers obtained information from a range of sources, notably: farmers associations, NGOs and CSOs, government extension services, LED officials, other farmers, community radio, and at fairs and farming activities pointed to the need to also consider the media and other stakeholders in a social learning model for informing a Knowledge Uptake Strategy.

As reported in Lotz-Sisitka et al. (2016) and confirmed in this period of project implementation, this drew attention to the need to scope information access within a wider networked stakeholder system. The analysis of the eight sets of material from WRC indicated that some sets of material are particularly appropriate for the non-formal sector, while other material are more appropriate for the formal sector (the training colleges and other educational institutes). However, subsequent to this analysis, it was found that information from all sets of material could be appropriate in a range of contexts.

Policy and contextual analysis identified a large number of stakeholders involved in agricultural developments, in sustainable development and climate resilient development pathways who should be involved, perhaps at different levels or depths, in consultations regarding the development of the dissemination strategy and the potential use of the WRC material and the associated knowledge and competences promoted by them. This opened up the field of potential audiences for the RWH&C information considerably, described in more detail in Lotz-Sisitka et al., (2006) but in brief, these included:

- **Members of national and provincial agricultural education and training forums** (although these were not found to be activated to any major extent at grassroots level).
- ***Relevant officials from the national and provincial government agricultural departments*** (including from the extension and advisory services; and from sectors dealing with rural development and climate change). May also include extension officers from other government departments (e.g. DWS; DSD; DDLAR; COGTA; DEFF). They provide in-field extension services.
- ***Agricultural colleges, ATIs and universities and their 'communities of learning'*** provide formal agricultural training at different levels.
- ***Agricultural schools and FET colleges*** provide formal agricultural training at different levels. Curriculum development.

- ***Agricultural commodity groups*** (as most of these are concerned with high-level commercially produced commodities, and few were found to be engaged with smallholder farmers).
- ***Agricultural Research Council (ARC)*** publishes on a wide range of topics. Their publications include booklets; CDs; factsheets; leaflets; journals and bulletins; pamphlets and research articles; training manuals; posters. These publications are highly valued and used frequently by farmers and extension officers.
- ***Agricultural and education sector consultants and training service providers*** – these have been found to provide an important 'in-field' training function (accredited training). Also training of extension officers.
- ***Agricultural, food gardening, rural development and educational NPOs, including local farmers associations*** – these have been found to have an important 'grassroots' training role and provide much support to smallholder farmers and household food producers, and also voice their concerns.
- ***AgriSETA*** plans for and funds accredited training; develops new qualifications and skills programmes. Associated with the AgriSETA are Department of Higher Education and Training and the South African Qualifications Authority / Quality Council for Trades and Occupations.
- ***National and Provincial Departments of Water Affairs and Sanitation*** offers training and extension services in rural areas, and works with Catchment Management Forums, and has various programmes promoting and facilitating RWH and water conservation. Also have national communications channels.
- ***Water Research Commission (WRC)*****;** This is a WRC project, but we are finding that it is important to link up with 'like-minded' programmes in the WRC – such as the WRC Climate Smart Agriculture project and new WRC programme on mediation of water knowledge to community groups and others that appear to share a similar interest in mediating water knowledge to communities. Here we are seeking to avoid duplication of effort.
- **South African Local Government Association (SALGA) (national and provincial**), in particular in relation to the knowledge hub and various publications.
- **Community representatives from agricultural and rural development programmes** involving rainwater harvesting, and women farmers / rural farmers associations; and youth projects and social movements in rural areas; including co-operatives.
- **Community radio stations and media-oriented NGOs and organisations** (e.g. Rhodes University Journalism Department); other key media institutions (e.g. Farmers Weekly Magazine); local newspapers and video / film projects (e.g. Sunshine Cinema).

This analysis indicates main stakeholder groups and potential ways of engaging them in using the WRC material. However, this required further investigation in terms of their particular interests, and existing forms of communications use. A decision was made to focus in more depth on those that were most affected by the RWH&C material and their knowledge, where the knowledge would most directly influence their practices (Stakeholder groups 1, 2, and 3 in Figure 2.5 below).

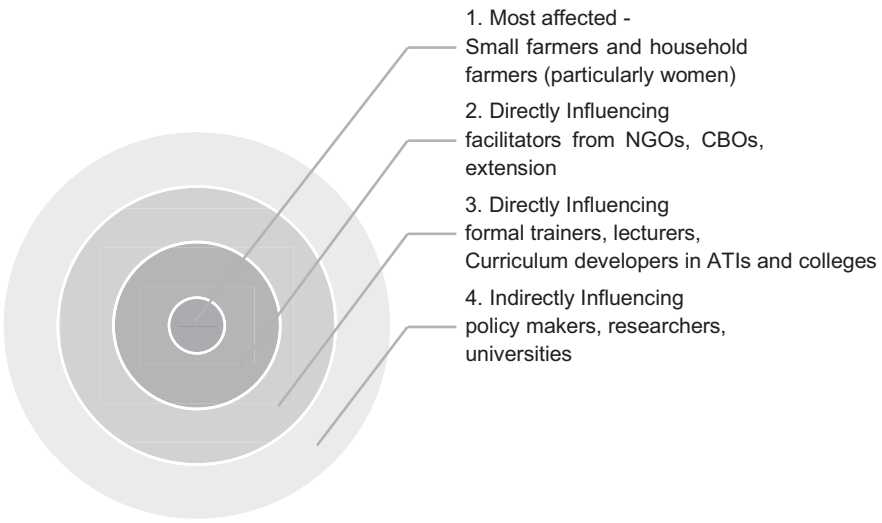


Figure 2.5. Stakeholder groups most affected by the RWH&C knowledge in the WRC material (drawn form Lotz-Sisitka et al., 2016)

Further contextual analysis helped to provide a clearer understanding of the communication channels preferred by the above-mentioned groups as outlined in Table 2.3.

Table 2.3: Main communication channels used by the key stakeholders to access information and support

Stakeholder Group	Information Sources	Support
Large-scale Commercial Farmers	• Trade journals (Farmers Weekly, etc.) • Suppliers of fertilisers, pesticides, machinery, livestock, etc.) • Fellow farmers within Associations or informally • Internet • Produce price apps (such as for maize, wheat, citrus, livestock, etc.) • Commodity groups • Local, regional and national radio and television • Local, regional and national newspapers • Agricultural research institutions • Agricultural colleges – initial qualifications and subsequent short courses	• Farmer Associations • Suppliers of fertilisers, pesticides, machinery, livestock, etc.) • Commodity groups • Agricultural research institutions
Small-scale and Emerging Farmers	• Agricultural extension services • Produce price apps (such as for maize, wheat, citrus, livestock, etc.) – recent development and limited scope • Suppliers of fertilisers, pesticides, machinery, livestock, etc.) – relatively limited scope • Trade journals • Local, regional and (to a lesser extent) national radio and television • Local and regional newspapers • Fellow farmers within Associations or informally	• Farmer Associations • Agricultural extension services • Local and District Municipality local economic development departments (in some cases)
CSOs	• Internet • Trade journals/magazines • Higher Education Institutions (HEI), including agricultural colleges, through formal training and short courses • Research institutions • CSO networks • Local, regional and national radio and television • Local regional and national newspapers	• CSO networks • Higher Education Institutions (HEI), including Agricultural Colleges, • Research Institutions • National and provincial departments of agriculture

Stakeholder Group	Information Sources	Support
Agricultural Extension Officers	• Internet – especially Extension Suite Online (ESO) • Higher Education Institutions (HEI), including Agricultural Colleges, through formal training and short courses • Trade journals • Local, regional and national radio and television • Local regional and national newspapers	• National and provincial departments of agriculture • Agricultural colleges • Research institutions
Agricultural College Lecturing Staff	• Internet • Trade journals/magazines • Higher Education Institutions (HEI), especially for postgraduate studies • Agricultural research institutions • Local, regional and national radio and television • Local regional and national newspapers • Lecturer/college networks • Communities of Learning and Action (COLA) – now discontinued	• National and provincial departments of agriculture • National department of education (in process) • Research institutions • Higher Education Institutions

The importance of institutions such as farmers associations, research institutions, government departments, local municipalities and local government development agencies, and networks has been noted in this analysis. This has shown that the knowledge dissemination system in/ for the agricultural learning system is not a one-way transfer process, but rather complex, which needs to be better framed via an engaged, networked process of learning and interaction amongst a diversity of stakeholders. This consolidated the concept of establishing a Learning Network approach for the knowledge dissemination and uptake strategy (described in detail in Chapter 3 of this report).

2.4.2 Farmers' associations and farmer-centred networks

Given that farmers were at the centre of the beneficiation of the WRC material, we also considered existing farmers' associations and farmer-centred networks in this period of project implementation in the development of the social learning approach to knowledge uptake and use. Peer-to-peer learning and communities of practice have long been recognised as key modes of learning among farmers (Spielman et al., 2008; ASSAf, 2017; Kelly et al., 2017). Learning from practical examples demonstrated by other farmers is a powerful method through which farmers learn about new practices and participate in the informal development and evaluation of potential solutions in their particular contexts. These practical engagements between farmers most commonly take place on-farm, and present significant opportunities for innovation as farmers discuss their experiences with a particular product or system which they have applied, consider its performance under their particular working conditions, formulate improvements and weigh up alternatives.

Unlike classroom based teaching or formal research, these embedded forms of research and learning are grounded in the daily practice of farming and as a result are well placed to address the contextual complexities faced by farmers. Research has consistently shown that knowledge acquired through peer-to-peer engagement on-farm is far more likely to be understood and adopted by other farmers than knowledge gained through an abstract engagement with a concept in a classroom (Franz et. al., 2010; Dolinska and Aquino, 2016; Metelerkamp, 2019).

In many instances farmers in a particular area or commodity type will form groupings through which they come together to learn, share and support each other in a wide variety of ways. These groupings vary in their size, structure, depth of relationship as well as level of formal

constitution. The nature of these constitutions ranges from informal social gatherings between neighbouring farmers and loosely constituted local ‘study groups’ to formally registered co-operatives, farmers’ associations, and formally constituted ‘commodity-groups’, with the latter often being linked to local ATIs and/or government extension services. Whatever form these groupings take, shared interests, close interpersonal relationships, trust and mutual benefit are key guiding characteristics.

Seen collectively, these farmer networks have the potential to play a key pollinator role, for once a technology is adopted by one member of a group, there is a high chance that it will be adopted by others. This principle is well understood by both farmers and input suppliers in the commercial agricultural sector, where companies wishing to promote a new product or service to farmers will sponsor farmers meetings in exchange for an opportunity to introduce their products to these networks. Farmers unions and commodity associations play a similar role in this arena, helping to drive on-farm research, organising local field visits and supporting the documentation and dissemination of their members’ work.

While the benefits of these forms of peer-to-peer learning have been widely recognised, there is another side to the story: when localised farming networks and communities of practice become too close-knit and are not effectively bringing in new ideas, there is the risk that these structures can entrench ineffective and outdated ways of working.

In relation to the dissemination and mainstreaming of the WRC material, the aforementioned points suggest a need to foster relationships with farmer associations, networks and cooperatives, as was also found in the first iteration of this project (cf. Lotz-Sisitka et al., 2016) where farmers’ associations emerged as important actors in the learning networks being formed in the Eastern Cape.

However, among communities of small-scale farmers and household food producers, few examples of effective formalised collective association exist and those that do often lack the material and social capital they require to operate successfully. This implies the need to think beyond the utilisation of these networks as the only forms of knowledge development and dissemination, but also to continue investing into the development and capacitation of farmer networks as an important form of civic infrastructure in the process of agricultural water provision.

Loose, informal associations among neighbouring farmers do emerge in different areas from time to time, and often have as much a social as a professional function. They are essentially mutually supportive networks with shared interests in particular crops and/or in marketing of produce, and provide opportunities for sharing of experiences and insights. Some of these become slightly more formalised as local commodity groups, such as Chicken or Goat groups involving farmers from a number of neighbouring villages. All these groupings, whatever their level of formality, provide opportunities for sharing information on RWH&C, particularly if one or two members connect with the ideas through the Training of Trainers programme. Reaching out to such groups is therefore a critical need for any effective knowledge uptake strategy.

2.4.3 Communication and media sector

Television and radio are well established media platforms in South Africa. There is also a vast and growing number of internet based media and Web 2.0 communication platforms, and social media tools and channels, with WhatsApp emerging as one of the most preferred social media platforms (see Chapter 4). Although television has a high impact on disseminating information, there are high costs to television production. Therefore, it was decided that the project could not focus on television, and this medium was therefore not reviewed.

In terms of traditional print media, this project was particularly interested in the types of print media that reach smallholder and household farmers and government extension officers (other than Farmers Weekly and government information services which were considered in the section on extension services). Thus, the Independent Publishing Media organisation that focus on community newspapers, was approached and provided the following contextual information:

Box 2: Facts about the Independent Publishers Sector

Circulation
87 newspapers are published weekly and print 1,220,950 copies weekly or (4,883,800 monthly)
38 newspapers are published fortnightly and print 417,600 copies fortnightly or (835,200 monthly)
55 newspapers publish monthly and print 830,500 copies monthly usually in the last week of the month.
This is a total of 6,549,500 copies per month
Languages
97 publish in indigenous languages or a combination of indigenous and English/Afrikaans
Ownership
60% of titles are black owned
18% are owned by women
Distribution area
Predominantly in rural and disadvantaged areas throughout South Africa
• AIP publishers can translate advertising into all South African languages
• AIP in a joint venture with a mobile company is piloting SMS alerts and mobi-sites which, with data bundles, will complement print advertising.

According to Vallabh (2014), the advent of Web 2.0 has opened up spaces for new forms of social engagement and learning, including learning and skills development mechanisms. Many of these engagements operate outside of formal educational systems, but also seem to provide viable tools for learning. The semantic web has undergone a shift from Web 1.0, which provided a mechanism for sharing information digitally, to Web 2.0, which embeds and integrates social processes of producing, sharing and reviewing (more than) information. This has particular implications for learning and knowledge production.

Compared to more traditional one-way media (for example, magazines, TV, etc.), Web 2.0 technologies have potential to increase opportunities to connect to wider communities of learning, access a greater number of learner and teacher generated content, communicate in a variety of ways, share and challenge ideas, and co-create content and learning support

material in a variety of forms. These emerging platforms facilitate and enable both receiving and co/production of learning content for those who have access (Vallabh, 2014). However, meaningful participation in Web 2.0 requires giving attention to the quality and depth of participation, rather than new or novel ways of simply being involved in learning processes (Hart, 1992 and Schnack, 2008 in Vallabh, 2014).

From a **social media** perspective, the South African SA Social Media Landscape Report Executive Summary (2014) published on the worldwide web, provided important insights into social media use patterns when we first engaged with this practice (cf. Lotz-Sisitka et al., 2016). At that time it was said that Facebook had become the biggest social network in South Africa, seeing its strongest growth yet in the past years and overtaking Mxit for the first time in 2013. At the time (2014), the study showed that Facebook had 9,4-million active users in South Africa, up from 6,8-million users recorded in 2012. Mxit, the previous market leader, at that point had remained stable at a little more than 6-million users, as it felt the effects of competing instant messaging services like WhatsApp and 2Go, as well as from the growth of social networking on phones. As reported in 2014, at that time Twitter saw the highest percentage growth among the major social networks, from 2,4-million to 5,5-million – showing 129% growth in 12 months. At that time (2014), WhatsApp was the most popular app in the Android, Apple and Windows app stores, with Facebook in second place in the Android and Windows stores, while Instagram took the Apple store runner-up slot. The 2014 report highlighted the intensified use of social media by South African corporations, revealing that at that point 93% of major brands used Facebook, 79% used Twitter, 58% YouTube, 46% LinkedIn and 28% Pinterest.

In 2015 further detail was provided on **the use of Facebook** in South Africa. Some of the detail is included below:

> The SA Social Media Landscape 2015 report, released by WorldWideWorx and Fuseware … showed that Facebook remained the most popular social network in South Africa, followed by YouTube and Twitter… Of a total of 11,8-million South African users – 22% of the population – 8,8-million access it on their mobile phones. This means that targeting Facebook users is not a matter only of marketing on the Facebook web site – its mobile properties are probably more important. … More important than the operating system numbers, however, is the split between feature phones and smartphones … Five million Facebook users still use feature phones. While smartphones only just dominate – at 5,6-million – it is clear that a large Facebook user base is still on a basic device… The 13-18 age group remains the single biggest on Facebook, with 2,5-million users. (http://www.worldwideworx.com/facebook/)

Due to these trends at the time, and the significant role of mobile phones in enabling access to Internet resources, the project was also interested in exploring the potential of social media, especially Facebook and WhatsApp messaging as these are increasingly accessible in rural areas, especially amongst youth, as was also confirmed in the earlier iteration of this project (cf. Lotz-Sisitka et al., 2016).

We were also interested in tracking shifts in the social media landscape, as this is known to shift rapidly. The 2020 SA Social Media Landscape 2020 report showed both similarities, but also some differences to the earlier 2014/15 reports, as follows. Reporting on social media trends and penetration, as well as users the Onica/WorldWildWorx (2020) report provides data derived from 26,922,000 South Africans, or 46% of the population, indicating the proportion of

active users of social media and instant messaging platforms. Correlating the penetration proportions with the sample frame, we are able to provide the highly active user base of each platform, as follows:

- WhatsApp 10.1-million
- Facebook 9.1-million
- YouTube 9.1-million
- Instagram 4.7-million
- Twitter 4.7-million
- LinkedIn 3.7-million

The analysis shows more people using WhatsApp than Facebook, and an increase in YouTube usage since 2015. The 2020 report also offers important information on use of these platforms according to Socio Economic Levels (SEL), which reveals that

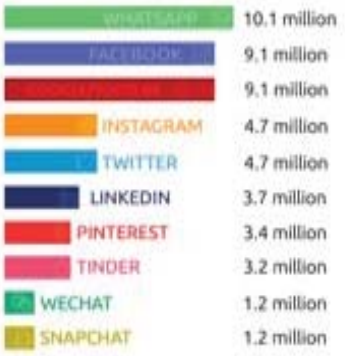
> all social networks drop close to zero in penetration of the lowest socio-economic level. Only apps rise above this penetration, but still only at 3%. Age, too, is a significant indicator of penetration, with penetration of all platforms inversely proportional to age.
>
> to develop a framework for understanding who embraces what platforms on the basis of tech readiness, which emerged as the clearest indicator of use versus non-use … The biggest contrast was between those defined as Tech Adopters, and the Tech laggards. So, for example, 56% of adopters used Twitter, versus only 36% of laggards. Instagram had almost the exact same contrast, of 55% versus 35%. For LinkedIn, the comparison was 41% versus 27%. The primary conclusion from this data is that, after age and socio-economic level has been taken into account, level of tech-readiness is the key factor in uptake of social media and related services. (Ornica / WorldWideWorx, 2020)

The graphics below (Figure 2.6) indicate some of these trends. For the WRC Amanzi for Food programme, some of the insights are important, notably: 1) the penetration and use of WhatsApp as most widely used social media platform and tool; 2) its accessibility and use across age groups; 3) its penetration into both urban and rural areas; and 4) lower socio-economic contexts. However, also to bear in mind is that there are significant groups of people who are still not using these platforms, especially the elderly and those most socio-economically marginalised. The finding on tech-readiness is also useful for a Knowledge Uptake Strategy development process that seeks to include a social media component targeting smallholder farmers and household food producers. The implications of the findings above are that social media tools are likely only to reach some of the farmers / members of a learning network, and other strategies are needed to include a wider network of practitioners.

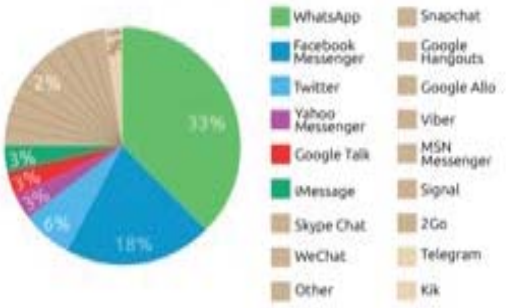
THE INTERNET

TGI works with Ask Afrika to structure questions in the TGI survey around technology, social media and electronics, to ensure it keeps up with rapid change. Last year Ask Afrika conducted 30 000 interviews, representing 24.6-million South Africans, aged 15+, living in cities and towns. The following demographics represent this sample frame. The Past-7-days metric represents highly active users, and is a powerful measure of impact.

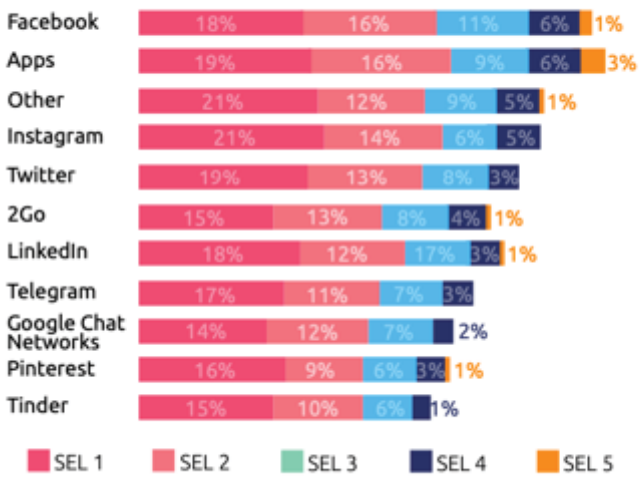
THE HIGHLY ACTIVE NUMBERS



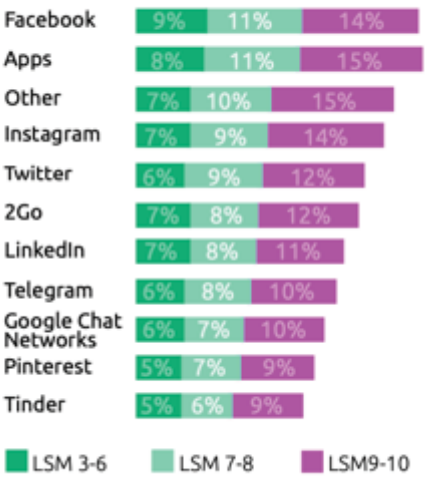
CURRENTLY USED INSTANT MESSAGING



SOCIO ECONOMIC LEVEL



LIVING STANDARDS MEASURE



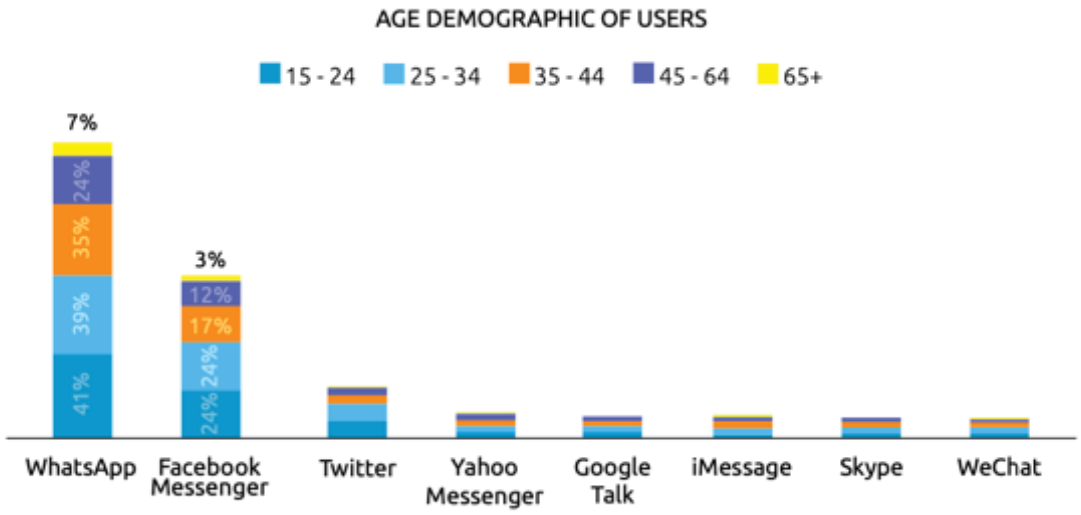


Figure 2.6. Graphics on social media use and penetration (Ornica / WorldWideWorx, 2020)

Of interest to the social media tech landscape in South Africa is the recent rapid uptake of the video-based TikTok platform. This is a new entry to the social media space and was said to be the big 'social media sensation' in 2019 (Ornica / WorldWideWorx, 2020). According to Ornica / WorldWideWorx, 2020), TikTok

> …is a video creation and sharing social network for Android and iOS smartphones that provides music tracks and special effects to spice up the material users put up. Videos can last anything from 3 to 60 seconds, which means they can be quick to create, quick to consume, and quick to forget…. In less than two years, numerous TikTok creators had thousands of followers …. The user base in South Africa must be well over 5-million … The app is massively popular among all race groups, and was the country's second most downloaded social app on the Android Play Store, behind Facebook Lite [in 2020] …. TikTok enables everyone to be a creator through easy-to-use tools, including special effects, filters, music, and more, which allows users to view and capture a wide variety of interesting authentic moments … This results in a diverse array of creative content. Along with TikTok's interest-based recommendation system, this helps creators to be discovered more easily among a new audience … Short video content consumption has gained increasing popularity and we believe TikTok offers opportunities for brands to reach creators to develop engaging, interactive content together, tailored for a new audience.

The latter information, together with the higher usage of YouTube (9.1 million users) in South Africa indicates a trend towards short video as a key mechanism for communication, a trend that we also saw emerging, and that we proactively supported in this period of the programme's implementation – reported in Chapter 3 in more detail. As will be seen in Chapter 3, we have not actively explored TikTok as a platform but that may well be interesting to do if this programme continues, depending on the penetration of TikTok usage amongst household food producers and/or smallholder farming networks, including young people in these communities.

The social media component and the Internet are very important in making sure that rainwater harvesting and conservation learning material are easily accessible and freely available to

everyone. The Amanzi for Food project has made use of a specially designed website (see the report of the initial set up of this in Lotz-Sisitka et al., 2016) and associated social media channels such as WRC Amanzi for Food Facebook page and WhatsApp group to disseminate learning information about RWH&C techniques, a process that has continued in this reporting period (reported in more detail in Chapter 4). The WhatsApp group, in particular, has been used as the main communication platform by the learning networks to communicate, share information and engage in discussion about RWH&C and other issues related to farming and food production. In particular, the focus is on the shared learning opportunities presented by the use of this online platform, and how the learning network members have responded to these.

Furthermore, broadcast radio, which can be traced back as early as 1923 (De Beer, 1998) in South Africa has been used as a form of communication platform between network members in the project. South Africa has different kinds of radio stations, namely, community, commercial, public broadcast service and national radio stations. Community radio, which was seen to be most relevant to the main producers being targeted by the Knowledge Uptake Strategy is a crucial part of the South African broadcasting landscape, providing diversity for listeners and the development of much-needed skills for the commercial radio sector. The details of how these aspects of Knowledge Uptake Strategy, (including a focus on community radio) were developed further in this reporting period and are reported in Chapter 4 below.

2.5 Conclusion

This chapter has provided a detailed contextual analysis of part of the South African Agricultural sector, highlighting the level of farming and food production targeted by the Knowledge Uptake Strategy, namely the smallholder farmer and homestead food producer. The contextual analysis also focused on the SA government extension services as it is these extension officers that directly support smallholder farmers with new knowledge such as that contained in the WRC material. It also considered smallholder farmers themselves and how they obtain information on RWH&C practices, and went on to review various communication and media approaches most appropriate for this level of farming practice in South Africa, and the scope of stakeholders involved in the Agricultural Learning System that are working in support of smallholder farmers and household food producers.

The agricultural education and training provisioning system in South Africa was also discussed, highlighting the flux that currently characterises the sector as well as new interventions, such as the re-orientation of agricultural colleges into Agricultural Training Institutes, and the move towards adopting competence-based approaches. The section also looked at recommendations for curriculum innovation in this sector, and indicated some of the earlier work undertaken that has been carried through to this phase of the Amanzi for Food implementation. This section provides the rationale for some of the key approaches adopted to the Knowledge Uptake Strategy development process, which were grounded in consultations in the field, stakeholder analysis, policy analysis, and carefully targeted contextual analysis work. Finally, the chapter also included a brief exploration of the opportunities offered by both conventional and social media platforms for sharing information from the WRC material, as this will be a key component of the Knowledge Uptake Strategy.

The above analysis of context of use in which the WRC material could be mobilised for greater Knowledge Uptake and Use, together with the emerging policy imperative for a wider

framework for social learning in extension services, and calls for the AET system's curriculum innovations to be more farmer centred and locally relevant, motivated the development of the **Learning Network concept** for the Knowledge Uptake Strategy. As reported in Lotz-Sisitka et al. (2016), an initial decision was made to centre these Learning Networks around 'knowledge hubs' where agricultural knowledge and learning takes place on a regular basis, as these are more likely to be a potential conduit for new knowledge into the local agricultural learning system. The **learning network concept** and its genesis is well described in Lotz-Sisitka et al. (2016), and its further application in this programme is discussed in more detail in the next chapter.

CHAPTER 3
TOWARDS A KNOWLEDGE UPTAKE STRATEGY PART 2 – Contextual profiling and learning network formation

3.1. Introduction

This chapter provides a report on the design and use of the **Contextual Profiling and Data Analysis Tools** (Appendix 3.1 and part of the Technology Transfer Tools that accompany the Knowledge Uptake Strategy). It also reports on the initial contextual profiling work that was done in the three agricultural learning sites to establish learning networks, and to provide an initial 'multi-actor' network map for each of these three learning network areas. The chapter provides insight into contexts in which the Project has taken place. In particular it examines the situation in relation to the three Agricultural Training Institutions (note that ATI here refers to emerging Agricultural Training Institutes, Agricultural Faculties in Universities, and in Colleges) where Learning Networks were being established and expanded. These are:

- Fort Cox Agriculture and Forestry Training Institute (FCAFTI),
- the University of Mpumalanga (UMP, Lowveld College of Agriculture), and
- Taung ATI of Agriculture (TAC).

As reported in Lotz-Sisitka et al. (2016) and in Chapter 2 above, the Agricultural Education and Training System (AET) context is in flux, hence the range of organisational forms and titles.

The contextual profiling captured the initial formation of the learning networks and emerging insights into each of these three sites. It identified and briefly described current involvement with Rainwater Harvesting and Conservation (RWH&C) practices, the key partnerships that the ATIs were forming around RWH&C practices, and also captured insight into the expansion of these three learning networks with a focus on RWH&C. These contextual profiles have been developed over the period of the programme years (2017–2020) in which interaction has taken place in all three sites, with the TAC coming most recently into the frame with the Training of Trainers course held there in October 2018, while the FCAFTI and UMP emerged as more sustained interaction sites over the period of the programme). This chapter also shares insight into the new methodology of Network Mapping that was developed and adopted to develop deeper insight into the learning networks. This chapter also informs, and is complemented by the Technology Transfer Tool booklet which provides 'Guidelines for the Establishment and Support of an Effective Learning Network' (Appendix 3.3), which forms part of the Knowledge Uptake Strategy.

Development of the ongoing contextual profiles is important for gaining insight into how best to support the learning interactions and the use of the WRC material that are the core focus of the activities in the learning networks. It is therefore an important part of a Knowledge Uptake Strategy; failure to take adequate account of the (changing) contexts, can lead to poorly oriented knowledge engagement and co-production activities. Hence we have put a lot of effort into ongoing contextual profiling in this programme, and recommend the use of the Contextual Profiling Tools, which can be easily adapted to other Knowledge Uptake and Use contexts.

3.2. Contextual Profiling Tools and their use

In May 2017 the selection of viable sites for the establishment of learning networks was discussed and confirmed and the Contextual Profiling Tools were developed to inform the Contextual Profiling Process. Contextual Profiling data collection has been ongoing since then during the roll out of the Training of Trainers programme in the Fort Cox and University of Mpumalanga sites, with this report offering an updated perspective on the contexts. The focus in this report is on gaining in-depth understanding of the contexts of practice of some of the participants in the Learning Networks. An in-depth study of the Taung ATI has also been completed (Van Staden, 2018). The Contextual Profiling data collection included a focus on these categories:

Part A: Historical and current context of the educational / learning institutions associated with the learning network

A1: Profile of educational / training organisations or institutions – which provided a potential 'hub' for the agricultural learning network OR which could be a key stakeholder in the learning network. This could be an ATI, university, NGO, or CBO. The purpose with this section of the contextual profile was to understand the current role of the organisations and institutions involved in mediating knowledge; and how they did this.

A2: Physical resources for mediating learning – which examines the physical resources, especially for supporting practice-based learning and potential for demonstration site development.

A3: Water related programmes at the educational/learning institutions – which identified what water related programmes were on offer, which have been tried out and which may/may not be needed (formal and informal)

A4: Educators' views on the teaching of water knowledge – which explores via interview data details of the teaching practices related to agricultural water.

A5: Learner profiles in the agricultural learning system associated with the institution – which profiles who is learning from the institution.**A6: Relationship mapping** which captured data on the agricultural learning institution's evolving relationships with other stakeholders.

A7: Document checklist – which provided guidance on key documents to collect from each site.

A8: Artefacts/images – which provided guidance on what to focus on during site observations and via use of photography in each site.

PART B: Farmer and farmer practice profiling (including household food producers)

B1: Demographic/biodata on farmers – which captured general information on the farmers.

B2: Information on farming at household/smallholder farm level – which researched on the types of farming, produce, participation in the farming activities and the relationship between farming and household economies.

B3: Information on group level farming – which examined whether the farmers were involved in farm groups such as associations, co-operatives, or collective farming activities.

B4: Farm scale – which identified details of the scale of farming practices (scale 1 = household; scale 2 = 1-2 ha; scale 3 = larger than 2 ha).

B5: Farmer knowledge – which captured farmers' existing knowledge of agricultural water use and provisioning, as well as RWH&C practices.

B6: Farmer communication – which explored the channels of communication used by farmers including radio, use of social media tools, language of communication and most widely used forms of communication.

B7: Farmers challenges – which identified challenges experienced by farmers with regards to water use, water provisioning, water harvesting and food production.

B8: Farm observations – which provided guidance on key aspects to observe when visiting plots, household gardens and/or small farms.

The following data analysis framework was used to develop the contextual profiles, was used to guide reporting on the contexts. More detailed contextual profiles exist based on this analysis framework, but for the purpose of reporting, we offer shorter views on the context, although we have also included some of the richly textured data generated in the different sites as these offer rich insights into the contexts and realities of learning network participants in these settings.

CATEGORY 1: General background information on the site where **the Learning Network was developed** – involving sourcing information on:

- General historical data
- Municipal district information
- Geo-physical data
- Social and demographic data
- Agricultural practice data
- Available data on rainfall patterns

CATEGORY 2: Information on the ATI as a Learning Centre – involving sourcing information on:

- The aims and purposes of the ATI
- The courses on offer
- The size and shape of the ATI
- Its current commitments and approaches to dealing with agricultural water and RWH&C in particular
- RWH&C knowledge evident in the curriculum
- Absence of RWH&C knowledge and practice and reasons for this
- Other practices related to agricultural water (e.g. use of locally adaptive seed for use in dry conditions)
- Partnerships that the education institution is linked to that can strengthen RWH&C practice
- Main programmes that can be expanded to include RWH&C in the education/learning institution

CATEGORY 3: Educator/Learning Facilitators knowledge of RWH&C practices – involving sourcing information on

- Educators' existing knowledge of RWH&C practices
- Sources of knowledge informing them
- Interest in expanding knowledge of RWH&C and why
- Communication channels and tools used most widely
- Availability of learning material for use for RWH&C practices
- Educators scope of engagement with household food producers and smallholder farmers

CATEGORY 4: Farmers' knowledge and practices of RWH&C – involving sourcing information on:

- Farming scale and type of farming
- Main purpose for farming
- Main issues associated with farming practice, including water supply and use
- Networks/groups that the farmers are included in (including collaborative activities such as co-operatives)
- Farmers' existing experience of RWH&C practices
- Main forms of communications used by farmers including language, radio, TV, social media, etc.
- Other information (e.g. on history of farming practice; changes in farming practice, etc.)
- Farmers' expertise and experience including willingness to learn

CATEGORY 5: Networked partnerships and co-learning interactions around RWH&C – involving sourcing information on

- Partners' main focus and their interests in RWH&C knowledge and practice
- Partners' existing links with others focusing on agricultural water and RWH&C knowledge and practice
- Potential role and contributions of partners to co-learning and learning network development for RWH&C knowledge sharing and practice development

In addition to the above, a further contextual profiling dimension has been added through the introduction of the **Knowledge Uptake and Social Learning Value Creation Framework** (described in detail in Chapter 7) and used as an evaluation tool. This enabled more in-depth examination of the influence and impact of the learning networks on their members and other stakeholders. This framework has informed the development of a consistent reporting process for all project activities, and is guided by an online reporting and evaluation tool (Appendix 3.2 in the accompanying Appendices document, which is also a useful Technology Transfer Tool, cf. Chapter 7).

Contextual Profiling to inform Learning Network Development and Social Learning around RWH&C practices and uptake of the knowledge in the WRC material was undertaken in three sites:

- The **Eastern Cape** Contextual Profile is inevitably developed in more depth than the other two as the project has been running in this area for longer (since 2014), and also because the project team are geographically closer to the farmers' sites of operation and are actively involved in the ongoing activities of the Imvotho Bubomi Learning Network (IBLN). This contextual profile was also significantly deepened by the studies of a number of scholars who worked closely with this cluster namely the work of Weaver (2016); Lupele (2017); Sithole (2018); Pesanayi (2019); Matiwane (2020).
- In **Mpumalanga**, the University of Mpumalanga did most of the coordination work for the Sinakekela Sibusiso Semanti Learning Network (SSSLN), the central network in Mpumalanga, and the four regional networks established out of the Training of Trainers Course that ran from 2017 into 2018. Rhodes University researchers have been able to engage with these networks, both through the main WhatsApp group, and also through infrequent visits to the province such as for the UMP Water Seminar in July 2018. Unfortunately all visits became impossible in 2020 due to the COVID-19 pandemic which cut short some of our ongoing engagement and contextual profiling

in this site. However, Mr Viljoen has continued to engage provincially with this Learning Network.

- In the **North West**, the contextual profile was informed initially by the PhD study of Ms van Staden (2018), who undertook in-depth contextual profiling of the site, as well as curriculum innovation research at Taung ATI itself. Further in-depth contextual profiling to capture data on participating organisations was undertaken with the activation of the #PulaWise Learning Network following the ToT course in October 2018.

The outcomes of these three contextual profiling processes are described in detail in the following sections.

3.3. Site 1: Fort Cox Agriculture and Forestry Training Institute as a Hosting Learning Centre and the Imvotho Bubomi Learning Network

3.3.1 General background information on the area[8]

The area where this learning network site operated is in the Amathole District of the Eastern Cape Province, named after the Amathole mountain range in the area. The district is organized into 6 municipalities, and has its seat in East London. About 90% of the people in this district speak isiXhosa. The Agriculture sector accounts for only 3% of the economy and yet many people in this district depend on agricultural production for their food. The two local municipalities where the learning network initially operated were Raymond Mhlaba (previously Nkonkobe) and Amahlathi, with most of the activity being centred on Raymond Mhlaba. Statistics for both are provided below. The profiles are quite similar and the only major difference being that people in Amahlathi also rely on river water.

Amahlathi Local Municipality

StatsSA Data on AMAHLATHI LOCAL MUNICIPALITY:

Source: http://www.statssa.gov.za/?page_id=993&id=amahlathi-municipality

According to the 2011 Census, Amahlathi Local Municipality has a total population of 122,778. Of the people in the municipality, 96,5% are black African, 1,2% are coloured, with the other population groups making up the remaining 2,3%.

Of those aged 20 years and older, 9,4% have completed primary school, 37,7% have some secondary education, 13,6% have completed matric and 4,7% have some form of higher education. Of the mentioned age group, 10% have no form of schooling.

There are 34 159 households in the municipality, with an average household size of 3,5 persons per household. Females head 48,8% of the households. About 31.3% of the population are in the age group 0-14, while 60% of the population are of working age (15-64). The area has a 66.5% dependency ratio.

[8] This contextual profile draws from, and is adapted from the descriptions in Pesanayi (2019), but is supplemented with other data.

Of the households, 82,4% have access to electricity. Only 15,6% of households have access to piped water inside the dwelling. 59,5% of people live on tribal land, while 34.9% live in urban areas, and 5.6% on farms.

There are 27 051 people that are economically active (employed or unemployed but looking for work) and of these, 36,1% are unemployed. Of the 11 948 economically active youth (15–34 years) in the area, 47,1% are unemployed. Furthermore, 79.2% of people have access to cell phones, 66% have access to television, and 65.4% have access to radio.

Agricultural data for Amahlathi LM shows that livestock and poultry are the two main types of farming in the area, but quite a number of households produce vegetables, and practice mixed farming. Annual incomes for most agricultural households in the municipality are low, indicating that agricultural produce has an important role to play in supplementing meagre incomes. The main source of water for 71.1% of the population is from a regional water scheme operated by the Municipality. Approximately 11.5% of people rely on river water, while 7.5% use rainwater tanks.

Raymond Mhlaba Local Municipality

Raymond Mhlaba LM is a new municipality having been established by the amalgamation of Nkonkobe LM and Nxuba LM in August 2016. It is, like Amahlathi, a rural municipality with farming a key player in the municipality's economy.

STATS SA data on NKONKOBE (NOW RAYMOND MHLABA) LOCAL MUNICIPALITY

Source: http://www.statssa.gov.za/?page_id=993&id=nkonkobe-municipality

According to Census 2011, Nkonkobe Local Municipality has a total population of 127 115. Black Africans make up 94,5% of the population, followed by coloureds (4,0%) and other race groups (1,5%).

Of those aged 20 years and older; 8,9% have completed primary school, 37,1% have some secondary education, 17% have completed matric, 7,1% have some form of higher education; and 7,2% have no form of schooling.

There are 35 355 households in the municipality, with an average household size of 3,4 persons per household. Nearly half of households (49,5%) are headed by females. Approximately 56.6% of people live on tribal land, while 40% live in urban areas and only 3.4% live on farms.

A high proportion (88,4%) of households have access to electricity. Only one in five (20,1%) of the households have access to piped water inside the dwelling.

There are 27 499 people that are economically active (i.e. employed or unemployed but looking for work), and of these, 48,1% are unemployed. Of the 12 037 economically active youth (15–34 years) in the area, 59.6% are unemployed.

Seventy eight percent (78%) of people have access to cell phones, 71,3% have televisions, and 66.4% have access to radio.

The majority of agricultural households have a low annual income, indicating that agriculture is an important food security safety net. Livestock and poultry production are the dominant forms of agriculture, but over 5000 households also produce vegetables, and some practice mixed farming. The main sources of water are from a regional water scheme operated by the municipality (77,6%) and the next most important source of water is from rainwater tanks (6.6%).

It is therefore not surprising that the Local Economic Development Agency (LEDA) has a strong Smallholder Farmer Development Programme. The Raymond Mhlaba Economic Development Agency has a dynamic programme for smallholder farmers where it has provided opportunities for the development and activation of value chains based on local inputs, local products and niche markets with community benefit brands.

Three of the original rainwater harvesting demonstration sites supported by the WRC Amanzi for Food Project (started in 2014, cf. Lotz-Sisitka et al., 2016) lie in Raymond Mhlaba area, namely at Lloyd Village near Alice, at Fort Cox ATI in Middledrift, and at Mqayise Village in Matole Basin. Amahlathi Local Municipality borders with and lies to the eastern side of Raymond Mhlaba Municipality. As its Xhosa name implies, forests are a key feature of the area, and forestry and timber production are major economic activities. Keiskammahoek and Stutterheim are the key towns in the area with the former having a rainwater harvesting demonstration site and the latter being the home of the Dohne agricultural research station.

The Eastern Cape has been recorded as being the poorest province in South Africa for many years (GoSA. StatsSA, 2017) with a past and continuing contemporary history of marginalisation related to homeland segregation[9]. “Eastern Cape and Limpopo have remained among the poorest provinces since 2001. … The Eastern Cape remained the poorest province in 2016, with 12.7% of its households classified as multi-dimensionally poor” (GoSA. StatsSA, 2017, p. 34). This is reflected in the two areas, with low agricultural household incomes, and high youth unemployment rates.

The Amanzi for Food programme activities and IBLN is wholly located in a former homeland region (across these two municipalities) because these are sites of struggle with small-scale farming, water scarcity and poverty where South Africa’s transformation agenda faces both huge opportunities and challenges. Pienaar and Von Fintel (2013) concluded from a study that the “former homeland regions were set up for small-scale intensive farming that had little scope for success” (*ibid,* p. 26). Major commercial activities in the area include citrus and game farming.

The IBLN is also located in the area where the eDikeni Water User Association (WUA) is established wherein lie three sites of importance to the IBLN’s initial activities (now also expanding) namely the Lloyd Village, and Khayalethu and Mpundu villages where the Agricultural Research Council earlier implemented rainwater harvesting demonstration sites (Botha, Van Rensburg, Anderson, Hensley, Macheli, Van Staden, Kundhlande, Groenewald,

[9] South Africa existed as a racially segregated nation between 1948 and the onset of democracy in 1994, with Black people designated to their tribally-drawn semi-autonomous areas called ‘homelands’ or ‘Bantustans’ by the apartheid government.

& Baiphethi, 2003). The eDikeni WUA covers an area demarcated by the boundaries of the Thyume Valley sub-catchment. The significance of this area of operation is that it involves multiple contradictions: such as a major dam (Binfield Park) within a few kilometres of farmers who are struggling with water for farming, the Amathole Mountains which generate significant amounts of relief rain, in the vicinity of much drier areas such as Alice in the rain shadow where Lloyd Village lies (Pesanayi, 2019).

The eDikeni Water Users Association was established in October 2006 bringing together farmers and their farmer cooperatives in Alice, including the Alice Farmers Association with the objective of improving agricultural water (RSA DWA, 2006; eDikeni WUA, 2013). Water User Associations in South Africa were brought into being by the National Water Act (Act 36 of 1998, Republic of South Africa, 1998). The Water Act of 1998 requires each Water Users Association to have a Business Plan in line with the requirements of the Department of Water Affairs' Water User Association Guidelines (RSA DWA, 2006). This requirement was gazetted in 2006 in accordance with the 1998Water Act of South Africa. The eDikeni Water Users Association was formed amid high hopes, which were backed by government legislation that was interpreted by the agriculture community as enabling and supportive of successful small-scale farming (Tregurtha & Vink, 2008).

Local economy: The local area is under-developed as a legacy of apartheid segregation in the former homelands and a perpetuation of the same pattern in the post-apartheid period (Westaway, 2010). The adverse agro-ecological context of the study area may be related to the historical and contemporary poverty and low contribution of agricultural production as shown in Figure 3.1 below.

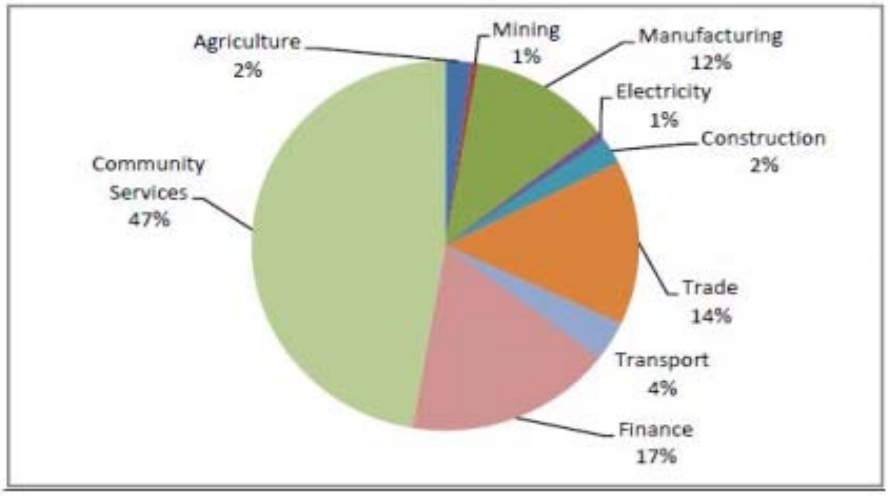


*Figure 3.1. Sectoral production structure of the Amathole District Municipality (ADM) economy, 2010 (*Source: Global Insight 2010 in Amathole District Municipality, 2012, p. 39)

According to the Amathole District Municipality analysis, the contribution of the agricultural sector "has been very minimal in the period from 1996 to 2010" (Amathole District Municipality, 2012, p. 39).

Soils: The soils in the IBLN area vary from clay to sandy loam across the different areas where farmers are coming from into the IBLN. Specifically soils at Lloyd Village garden were

sandy loam meaning they had a poor water holding capacity, while soils at Fort Cox ATI were generally clayey loam meaning they could keep water for longer periods.

Rainfall, water and temperatures: There is distinct variation in the rainfall received in the eastern and western parts of the IBLN area. The rainfall is generally lower in the western side (Alice, Lloyd Village) of the Tyume Valley compared to the eastern side (around Amatole Basin, Fort Cox ATI and Middledrift). Alice has an average annual rainfall of 386 mm (Fort Hare Research Farm, 2001) most of which falls in the summer season (October to March). Sometimes significant winter rains are received but generally very low rainfall is received in winter which is inadequate for most crops. A significant water feature in the area is the Tyume River. It springs in the Hogsback mountain forests that form part of the Amatola Mountains, and runs down the Tyume River Valley. The river then flows through the eastern verge of Alice town, and borders the greater part of the Fort Hare University grounds. Binfield Park Dam near the centre of the valley draws water from Tyume River and is a key reservoir of water for farms in the area, some of the rural settlements along the river valley and Middledrift town further downstream. The river later joins the Keiskamma River on its way to the Indian Ocean. The Keiskamma River's source is in Keiskammahoek and it passes through Fort Cox Agricultural ATI which it supplies with raw irrigation water. The ATI also receives water from Binfield Park Dam. The Seven Stars Dairy farming co-operative in the area supports enterprises such as pasture lands and maize at Keiskammahoek, one of the sites of engagement, is supplied with irrigation water from the Cata and Mnyameni Dams, with the latter also supplying domestic water to the local area and surrounding villages. The irrigation water supply at Keiskammahoek is erratic resulting in water shortages, hence farmers becoming more interested in the Amanzi for Food programme and the ToT. Mqayise village farmers like the rest of the farmers in the Matole Basin operate under a rain-fed farming system.

Average midday temperatures in the area range from 19^{o}C in winter (June) to 29^{o}C in summer (February), while night time temperatures range from 5^{o}C to 16^{o}C. Mqayise village experiences an extended frost season that cuts into October thus making its growing season later than the rest of the IBLN area.

3.3.1.1 Expansion into Buffalo City Metropolitan Municipality

The second phase of the project, in particular the second running of the Training of Trainers course brought in farmers and others from the Buffalo City Metropolitan Municipality (BCMM). This is a large urban-based (East London) municipality, which includes King Williams Town and surrounding small towns (such as Dimbaza to the west and Berlin to the east) and many villages, such as Quzini to the north. The area is therefore more highly populated than the other municipalities, with dense concentrations of people, and less available agricultural land, although there are still tracts of productive land between the settlements. Although there is essentially little difference in the climatological and geological context of the area as compared with the other municipalities, the urban and peri-urban bias has introduced a different dynamic into the IBLN. Central to this is the Zingisa Education Trust, a national NGO with its Eastern Cape office based in Berlin, which trains farmers in agroecology principles and practices. As a result of this many of the new farmers coming into the Training of Trainers course and the IBLN have already gained a quite sophisticated understanding of sustainable agricultural practices, including rainwater harvesting and conservation. They are also quite passionate about the agroecological approach, including the notion of seed sovereignty, where farmers have full control over the seeds they use, and are free to save and share these with others.

This is a critical element in the broader movement towards food sovereignty, a growing area of farmer (and consumer) activism across the SADC region and the continent as a whole, and is part of a global movement. These farmers have therefore taken up a more politically activist and advocacy role than those in the other municipalities, and are linked to national, regional and continental activist groups, such as the Rural Women's Assembly (RWA) and the African Food Sovereignty Alliance (AFSA). This element of activism has imbued the network with a new energy to which most members respond very positively. This energy has also led to a proliferation of productive demonstration sites across the area, with the farmers keen to share their new understandings with family, friends, neighbours and other farmers. Many of the IBLN meetings now take the form of 'ilima' where members come together to develop practices on different farmers' sites which then become productive demonstration sites

3.3.1.2 Fort Cox Agriculture and Forestry Training Institute (FCAFTI) as a learning centre

The FCAFTI is situated right inside the boundaries of the former Ciskei Homeland. It has a mission and cultural-history of networking and community engagement (FCAFTI, 2015). The AFTI was established in 1930 making it one of the historically black public institutions in South Africa. It is endowed with rich historical, cultural and diversified socio-economic and biological heritage. In the early years the ATI provided training only in agriculture until 1969, but from 1970 forestry training was instituted with a Forestry Diploma course. The "New ATI" campus was constructed on land bought from Chief Sandile and officially opened by the Ciskei Government in 1977. Fort Cox ATI was granted autonomy in April 1990 through Decree No 5 of the former Ciskei Government, a status that it has to date. In 1991, the ATI became affiliated to the University of Fort Hare through a Memorandum of Agreement between the Department of Agriculture, Forestry and Rural Development of Ciskei and the University. In 2010 the Fort Cox AFTI curriculum "was reviewed and implemented in line with the industry and socio-economic needs of the country" (FCAFTI, 2015, p. iv). Fort Cox ATI also has a unit dedicated specifically to rural development – the Rural Development Centre – which trains farmers and youth making the ATI a community learning centre.

Fort Cox Agriculture and Forestry Training Institute projected itself and was confirmed by its partners as a learning centre in 3 main ways namely:

- A Centre for training Diploma-level agricultural professionals with graduates profiled mainly as Farmers or Agricultural Professionals, e.g. Agricultural extension officers (Fort Cox AFTI, 2017);
- A Centre for training practicing smallholder farmers and youth through its Rural Development Centre (RDC);
- A Centre for engaging with and learning from farmers' contexts and needs as co learners and co-educators, and for trying out farmer-relevant innovations in water harvesting and conservation, locally adaptive seed and value chains / markets for their preferred cropping systems.

3.3.2 A centre for training diploma-level agricultural professionals

Fort Cox AFTI offers two diploma-level courses in Agriculture (Crop Production, and Animal Production or Agribusiness options) and Forestry at NQF level 6. Through the Competence-based Learning initiative supported by the Transformation of ATIs of Agriculture into

Agricultural Training Institutes (TACATI) project, Fort Cox AFTI is now working towards raising the level of its courses to meet the requirements of NQF Level 7 in order to comply with the requirements of the Norms and Standards of ATIs (RSA.DAFF, 2015[10]). Fort Cox AFTI profiled its graduates as essentially farmers, with the capability to perform as a professional agribusiness person or extension advisor. The AFTI recently conducted a curriculum review and Rhodes University's ELRC serve as a member of the Fort Cox AFTI Advisory Board, along with other members of the IBLN. The process of curriculum review has been ongoing, and in early 2020 the Rhodes University team, together with members of the IBLN undertook a substantial workshop on curriculum innovation with the AFTI to consider the alignment with the curriculum with farmers' and stakeholder needs, and options for new qualifications development.

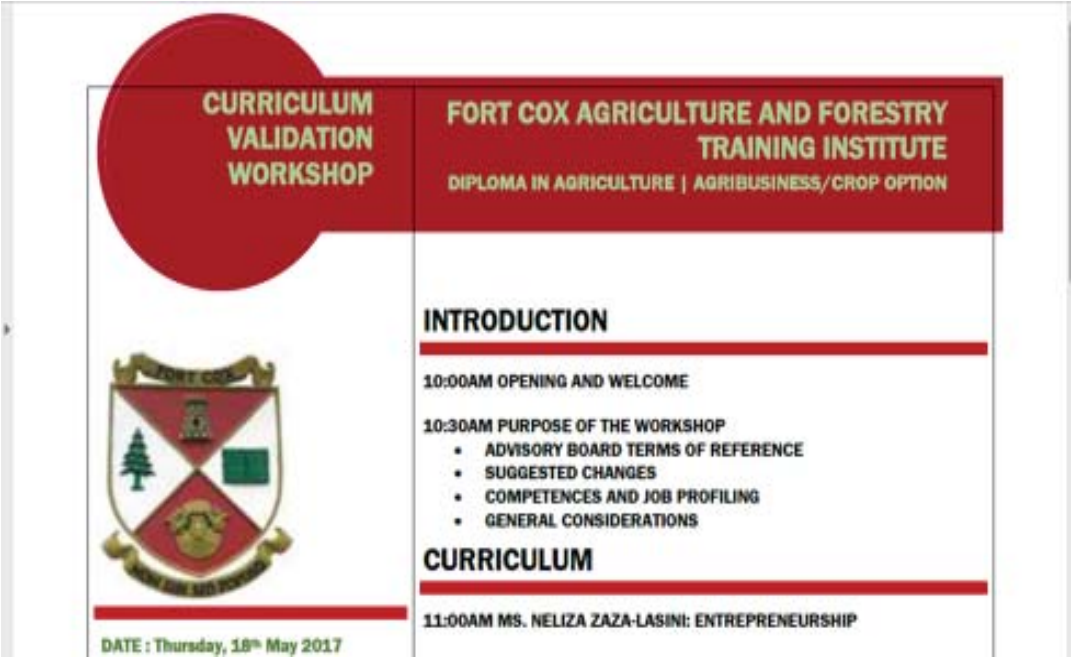


Figure3.2. Curriculum Validation Workshop programme at Fort Cox AFTI

The Fort Cox AFTI is also a centre for training smallholder farmers and youth through AgriSETA-accredited courses offered either on demand by farmers or organized by the Department of Agriculture or other organisations. There is potential for these courses to integrate rainwater harvesting and some progress was made in this direction during the first phase of the Amanzi for Food programme, but work is still continuing on integrating RWH&C into the ATI's curriculum during the current curriculum renewal cycle. The Rural Development Centre trainers indicated a desire to use the existing Amanzi for Food demonstration sites to take their learners for practical learning visits and in this project period (2017-2021) an expanded number of Fort Cox ATI Lecturers have participated in the Amanzi for Food ToT,

[10] RSA.DAFF. (2015). Norms and standards for the Agricultural Training institutes of South Africa. Pretoria: DAFF. Retrieved on July 23, 2016 from http://www.nda.agric.za/doaDev/sideMenu/SectoralATIs/docs/ITCAFF%20final%2001_10_15%20norms%2 0content.pdf

expanding the number of lecturers at the ATI who have knowledge of RWH&C and also their engagement with the productive demonstration sites development within the IBLN.

The AFTI has embarked on a curriculum review cycle, and Prof Lotz-Sisitka attended the inaugural meeting of the external stakeholder committee, which included a number of the members of the IBLN. Prof Lotz-Sisitka was appointed Chair of this committee, and has continued to engage with the AFTI Staff on new curriculum innovations. This is a strong testimony to the strength of the relationship between the ATI and the IBLN. Another such example of the established strength of the relationship between Fort Cox ATI and the other members of the IBLN was evidenced by the invitation issued by the ATI for IBLN members to attend the 2019 Graduation ceremony. Several IBLN members donned their gowns, joined the academic procession and witnessed the graduation, seated amongst ATI teaching staff on the stage.

3.3.3 A centre for engaging with and learning from farmers' contexts and needs as co-learners and co-educators

A community engagement function exists as a formal mandate and has been enhanced with plans for 'Work Integrated Learning' (Fort Cox AFTI, 2017[11]) where students will be expected in the new curriculum to learn and perform work under the supervision of farmers. The Fort Cox AFTI also works with farmers to conduct students' controlled experiments in the farmers' fields, where the produce remains with the farmer.

Fort Cox AFTI was elected by their learning network partners in 2016 to coordinate the Imvotho Bubomi Learning Network (IBLN) and continues to do so through a committee that includes farmer representatives.

Some lecturers at Fort Cox AFTI continue to make use of farmers' demonstration sites for students learning, with "farmers acting as co-educators" (N. Makhaga, personal communication, May 9, 2017) in the mediation of learning. Evidence is also emerging that the Amanzi for Food Training of Trainers programme is providing extended interactions and networking opportunities for ATI Lecturers to interact with farmers and others in the smallholder farming value chain.

3.3.4 Educator/Learning Facilitators Knowledge of RWH&C Practices

In the first phase of the Amanzi for Food programme it was revealed that few lecturers had extensive knowledge of RWH&C at the Fort Cox AFTI. The first phase of the Amanzi for Food programme also showed that those who had participated in the programme had extensively expanded their knowledge of RWH&C and that they had also actualised this knowledge in practice through active participation in the co-development of productive demonstration sites (Lotz-Sisitka et al., 2016). Three of the lecturers that were most engaged with the Amanzi for

[11] Fort Cox AFTI. (2017). Summary of Major Changes to the curriculum (second page, unnumbered), In *Fort Cox Agriculture and Training Institute Curriculum Validation Workshop: Crop and Agribusiness Option INFO Pack*, 18 May 2017.

Food programme in Phase 1 of the programme have been co-leading much of the training in this project period (2017-2021) and have accompanied the Rhodes University team to the University of Mpumalanga to co-facilitate sessions on RWH&C with the emerging Mpumalanga Learning Network. Evaluation scores from the course sessions where the lecturers from Fort Cox ATI have presented have been high (98% and 96%), showing that peers in other universities and extension training contexts are recognising their expertise in this area (which if tracked back to the start of the Phase 1 programme, was not there). This is a very important finding for the Amanzi for Food programme, as it shows the beginning of the potential for ATI-to-ATI Learning Network interactions and co-learning. Unfortunately the plans for upscaling the ATI-to-ATI Learning Network interactions in 2020 were curtailed by the COVID-19 pandemic travel restrictions. Their expertise added a lot of validity to the training offered in the University of Mpumalanga context, especially the reporting on the co-development of the productive demonstration sites, and the scope of RWH&C practices tried out, as well as their references to the use of the WRC material in their teaching.

Of interest to this phase of the Amanzi for Food programme is that a number of new lecturers, also from the ATI, joined into the Amanzi for Food ToT course, as have some lecturers and students from the nearby University of Fort Hare. New extension officers from the area also joined the ToT programme in Phase 2. Lecturers also encouraged some of their students to participate in the Amanzi for Food ToT programme. We therefore focused in on these new ATI lecturer's and extension agents' knowledge as well as the students' knowledge and interests in RWH&C knowledge in this phase of the contextual profiling. Note: Names are pseudonyms.

3.3.5 Reasons for interest in Amanzi for Food Training of Trainers (ToT) course

Some of the reasons provided by ATI lecturers, extension officers and students for joining the Amanzi for Food ToT course also provide insight into the knowledge needs and context as follows:

- **Student at Fort Cox (2nd year crop production):** "I want to acquire more knowledge on water and soil management to help with water and soil conservation module" … "I also want to meet new people, to take this knowledge with me to Gauteng where there is little knowledge about rainwater harvesting and soil management". … "I am here because there have been water problems on campus, and in Gauteng we have access to water but this water is often incredibly dirty."

- **Lecturer at University of Fort Hare:** "I have done the previous Amanzi for Food ToT course, this one seems interesting because there are more resources and I want to learn more on this one, e.g. grey water harvesting [referring to the wider range of WRC books in the Phase 2 training]"… "I am developing a better understanding of managing the little water resources available for agricultural production" …"I have observed farmers experiencing water problems in the Amathole region due to climate conditions"… "I have received support from Amanzi for Food and IBLN to work with farmers to build small dams" … "In this programme there are more options for farmers to alleviate water problem – I expect to implement more of these after this course"

- **Lecturer at Fort Cox AFTI:** "I am on the Amanzi for Food ToT because I want to get more insights for the soil and water course that I am lecturing" … "I expect to get more capacity on water innovations"… "The Water for Food problems I am responding to are

the practice mismatches between curriculum and agricultural activity and practice – this is of concern to me and a challenge hampering student learning and development".

• **Training Officer (Extension Services):** "I need to get more knowledge and ideas on RWH&C to share with farmers"… "Due to low rainfall quantities, farmers are currently facing challenges, crops are losing market value"… "I want to assist farmers to gain more practical methods from the training that I have received".

• **Agro-Ecology Trainer:** "I want to know more about rainwater harvesting" … "I have seen farmers struggling with crop failure, death of livestock and salty water from the drought"… "I want to support more sustainable production amongst farmers that I work with".

• **Extension officer:** "I want to support farmers to harvest water, and how to irrigate without wasting water"…. "There is a scarcity of water due to the drought, which has affected cropping in the Raymond Mhlaba area".

• **Fort Cox AFTI Student, 2nd year crop sciences.** "I want to do this training as it will benefit the community and will equip me personally to help people with water conservation"…. "I have noticed inappropriate farming practices, climate conditions and irrigation methods that are creating water problems for farmers".

In the section below, we share four emerging profiles of new lecturers/extension agents/students in training to become farmers or extension agents. The contextual profiling (see the Profiles below) shows interesting dimensions of the 'status' of RWH&C knowledge in the ATI at the start of this project period of the Amanzi for Food programme (in 2017/18), most notably:

• That earlier phase (201-2016) phase of the Amanzi for Food programme has had an impact not only on the knowledge of RWH&C in the ATI and how it is circulating, but also on the practice and an increased emphasis on practicals in learning; and an increased emphasis on interactions with farmers, with the Amanzi for Food training of trainers creating more opportunities for Lecturers to interact with farmers and form new partnerships;

• That new lecturers entering the Amanzi for Food programme are more able to 'pick up' the knowledge due to the emerging knowledge infrastructure and previous knowledge practices that were developed during the earlier phase of the Amanzi for Food programme;

• That lecturers from a wider range of departments are getting interested in the RWH&C knowledge and practices, also seeing potential to develop these more systemically across the ATI, not only as methods but also as ATI Sustainability Practices;

• That lecturers and students are able to identify gaps for further learning especially – as can be seen below – related to more complex RWH&C practices such as grey water management.

3.3.6 Emerging profiles

LECTURER 1, Fort Cox AFTI: Ms N (a pseudonym) is a lecturer at Forty Cox AFTI. She explains that the AFTI's main partner organisations are the Department of Agriculture, Forestry and Fisheries, the Department of Energy, Fort Hare University and small-scale farmers and

that Fort Cox AFTI is funded by the Department of Agriculture, Forestry and Fisheries (DAFF). Policies governing the institution include government policies, and the AFTI Prospectus which contains the AFTI rules and regulations. The institution is governed by government policies on labour. Learning programs that the AFTI offers includes a Diploma in Agribusiness, Crop Production and Animal Science and a Diploma in Forestry.

The physical resources used by the institution are classrooms, laboratories and a farm. Most practicals are done on the farm. The total available farm area is 750 hectares, they have 2 laboratories (2 huge rooms that can take up to 100 students), and 3 small laboratories that can take up to 35 students. Her class does practicals, presentations, assessments and lectures. Activities conducted include planting, irrigation, animal rearing and slaughtering of livestock. The demonstration site is just 30 minutes' walk from campus. Describing the roles and responsibilities of the learners Ms Mrs N said that they have students grouped in sectors and that they allocate them land in groups of four; "we do our part on demonstration and then they run the practical on their own", she said. She said further "Among the students are those that are involved in group discussions and those that get away with doing nothing, and there is nothing that can be done about it except when giving individual marks", pointing to some aspects of learner apathy and disinterest.

Profile of water related programmes at the organisation/institution: The curriculum covers soil and water conservation practises where different types of rainwater harvesting, and conservation techniques are discussed, some of the rainwater harvesting and conservation techniques covered include roof top rainwater harvesting and harvesting rainwater in a pond. She notes that "For water that is used for bathing by students, there is still more that can be done. The ATI can harvest the water that the students use to bath and use it on the farm" (i.e. they can implement a greywater harvesting and management system). She explains that this will decrease water usage as only little amounts will be used for drinking.

With regards to her knowledge of RWH&C, Ms N said the Amanzi for Food training enhanced her knowledge on RWH&C. Her students have been using the Water Research Commission material and these are in the Fort Cox library. The demonstration sites and YouTube videos developed in Phase 1, are also used to share knowledge. She says "We watch and discuss the video, and that becomes part of the assessment. We also go to the farmers' areas and construct the techniques we know", showing ongoing engagement with the project following the Phase 1 activities that were started by other lecturers. This has created a better 'starting point' for her to learn more about RWH&C for her own teaching.

Network partner mapping relationship and communications mapping: She explains that at Fort Cox AFTI, they work with small-scale farmers some in groups and some not in groups. She said the farmers who were present at the Eastern Cape, Amanzi for Food ToT course are the ones they work with. The farmers come from Alice, Berlin, Amathole Basin, Middledrift, Keiskammahoek and Quzini and surrounding areas. The Amanzi for Food ToT is giving them more opportunity to meet with and learn with the farmers from these areas. Mrs N said she interacts with the farmers once a month or more specifically when the Department of Agriculture rolls out a program with them. The interaction with farmers when the Department of Agriculture is there depends on the length of the programme.

LECTURER 2, Fort Cox AFTI: Mr M (a pseudonym) is a Lecturer at the AFTI, in the Forestry Department. He notes that the vision of the AFTI is to be the leading centre of learning for

Sustainable Agriculture and Forestry in Southern Africa. The mission is to provide quality education in agriculture and forestry and enhanced applied research and community outreach.

The institution's stakeholders are students, farmers, extension officers, government departments and private industries. Partner organisations of the AFTI include the Department of Rural Development and Land Reform, Amatole Forestry Company, DAAF, The national and regional office, SAFCON and AGRISETA. The institution is funded by DRDAAR regional. Policies influencing the institution include the Council for Higher Education Policy and SAQA. In designing the curriculum, the institution takes into consideration the needs of the industry. He notes that most of the graduates from Fort Cox get employed easily. The AFTI curriculum covers NQF Level 6 and it also offers a Diploma in Forestry NQF Level 6, Agriculture is structured into agri-business, crop production and animal production. The curriculum is reviewed every 5 years, and every 3 years internal review is undertaken. He reports that the AFTI adopts an educational/training approach – that is more practical, and less theory based. He reports that the following structures are used for demonstrations;

- Farm – more than 1000 ha
- Plot
- Commercial farms outside Fort Cox
- Nursery
- Agro forestry plot
- Agro-forestry
- Commercial farms that include dairy farms at Fort Hare, and Port Alfred, etc.

Activities conducted at the demonstration sites are practical and they are aimed at supporting the curriculum and agriculture practices for food production including sales which generates money for the AFTI. He reports some challenges with the demonstration sites and notes that the demonstration site is working well but some years they experience drought and shortage of resources and water shortages affect agricultural productivity. He notes that the AFTI should prioritise teaching and learning more than production, because the core business is teaching and learning instead of production for profit.

Profile of water related programmes at the organisation/institution: The AFTI uses an open pond which is feeding the farm with irrigation water (note that this pond was established during Phase 1 of the Amanzi for Food programme). Water related subjects are covered in the textbooks and online material. He notes that they recently received WRC material from the Imvotho Bubomi Learning Network which are very useful. He said that the interest has shifted in the way that the AFTI is teaching; "we are focusing on more practical and less theory". Students are being trained to value practical more than theory which is working better. Other assessment methods used include tests, presentations, exams and these are used for evaluation. Mr M said that rainwater harvesting and conservation is not covered adequately, as it only covers the different methods of harvesting rainwater; and it could be broadened to be more system based and address water issues more broadly on the campus. As a recommendation, Mr M said the institution must try and integrate curriculum and farm practices and what happens in the farm should be integrated with what happens in the class.

With regards to sources of information, Mr M noted that they use research, online material, information from other experts, textbooks, guest lectures. They get new information from conferences, networks, research, library, other publications such as newspapers and journals.

He uses learning resources such as presentations, YouTube videos, notices, and other ways of complimenting mainstream lecturing practises. The AFTI works with forestry companies and local communities from the villages around Amatole and Middledrift areas, where they do community outreach and demonstrations; “We opted for those that are near for distance purposes and monitory value”, Mr M said. “We do visit local farmers around, we have practical with them every Wednesday. We have formal partnerships and annual planning that we hold with them”, he added.

Professional partnerships. He noted that to form professional partnerships, they use MoUs. The AFTI gets funding from DRDARR, others are partnerships are with prospective employers for their graduates. The AFTI also manages an internship program for unemployed graduates for work-based learning to equip them for work environments. The rural development centre offers NQF level 5 programmes for farmers. He has undertaken quite a lot of training, including a Postgraduate Diploma from Fort Hare, ToT course modules, and he is now also doing the Amanzi for Food Training of Trainers’ course with Rhodes University on rainwater harvesting and conservation. With regards to sources of information he mentioned radio programs at Fort Hare ATI, also news bulletins that come every month-end that are published by the AFTI, the Farmers Weekly magazine and WhatsApp groups, including the IBLN WhatsApp group.

Learner’s profile: He noted that the age of learners at the AFTI is mainly between 18-30 years, and is a mixture of males and females. He notes that the ATI has a gender policy but that it is not being fully followed. There more males than females. Entry requirements are that they should have English level three and Level 4. The language of learning is English but the home language of almost all of the students is isiXhosa.

STUDENT, Fort Cox AFTI: Indicating the extent to which RWH&C knowledge is permeating the curriculum (note that at the start of the Amanzi for Food programme very little such knowledge was included in the curriculum), Ms L (a pseudonym), a third year crop production student says “Yes, I am exposed to water-related courses, namely soil and water conservation and horticulture, we are taught to use drip irrigation which saves water, how to make trench beds, techniques to save water and to prevent soil erosion and to conserve moisture in the soil”. She goes on to say “We did a project on grey water use and we used different types of soap, we were testing for quality of water to see which ones produce more yields, which has more nutrients”. We were also taught how to make trench beds, and how to install drip irrigation”.

She goes to say “Yes, it [the curriculum] covers everything on rainwater harvesting. It is just that people are not willing to use grey water because they say it's dirty and has pathogens, so it is something that needs to be looked at to see if the water is safe to water crops … The information on rainwater harvesting can be used to save water”. She expressed satisfaction with the course, noting “The course fully equips me with information to be an extension worker, I would be able to share relevant information to harvest and store rainwater with the farmers” but she also had recommendations for improvement, “more practicals should be included in the curriculum, as people are not practising what they learn in class”.

LECTURER 3, University of Fort Hare: Mr K (a pseudonym) works in the Department of Agronomy, and he has been there for 4 years. He teaches mostly agricultural engineering and water-related courses. The University of Fort Hare (UFH) is a formally constituted Higher Education Institution with a long history of being committed to teaching and learning. Its

stakeholders comprise of students, researchers, extension officers and the Department of Agriculture, Forestry and Fisheries. Their partner organisations include the Department of Agriculture, Forestry and Fisheries (national and provincial DRDAAR), Department of Water and Sanitation, Non-governmental organisations, and the Agricultural Research Council. Through the Amanzi for Food programme they also see the WRC as their partner organisation. The University is funded by the government via subsidies and the policies governing the institution's operations also come mostly from the government and the University Senate. The institution is influenced by the market for instance, Mr K said; "when we train the students we train them for the market which is the agricultural sector and this has an impact on what we do here".

He reports that they have a research farm with irrigation and reservoir dams and state of the art equipment, i.e. centre pivot irrigation, so for the practical we take them to the farm for demonstrations. There are different experiments that are done in the research farm, "… I take them so that they can appreciate the irrigation equipment that we use, but also demonstrate things like infiltration". The farm is located close by the main gate, it's about 3-4 kilometres from the main gate. He notes further "We have somebody running his experiments on the demonstration sites as well. We can do a lot more in terms of exposing students to practical experience and there is need to use it more for demonstrating different techniques, I think we are not that coordinated in terms of the use of the farm, i.e. people come with different agendas, some to conduct experiments, etc., there is no proper coordination of the different activities at the demonstration site. Improved teamwork, i.e. that's a thing that is lacking". Additionally, Mr K said that the current curriculum is not well coordinated the way that it has been carried out. He proposed that if students can be involved in setting up the experiments for example they would benefit a lot from that. Furthermore, he noted that in general the syllabus is meant mainly for commercial farmers, it doesn't address smallholder farmers' needs. The curriculum should thus include smallholder farmers. This, he said was becomes "Some of the farmers who graduate will work with smallholder farmers, but they will not be well positioned to advise the smallholder farmers, and there is therefore a need to address that gap". He felt strongly that there was need to relook at the curriculum, to include RWH&C, and to therefore include all the stakeholders coming in, and "… they should have a voice in terms of what we teach here". This was the main reason why he joined the Amanzi for Food Training of Trainers programme.

He noted that "We are not that much covering a lot of rainwater harvesting techniques, and so we are just using what is available in terms of the dams, etc." He commented, that until now at the University of Fort Hare, the "The WRC material are just lying idle, they are not being fully utilised. It's something that needs to be infused into the curriculum", said Mr K. He said that they also need to use videos, and "… it's something that we are being encouraged to use in teaching. I do use videos in teaching. Normally I would use them as a practical, due to limitations to resources, videos thus demonstrate what you may not be able to show at the demonstration site".

Mr K said he has been working mostly with farmers in the Lloyd village, especially those that were part of the Amanzi for Food programme in Phase 1. "The farmers needed assistance on water knowledge and we worked with them to provide this knowledge". He went on to say "I have tried to meet the farmers every quarter of the year, the interactions are meant to share knowledge, and try and improve the productivity of those farmers. Farmers have some practices that they do, that we also benefit from those interactions".

These profiles confirm other sources of data that show that due to the history of privileging mainstream commercial agriculture, agricultural education in South Africa continues to exclude a focus on RWH&C and the smallholder farmer and household food producers. The situation, as noted above, however, is also changing as agricultural educators develop greater insight into, and empathy with the plight of the smallholder farmer, and realise the importance of supporting them with adequate and relevant knowledge and praxis.

3.3.7 Farmers' reasons for undertaking the ToT Course and their knowledge of RWH&C practices

The farmers who undertook the ToT course and who join the Imvothu Bubomi Learning Network are mainly smallholder farmers. The following quotes indicate their interest and the reasons why they joined the Amanzi for Food ToT programme and the IBLN:

• **Farmer:** Enrolled for the Amanzi for Food ToT course because she is "intending to save water" and "wants to know more about saving water".
• **Farmer:** Enrolled for the Amanzi for Food ToT due to difficulties with water. She says "We use tap waters which contain chemicals. Dams and rivers are polluted. Communities use them for dumping and they are no longer respected. We regularly have water cut offs. We have not received support for RWH&C before".
• **Youth Farmer:** "Water is very scarce at my village but we have some on the site where we are growing our vegetables. We have never had support on RWH&C before".
• **Farmer:** "At Lloyd Community we suffer a lot from getting water to our plants especially as small-scale farmers. We bring water from the taps and we don't get to save water".
• **Farmer:** "In my village I do have enough water, but we have to pay for it. The problem we are having is that to get a water licence we have to pay, also for water pumps and diesel which is expensive. I would like to have visible water harvesting practices in my garden".
• **Farmer:** "We suffer from water cut offs".
• **Farmer:** "We have low rainfall and currently we don't know the methods of cultivating with rain water … I want to learn more about RWH techniques to more effectively harvest water".
• **Farmer:** "We have a shortage of water supply dams. Some farmlands are miles away from water sources; water collected is not enough to last for producing viable vegetable crops; some people do not have containers to collect sufficient water. We need more knowledge of how to use different methods for rainwater harvesting".
• **Farmer:** "We are suffering from water scarcity. The water we are using is treated with chemicals, and the flow is also not consistent to the villages due to illegal connections and leakages. We have only had some support of a few Jojo tanks from the DWA".

Most of the farmers in the area who are involved in the IBLN are working plots between 0.5 and 2.5 hectares. We undertook some in-depth interviews with some of the farmers, to obtain more insight into their practices and their sources of information and current engagement with RWH&C knowledge. The following six Farmers' Profiles provide further insight into the detail of some of the Farmers' experiences and practices in the IBLN context. Their profiles also give some insight into the different types of farmers that are involved in the IBLN: youth farmer just starting out (Farmer 1); mid-career farmer (Farmer 2); youthful pensioner farmer (Farmer 3) and Co-operative farmer (Farmer 4). (NOTE: This is not a comprehensive scoping of all farmers, but rather focused interviews with a range of different types of farmers. Names are pseudonyms).

FARMER 1 – YOUTH FARMER: Mr S (a pseudonym) is a young small-scale farmer from Keiskammahoek with an interest in developing farming as an occupation. He says he is involved in subsistence farming for his family to eat fresh vegetables, and he has been involved in farming since last year when he started to practise what he was taught at university (after he finished university). Other projects that he is involved in include a piggery, and chicken farming with emphasis on egg production. Mr S said he grew up on a farm and was motivated to go into farming by his family members; "I have never been about the town life, I always liked seeing the fruits of my work, that is to watch crops growing from seedlings to big plants". He said agriculture is contributing immensely to his household income as he is not buying food stuff such as spinach and cabbages but relies on his garden produce. Mr S says farming relieves expenditure for food, "that is the amount we would put towards food". Besides being involved in small-scale farming, he is unemployed and does part time jobs on the side. He says he drives a taxi from King William's town to Cape Town sometimes. He works alone and has a registered company.

Farm size and scale: His farm is one hectare in size, and he is growing spinach, tomatoes and beetroot, and yellow maize, sweet beans, beetroot, spinach, cabbage, and butternut. He has mixed different crops in one area and he is rotating the crops.

Sources of seeds: He buys seedlings from King William's Town and the variety of the seedlings that he is currently growing include yellow maize. He sometimes swaps his farm produce with a friend for instance, he would take onion seedlings from him, and give him a bundle of spinach in return.

Sources of information: Mr S's main source of information on farming is from a degree that he completed at Fort Hare. "I did crop production and agronomy, soil science, those courses shaped the knowledge that I have on farming". Another key source of information for him is magazines, especially the Farmers Weekly.

Sources of information on water use and supply: Mr S says he is practising rainwater harvesting using a JoJo tank; "I harvest water from the roof using gutters which I then use that water to irrigate, and when that water is used up that's when I use the water from the tap". Mr S says he is now also using mulching, he says he has realised that the bed with mulch grows much faster than the one without mulch. He also mentioned that he did not know a lot about rainwater harvesting before, but that the knowledge he has and is now using on rainwater harvesting he got from the Amanzi for Food ToT course (which he has been attending). Mr S said he also knows *gelesha* practices, from his father who used to do the practice.

FARMER 2 – MID-CAREER FARMER: Mr D (a pseudonym) is a semi-commercial farmer from Hogsback, aged 38. His dependents are still young and at school. He does farming part-time and he is also collaborating with another farmer. Other projects that he is involved in include selling wood chippings. He is the only one who is currently involved in farming in his family, and this year it's his 10th year of doing farming. His motivation to go into farming comes from his family background, "I was born and bred on the farm. And working with my brothers on the farm gave me the motivation to go into farming". His reasons for farming are so that he can provide food at a reasonable price, and so that everyone can have access to food. He says he was lucky to get mentorship from a farmer that he is working with. "At the moment we are working on a project for livestock and cash crops and a poultry project on a commercial scale". Mr D says he used to work as a firefighter, and besides farming he is doing network

farming. He is practising farming, so he can add on to the economy of South Africa because agriculture is one of the top two sectors that contribute to the economy of South Africa. He mentioned that he is also working within a company called the Amazing Forestry Project.

Farm scale and practices: His farm is semi-commercial, and he is using 150 hectares of land to grow vegetables. He sells his produce in Cathcart, Queenstown and to supermarkets. He is growing potatoes, cabbages, spinach, apples, pear and different types of vegetables.

Farmer knowledge and information on water use and supply: Mr D says he is not facing any problems with water access, as he gets his water from the dam. He mentioned that their dam level is low and so he is practising rainwater harvesting so he can get water to use for his plants. He says he collects water from the dam and channels it to his field. He mentioned that he is aware of different methods of harvesting rainwater and is currently working on sourcing a tank to harvest rainwater.

Sources of seeds: Mr D says he does not buy many seeds, as he produces his own seeds from seed saving approaches. Some of the seeds he buys from different people who are running nurseries, an example he gave is in Alice where there is a nursery, and that he is trying to support the ladies who sell the seedlings by buying from them.

Sources of information on water use and supply: Mr D mentioned that most of the knowledge he has on water he got from the Amanzi for Food training of trainers course and he also get some of his information from the internet and other farmers. The most popular source of information are pamphlets and magazines. He acquired his original knowledge on rainwater harvesting and conservation from the University of Fort Hare but mentioned that he has more knowledge now after the Amanzi for Food training.

Challenges faced: The challenges he is facing in his farming practice include lack of financial and non-financial skills. Another difficulty he is facing is access to funds from the government. Thus, lack of funding is the biggest challenge he is currently facing in his farming practice. He is getting some help from a friend who is a commercial farmer who is supporting his farm production.

FARMER 3 – EARLY PENSIONER FARMER: Ms E (a pseudonym) is a 56-year-old full-time farmer from Amatole basin. She does not have any other job other than farming. She is married to Mr D who is 65 years old, and they are both involved in farming, and also draw pensions from their previous work in nursing and local government. She started farming in 2011 and before that she was a nurse educator, from where she learnt that prevention is better than cure and that is what she has been instilling in her children. Ms E said that as a child she never used to see her parents buying food stuff, as they used to produce their own food such as maize. But when she stopped nursing she started doing farming exclusively. Farming is now contributing a lot towards her household income as she relies mainly on farming for her food. She is rearing free range chickens and buys the rest of the food that she is not producing. Ms E also grows and sells Moringa.

Farm size and scale: Ms E farms on a local commercial level, the size of her farm is 2.5 hectares. She also has a homestead garden where she is planting maize for family consumption. She said she sells the produce from her homestead garden and generates income from the garden. The herbs and vegetables that she is growing are OPV maize, vegetables, lettuce, cauliflower, kale, spinach, broccoli, yarrow, marigold, thyme, fennel, fruit

trees, guava, peaches, apple and a lot of other herbs. Ms E says she has a passion for working the soil and trying to prevent the wrongs done by the commercial farmers on the soils.

Sources of seeds: Her sources of seeds are heirloom, traditional and organic seeds. She is also involved in seed saving.

Farmer knowledge and information on water use and supply: Ms E says she gets water for farming from the river and it's difficult because it's in a steep area. She says currently it's the rainy season and they are getting a lot of water from the rains. The river does not run dry and it's always flowing. She mentioned that they used to get water from the municipality to fill their JoJo tanks, but the municipality has stopped giving them water. "We do not have a good watering system, if we had a good water system we could even go commercial", said Ms E. Ms E said due to water challenges she is now only growing maize which is rain-fed; "If we had water or irrigation, we would be planting vegetables as well", said Ms E. She also mentioned that she is harvesting rainwater from the rooftop and she is also using trench beds to divert water into her garden.

Sources of seeds: Ms E says she is buying seeds from living seeds in Jo'burg and she also shares seeds from her own seed saving with other farmers, "I do sell to other community members and to the hawkers in Alice and I also give to the poor, the church and to my relatives", said Ms E.

Sources of information on water use and supply: Her sources of information are workshops conducted by NGOs, the farmers' association, the IBLN, other organisations, reading and the internet. Ms E says she gets information on water also from these sources and is currently not facing any challenges with accessing information. Radio and WhatsApp are the most popular source of information. The radio programmes where she accesses information on farming are Forte FM and Umhlobo Wenene. She gets information on JoJo tanks, underground storage, swells, and rainwater harvesting and conservation techniques from the ToT course and the IBLN. Ms E said the ToT courses are important in that learners do practicals and this helps them to practise these methods in their own homestead gardens. She said the community members where she stays are not keen on farming. She joined the IBLN through a radio programme, and is now doing the Amanzi for Food ToT programme.

FARMER 4 – CO-OPERATIVE FARMER. Mr B (a pseudonym) is a 36-year-old farmer from Lenye village. He comes from a household of 5 people comprising 3 females and 2 males. There is no one with a disability in his household so there is no disability grant income. Everyone in the household is dependent on Mr B and he is the only one who is employed. He, together with his household, rely on farming activity for economic contribution and they get a small contribution from other skills, such as electrical and ceiling work. The name of the area where he farms is called Lenye village and he himself is a full-time farmer. No one else in the family does farming. He started farming in 2008 to help the Sdala Ukukhanya Co-operative. The youth cooperative Mr B is part of, seeks to open opportunities for youths so that they can be independent. The cooperative also capacitates old people so that they can support their homes. The aim of the cooperative is to create opportunities for community members in Lenye, neighbouring villages, people from Amathole basin and people from Qoboqobo and they are about 300 people in total. The youth's cooperative members meet twice a month and they also have quarterly meetings where they can quickly inform, reprimand and remind each other of progress made.

Mr B says he is involved in crop farming and is also part of the Lenye Youth Cooperative where there are growing mixed vegetables namely, chillies, mealies and cabbages. Sdala Ukukhanya is a primary cooperative of the Zanyokwe Irrigation Scheme which is a secondary co-operative. The scheme leases them tractors. Their other partners are Rance Timbers. He says “We have land and water and they have inputs and we share 50:50”. Challenges that they are facing in working within the cooperative are lack of collaboration/good working relationships. Some of the advantages that they have in working as a cooperative is that they get access to funding and more land easily and they can share responsibility. Sdala Ukukhanya cooperative members received training on agriculture from the department of Agriculture and the ECRDA, during the time of the ASGISA policy. The training equipped them with knowledge on farming and the use of chemical fertilisers.

Farm size and scale: The Sdala Ukukhanya farm comprises 10 hectares for chillies and 11 hectares for mealies. They also grow potatoes, butternut, pumpkin and beetroot. They buy their fertilizers, chemicals, herbicides, fungicide from Rance Timbers. The produce from the farm is sold and the profit is used to pay off expenses to help the community.

Farmer communication: They get information on farming from google (the internet), talking with others, sharing knowledge as farmers. They also use Facebook during harvest season or when someone is curious about the co-operative or employment.

FARMER(S) 5 – YOUTH CO-OPERATIVE: A dynamic young farmers’ cooperative operates in Mxumbu village near Middledrift. These young farmers are deeply committed to farming as an entrepreneurial activity and have a strong focus on farming commercially. They are also moving towards the use of solely agroecological practices and are keen to experiment with a range of different practices. Although they have only been actively farming for two years (at time of writing) they have already demonstrated considerably ability and innovation in how they grow their crops, which include all the staples, but also include herbs and plants such as marigold and nasturtium to repel pests, and watermelon.

They manage both a number of homestead gardens, totalling some 2 ha, and a 14 ha field of which just 2 ha was planted towards the end of 2018 once fencing material had been secured and erected. They also, as with other IBLN members are linked to the WRC Climate Smart Agriculture (CSA) project (K5/2719/4) led by the Mahlathini Development Foundation from Pietermaritzburg, and are implementing practices introduced by this project which complement the practices that they have been learning and implementing from the Amanzi for Food Project.

In addition to being extremely active in developing their own skills in food production, and learning about a wide range of sustainable agricultural practices, they are highly committed to sharing their knowledge with others, especially other youth groups in surrounding communities. They have established a flourishing outreach and training component and have been commissioned to run training for a number of different communities, including some near Lady Frere, some 50km distant. The Amanzi for Food programme has been supporting them with the WRC Training Material which they are using in their training with communities. We have also been supporting them with field-based facilitation support.

Their energetic and resourceful leader is adept at forming partnerships with NGOs and government departments, in order to access the resources and equipment the group needs,

and the group is therefore linked to a number of different networks in addition to the IBLN. They took the lead in hosting a 2018 World Food Day event in their village, which was attended by many NGOs and CBO, including the African Centre for Biodiversity (ACB), and members of the Rural Women's Assembly (RWA). This event included a visit to their field, where participants assisted in sowing maize, bean and pumpkin seeds.

For some time now, they have been selling produce to neighbours, and to a few commercial outlets. In addition to selling the vegetables themselves, they also produce seeds, in particular onion seeds, which they also sell commercially.

Figure 3.3. Carrots produced from a raised bed by the Mxumbu Youth Cooperative

FARMER 6 – HOMESTEAD GARDENER: Ms F (a pseudonym) manages a homestead garden of approximately 900 m² in Quzini. The garden is packed with produce grown using a wide range of different practices, some learned through Zingisa, others through Amanzi for Food, and the most recent through the WRC Climate Smart Agriculture project (a sister WRC project). Ms F grows beetroot, spinach, lettuce (different varieties), cabbage, onion, broccoli, cauliflower, beans, pumpkin, butternut, eggplant, potatoes, parsley, thyme, rocket, wormwood, garlic, white clover, mint, lemongrass, comfrey, strawberries, and also fruit including apple, avocado, orange, fig, peach, and bananas. In addition, she raises goats, pigs and chicken. According to her she rarely has to buy any food, and in fact runs a soup kitchen for elderly residents, making the soups from her own produce. She does not have any commercial aspirations, but rather wants to share with her family and others in her community. Ms F also loves to share her knowledge and passion for gardening, and her whole garden is a productive demonstration site to which everyone is welcome to come and learn. An extremely active woman, Ms F is a member of the local indigenous chicken and goat groups, and of the Rural Women's Assembly, in addition to being a very active member of the IBLN.

3.3.8 Current status of RWH&C knowledge and use for smallholder farmers and household food production in the AFTI

The RWH&C demonstration site at the Fort Cox AFTI farm continues to be productive and functional. An episode of damage caused by straying livestock stalled the development of the site. But efforts by Agricultural engineering lecturers active in IBLN to fence the area have been rewarded. An attempt at establishing a teaching garden by class blocks was unsuccessful. The plan is now to move this to the Rural Development Centre. An OPV seed

bank and seed trails plans are in process, and one of the AFTI lecturers will work with this and the indigenous food plants book from the WRC to strengthen local food production.

A number of new productive demonstrations have been identified and set up with links to the various participating organisations, and are also being developed via the expanded partnership structure of the IBLN. These have been reported on in the ToT reports.

3.3.9 Extension, through the ToT, of RWH&C Understanding and Practices

During the ToT, farmers were extended their knowledge of a wider range of RWH&C practices as shown by these illustrations of demonstrations site development as being developed in the Phase 2 Amanzi for Food programme activities:

Figure 3.4. Hydroponics Nursery and Drip Irrigation Productive Demonstration Site Developments at Fort Cox AFTI

Figure 3.5. Raised seedbed and mulching productive demonstration site development in Dimbaza

Figure 3.6. Deep trenching productive demonstration site development at Fort Cox ATI

3.3.10 Existing linkages between the Fort Cox Agriculture and Forestry Training Institute and other local stakeholder organisations

From the IBLN network meetings held at Fort Cox AFTI and subsequent ToT programme sessions, and interviews held with key partners it was clear that there were very strong existing linkages between Fort Cox AFTI and other stakeholder organisations. This is illustrated in the table below.

Table 3.1 Key IBLN Stakeholders and Linkages

Name of stakeholder	Nature of relationship in existing linkage
Department of Rural Development and Agrarian Reform	Provincial DRDAR: involved in curriculum reviews / validation
Local smallholder farmers	Fort Cox AFTI lecturer/s regularly take students to Keiskammahoek to learn RWH&C mediated through productive demonstration sites put up there through the IBLN. Farmers act as co-educators; The Fort Cox AFTI takes students regularly to do practicals with local farmers that the ATI would otherwise not be able to do due to lack of relevant resources, e.g. building tunnel gardens and a planned collaborative work (*ilima*) to dig deep contours in the Amatole basin.
University of Fort Hare	Member of academic board Involved in curriculum reviews / validation Helping with productive demonstration site development and innovation support
Local Extension Offices	Support Fort Cox with links to farmers
Dohne Agricultural Research Institute	Very active in Fort Cox AFTI's curriculum review and validation board.

Name of stakeholder	Nature of relationship in existing linkage
NGOs	Zingisa Education project is a member of the learning network and is assisting with the set-up of a seed bank and OPV seed trials. Also on FCAFTI curriculum review and validation board
Forte FM	Listenership good: 164,000 in Eastern Cape and growing • Frequency of the station is 88.2 MHz Amanzi for Food secured a slot for a monthly farming program that is aired either from 130pm (15 min) or 7pm (30 min) on Tuesdays. For promotions we will have to pay R500 for promoting a show daily over a month's period. Logistics for bringing participants to the show will be organized by the learning network. Preliminary topics have been identified by the learning network that include Challenges facing the farmers in Amathole District, RWH&C technologies, productive demonstration sites, seed saving, marketing/local value chains, youth in farming Presenters will be drawn from the IBLN
Co-operatives	Bring smaller scale farmers together and support co-learning and communications amongst farmer groups
Farmers Associations	Provide meeting points for farmers Share knowledge of innovations and support links between farmers Support collective action and lobbying for farmers' interests
Department of Social Development	Supporting homestead food producers Helping with knowledge dissemination and communications, as well as technology support Helping with monitoring and networking
Farmer support enterprises (SMME) and development trusts	Supporting co-learning amongst farmers Building networks and sharing knowledge Helping with technology support and innovations

3.3.11 Networked partnerships and co-learning interactions of key institutions / organisations / stakeholders in the local agricultural learning system in the area

Besides Fort Cox AFTI profiled above, there are several key organisations and individual stakeholders in the local agricultural learning system in the Amathole District area who are interested in RWH&C knowledge, some carrying over their interest from the previous project phase of the Amanzi for Food Programme, while others have become involved recently as the Phase 2 ToT started up. They have all joined the IBLN, and are actively engaged in the programme. The brief descriptions of these participants below show a diversity of types of organisations, and an increase in both the government departments supporting smallholder

farmers and household food producers in the area, and smaller enterprises, cooperatives and smaller development organisations. It is encouraging to see that the agricultural learning system is richly textured with a lot of potential for expanding co-learning amongst these IBLN members.

- **Raymond Mhlaba Development Agency** assists subsistence farmers with increasing agricultural production, and offers programmes that empower local farmers through skills development, capacity building and business enterprise development, including assisting farmers to access markets. The Raymond Mhlaba Development Agency also provides farmers with material such as fertilizer, seeds and seedlings, etc. to help them in developing their projects. Also assist them to register their projects (cooperatives and companies).
- '**Inyanda National Land Movement community news'**. The paper covers land issues, different farming practices and agro-ecology using English, Afrikaans, Sotho and isiXhosa in the same newspaper. Contributors include local community farmers among others. The newspaper is published by a Cape Town-based organisation called Inyanda National Land Movement, with offices at 36 Durban Road, Mowbray 77000, Telephone 021 685 3033.
- **Lenye Youth agricultural group**: the group is based in Lenye Village. It is made up of six active members and is experiencing some changes in membership. The group has approximately 2 ha of land that is protected by a communal fence around a larger communal farming space. The old irrigation infrastructure is usable but needs regular maintenance as there are frequent breakdowns. The group is interested in developing a RWH&C demonstration site and undertaking the ToT course. The land is not owned by the group but by older community members. Lenye Youth group has a strong relationship with the agricultural extension officers in Qoboqobo (Keiskammahoek).
- **Lloyd village garden women and youth**. Lloyd village garden developed a demonstration plot in its 1 ha garden in phase 1 of this project but were struggling to keep enough water in the small farm ponds. They desire to build a bigger farm pond or deep contour in the garden. The group is made up of mainly elderly women who struggle to carry extra water from a village dam some 100 metres away. They lost an engine that was pumping water to their garden and cannot afford to replace it. The youth in the area are generally not keen to participate in the garden however one young man showed an interest in undertaking the ToT course.
- **University of Fort Hare** continues to develop and provide important agricultural knowledge in the area, as well as risk and vulnerability information via their Faculty of Science and Agriculture and their Risk and Vulnerability Assessment Centre.
- **Forte FM Radio station** based at University of Fort Hare. The station has to generate its own income to pay its staff and therefore relies on advertisements and selling some of its airtime. This resulted in the sale of the time previously allocated to their agricultural programme in early 2017 due to underutilization by the local community. Following negotiations, the station manager agreed to make a 15-minute slot available to the IBLN on the 4th Thursday of every month.
- **Zingisa Education Project** provides facilitation training and farmer support on Agroecology. It is based in Berlin and has had a strong influence on the farming practices of the farmers involved in the IBLN.

- **Alice, Middledrift and Qoboqobo (Keiskammahoek) extension officers** who continue to provide support to local farmers.
- **Intinga NGO based in Qoboqobo**, Ngqeqe (Rhabula) village, a local NGO that also provides support to farmers.
- **WRC Project on Climate Smart Agriculture,** a project that has been supporting farmers with CSA knowledge and practices that emphasise interconnected systems of agro-ecology in which RWH&C is an important practice.
- **Department of Rural Development and Agriculture:** This department is providing support to farmers, and advise them on best approaches for supporting farming practices and innovations.
- **Department of Social Development:** This department is involved in financially supporting and monitoring food security projects and household backyard gardens, helping to link them to stakeholders. They note that water is a big problem affecting their projects. Monitoring the progress of the projects involves checking the ways in which the projects contribute to food security. They also provide advice to households who are producing home food gardens and assist with marketing of products. They also assist with the starting up of home food gardens, and source relevant training. This involves managing 22 community motivation centres in all 9 districts. One of the sites, Klipplaat, has been identified as an Anti-Poverty site, where funded projects such as the Klipplaat Hydroponic Tunnel Project are being implemented.
- **Middledrift youth agricultural co-operative,** called **'**Middledrift Youth in Agriculture and Rural Development' are a co-operative of youth who are teaching others a range of farming skills.
- **Ilizwi Lamafama Farmers Union:** Works with farmers and schools around the Xhukane area in the area of promoting household food gardens including rain water harvesting methods. Involved in facilitating a programme of agroecology water harvesting and seed saving.
- **Maimanyane Permaculture Association:** This association works families, resource area units, schools, churches, clinics, farmers practicing this farming method which covers seed saving, worm farming, herb production, water harvesting and indigenous tree planting, helping to support promotion of household food security through establishing food gardens and small livestock. They also work with primary schools around Amahlathi and Buffalo City encouraging school gardens using permaculture farming methods, and in this process working with school learners, nutrition teachers and school governing bodies. They also, from their own gardens, support neighbours to become food producers, plant herbs, start nurseries and host soup food kitchens.
- **Sainex Projects:** Mostly working in small-scale farm in Qoboqobo (Keiskammahoek)
- **Mazoyi Group Pty (Ltd):** Mazayi Group is a small enterprise currently producing alternative remedies for children and adults that assist with different illnesses. The company is using a lot of water in its production and they employ families in the manufacturing process.
- **Sollace Enterprise:** a small enterprise working with household food producers in rural areas to help them understand the diverse processes involved in cultivating their production and in how to take care of the production process.
- **Spruce UP Environmental & Geo.SER:** This organisation is a geological service provider. As such they assist farmers in finding water aquifers, revive old bore holes,

and support dam rehabilitation. They also support environmental awareness on reuse and recycling of waste, including development of organic compost/ fertilizers.

- **DTST (Pty) Ltd:** This small enterprise is engaged in organizing meetings for small-scale farmers; mentoring them on crop cultivation and farming. They also provide training, and assist in getting specifications on implements to be bought. They also help with organizing bulk sales/buying of fertilizers, and provide advice on innovative ways of growing crops, and weed eradication methods and means. They also give advice on cross breeding and pest control measures. They own tractors and TLBs which are contracted out by local farmers during ploughing seasons.
- **Stutterheim Amazing Forestry Project**: This project supports small-scale farmers in growing crops, poultry farming and livestock farming. They are currently working closely with the Cathcart Farmers Association.
- **Umnqophiso Agriculture Co-operative Limited.** This is a small-scale farming cooperative producing vegetables.
- **Mayibuye Ndlovu Development Trust:** This development organization is responsible for youth development and training. It helps with identification of projects and job opportunities in the agricultural and tourism sector. They help to identify women projects such as gardening, knitting and business opportunities for women, and are involved in working with eight communities in SRVM. Projects range from creches; youth development, agriculture that includes gardening, tourism and conservation, service centres for the elderly as well as training and monitoring. This interview data provides more insight into how they operate: “The organisation was formed to develop the poor people in the area. It is funded by Addo National Park and the business people in the community. It covers 8 areas, each area consisting of 2 sites, with 16 people from each site. The organisation has a business plan and a trustee. The organisation takes youths on a learnership course as part of their mentorship programme. I am also part of the people who are going for learnerships for computer courses. We send the teachers for training as well … we are the representatives for our communities, we call public meetings and explain what we have, we have a community budget, so we invest even the money. Partner organisations work through the leadership such as the ward committees in their areas. The money from the trust is invested. What the organisation does is to look for a project that they can do in their community and then look for funding for the project … the organisation also supports youth projects. We make sure there is development in our communities and “We make sure each community is doing right for the communities”.

Raymond Mhlaba Development Trust: A more in-depth interview with farmers involved with this NGO partner provides further insight into the practices of some of the organisations participating in the IBLN, and their reasons for joining the Amanzi for Food Training of Trainers programme:

> Mr P (pseudonym) comes from a family of four, himself (42 years) his grandmother (89) and his two cousins (aged 17 and 26) who make up their homestead. He comes from Sompondo village and he is a full-time farmer. He studied agriculture because he wanted to go into farming and to inspire other young people to go into farming. Also, he wanted to try the new farming techniques that he learnt from school. His grandmother has a small plot, where he plants organic vegetables. He says agriculture

is contributing immensely (100%) to his household income, saying that him and his cousin are earning a salary from farming. Mr P is using municipal water for farming. Mr P is the founder and managing director of the Vegetables Layers and Agricultural Development Organisation, which was started in 2012. It is a registered not-for-profit organisation. Mr P keeps chickens for meat and eggs. They have a Facebook page. The vision for the organisation is to champion rural development and economic transformation The NGO stakeholders are Amanzi for Food, RMEDA, Dept. of Agriculture. The organisation is funded by RMEDA and Pick and Pay. The organisation also assists people in Amatole and at the provincial level on issues to do with land distribution. Mr P says the organisation noted that people prefer cheap and organic grown broiler production, so their production was influenced by that. We expanded by including broilers; “We always try and see what our local community needs are and we then work to meet those needs”, said Mr P. Mr P said his organisation is also influenced by the market; we decided to come up with our own model that is different from Pick and Pay and other big shops, we deliver live chickens to people residing in different areas. In each village we have people who forward information from our clients thus creating employment for them. We have village distributors. We assist by creating employment for them. The company that he is working for is a private company called RAYMAF that is involved in the production of chickens. Mr P says they work as a team, and this is an advantage as they get discounts buying as a group. Mr P says he is a mentor and provides advice to them to his colleagues. The organisation formed a WhatsApp group where they share challenges and opportunities for farmers. An important source of information is radio, for instance the Fort FM radio slot, listeners wanted the slot to be increased to 30 minutes because they said they were getting useful information from the radio programme.

Water scarcity and other challenges: Mr P says he is facing water challenges as their water supply is cut off by the municipality. Mr P said they do not have marketing facilities; “also we are facing a challenge of shortage of broilers, so we decided to buy incubators”. We are farming chickens, broilers, sheep, goats and traditional chickens. The chickens are for household consumption.

Figure 3.7. Live Matiwane (left) from Rhodes University interviewing an agro-tourism operator in Raymond Mhlaba Municipality area, Eastern Cape

3.3.12 Current status of RWH&C knowledge and use amongst multi-stakeholders, and interest in available WRC knowledge

While most stakeholders already have some understanding of basic RWH&C practices, they are all interested in taking this understanding further and learning about other practices.

Table 3.2 Current status of RWH&C knowledge and use amongst multi-stakeholders, and interest in available WRC knowledge in IBLN

Stakeholder	Current status of RWH&C knowledge and use	Interest in available WRC knowledge
Department of Agriculture and Rural Development : Local extension officers	Middledrift Extension officers are fully involved in ToT mostly via their Controller (who obtained a Rhodes University certificate) and active in IBLN. More extension officer involvement needed. Keiskammahoek extension officers introduced to RWH&C via development of demonstration plot Alice extension officers initially exposed to RWH&C by ARC and then participated erratically in IBLN. Extension officers taking part in Phase 2 ToT.	Dissemination through extension.
RMDA	Operations Manager attended the Training of Trainers course in 2014/2015. Led RMDA team to support farmers in rainwater harvesting dam scooping. RMDA continues to support farmers to use RWH&C techniques, and is also supporting the development of a wider range of productive demonstration activities, and links between these.	Rainwater harvesting for biogas generation in the Upper Blinkwater project (M. Mali, personal communication, April 2017[12]). Would like Blinkwater farmers to be involved in ToT.
NGOs	Zingisa Educational Project is a member of Imvotho Bubomi Learning Network. Promotes Agroecology – locally-adaptive seed. Has contributed to the IBLN ToT programme, and continues to support farmers to use RWH&C approaches.	Available to support local farmers on agro-ecology inputs and support, and Fort Cox AFTI to develop a seed bank and trails.

[12] Mali, M. (2017, April). CEO Raymond Mhlaba Development Agency, Raymond Mhlaba Municipality Local Economic Development, Alice. Personal communication.

Stakeholder	Current status of RWH&C knowledge and use	Interest in available WRC knowledge
	Siyakholwa Development Foundation (siyakholwa.co.za) does poverty alleviation by creating sustainable jobs and business community. They operate a garden at Lenye Primary school where they are producing food for the school but with no clear involvement of the school learners or teachers in learning.	This is an opportunity to partner with Amanzi for Food.
Maso family (Keiskammahoek)	Have an existing productive demonstration plot from Amanzi for Food phase 1. This site continues to be productive and is actively used for mediating learning by students from Fort Cox AFTI.	Keen to expand learning.
Peters family (also Chair of the Farmers Association)	Have implemented rainwater harvesting farm ponds and mulching through IBLN, peer to peer extension, support by Amanzi for Food project and from associations with Zingisa Educational project. Championing locally-adaptive seed (OPV grains) through agro ecological / food sovereignty framing.	Greywater harvesting as new technique
Department of Social Development	Supports a wide network of community-based projects, especially in vulnerable areas and households. Supports household food production and monitoring of the benefits.	Women are struggling with water for food production; interested in learning more about RWH&C to share with the women's projects at household food production level.
Youth projects and co operatives	Interested in getting involved in the agricultural value chain; need access to water for production. Involvement on the Food for Us Rural Hubs initiative is providing opportunity for connection with the value chain.	Interested in learning RWH&C techniques to address cost of water, and also water cut offs.
Farmers associations	Interested in supporting groups of farmers to be more successful in food production, as well as marketing access. This interest is being addressed through involvement on the Food for Us project Rural Hubs initiative.	Interested in a range of RWH&C knowledge for small-scale farming, including permaculture

Stakeholder	Current status of RWH&C knowledge and use	Interest in available WRC knowledge
		practices, as well as livestock management.

3.3.13 IBLN linkage to the Food for Us project and other Learning Network beneficiation projects for the farmers and partners

A key observation in the contextual profiling was that the IBLN – initially established to support RWH&C practices has expanded to a much more expansive learning network that is able to take on a range of other issues and interests that support the farming value chain, and the well-being of farmers and local actors, as well as new innovations for the local farming system.

One such example of a major expansion of the IBLN connections and activities was represented by IBLN members' involvement in the Food for Us initiative[13], with which many members are connected. This connection has expanded considerably with the recent launch of investigations into a possible Food for Us Rural Hub initiative which forms a key part of the SPAR supermarket chain CSI commitment (investigated in some depth in 2019 by Sarah Durr, a researcher on this programme in partnership with SPAR)[14].

The Imvotho Bubomi Learning Network was very influential in the developing and furthering of the Food for Us food redistribution and market access mobile application project. The Food for Us application was introduced to the Imvotho Bubomi Learning network in 2017 during the Amanzi for Food Training of Trainers course. The Imvotho Bubomi Learning Network members who attended the course (as well as those who were not able to attend) were invited to be part of the Food for Us mobile application trial. The trial participants were asked to download the Food for Us application and interact with the different features, testing their usability and applicability to the Raymond Mhlaba small-scale farming context over the duration of the pilot trial (18 months). The trial participants gave feedback to the Food for Us

[13] The Food for Us project was a UNEP funded ICT based mobile learning application development programme that sought to connect producers with consumers. It was researched in some depth by Sarah Durr (2020) in the RU ELRC and was closely connected to the IBLN and Raymond Mhlaba LED office, who offered to support the piloting of the mobile application. Key outcomes of the study are that it brought more youth into the IBLN, and also facilitated ICT use and expanded ICT based skills development, as well as closer links between farmers for marketing of produce, although WhatsApp proved to be a more user-friendly application than the FoodforUs application itself. Sarah Durr continues to provide support to the Amanzi for Food Programme and has since helped to develop the evaluation framework, generate and analyse evaluation data, and help with the design and tutoring of the online course. This shows how innovations emerge in Learning Networks, and how new members become important contributors to the network over time, bringing new skills to the network in this case ICT-based learning capabilities that have supported farmers, students and other actors in the IBLN.

[14] Unfortunately the initial research done by Durr into the SPAR marketing hubs stalled due to problems at SPAR. This work will however, be taken forward with ongoing research into Food Systems and Food Economies in the context, recently funded by the NRF in partnership with the University of Witwatersrand Centre for Researching Education and Labour.

team, providing insight into important findings around informal mobile learning and the importance of support networks when introducing new innovations.

The Food for Us network developed as a subsidiary network from the IBLN. This new network included important IBLN members such as Mr and Mrs Peter, Simthandile Bobotyana, and Edmore Parichi. The Food for Us project also started to attract new members who were not only invited to be part of the Food for Us pilot application trial, but also were encouraged to connect with the Imvotho Bubomi Learning Network. The Mxumbu youth co-operative, led by Xolisa Dwane, was one such group of people who were introduced to the Imvotho Bubomi Learning network through the Food for Us initiative. The Mxumbu Youth cooperative are now very active and enthusiastic IBLN members who actively put into practice much of the water saving techniques and agro-ecological farming practices that are promoted by the IBLN.

Mr Dwane has been influential in propelling the Food for Us project forward and spearheading the adoption of the application amongst farmers in the Raymond Mhlaba area. He was asked to act as a member of the project who could provide advice and assistance to potential users who were struggling with the application at the time of the trial.

Once the first phase of the Food for Us project was completed (July 2018) Mr Dwane continued to be supportive of the continuation of the Food for Us project explaining that the application was something that was desperately needed in the area, and despite the App not being continued as a tool for use, the principles and skills of the App development process continue via other mechanism and means for market development which are still ongoing.

Towards the end of the project, the Food for Us project team explored possibilities of going into a second phase of the Food for Us project, looking to partner with the SPAR Rural Hub project which aims to develop sustainable fresh produce local hubs which improve the local supply chain. The Rural Hubs initiative aims to provide support and market access to small-scale farmers, enabling them to have a constant demand for their produce and also provide guidance and assistance in areas such as business model development, logistic planning, pricing and the development of planting plans. The Rural Hubs initiative aims to develop central points where farmers produce is brought to and then redistributed to retailers, schools, restaurants and other consumers thereafter. The Imvotho Bubomi Learning Network has been influential in showing unwavering support to work alongside SPAR and the Food for Us project to develop this idea and build a more sustainable local supply chain where locally produced fresh food is consumed locally. Several members of the Imvotho Bubomi Learning Network attended the first SPAR Rural Hub scoping meeting held in Alice in January 2019 and several more were engaged for a second time in farm visits conducted in May 2019. Mr and Mrs Peters, Xolisa Dwane and the lecturers from Fort Cox have been particularly proactive in sharing their ideas with the SPAR Rural Hub team. This project has been stalled due to a lack of ongoing commitment by SPAR in 2020, but will be continued via a University of Witwatersrand programme on Food Economies and Markets in 2021, and via broadening the focus from SPAR to other marketing partners.

Figure 3.8. The Food for us and SPAR Rural Hub initiative meeting in Alice (January 2019)

The Raymond Mhlaba Development Agency (RMDA) were also a crucial role-player in the rollout of the first phase of the Food for Us project, as well as in the collaborative planning and negotiations that have occurred in the scoping stages of the second phase of the Food for Us. Mr Passmore Dongi of the RMDA worked alongside the Food for Us team in 2017 and the beginning of 2018 to collaboratively organise events and network building activities within the Raymond Mhlaba area. The Food for Us Matchmaking event held in May of 2018 was one of the successful collaborative events between the RMDA and Food for Us and Amanzi for Food IBLN. The Matchmaking event provided a networking day for local farmers to meet local buyers of produce. The event was attended by close to 50 people and not only encouraged the development of trading relationships but also included a workshop that worked through the local buyers and sellers' challenges and provided space for the attendees to brainstorm solutions. The Food for Us application and use of technological innovation was discussed as a possible solution and way to work with disconnected supply chains. There was strong Imvotho Bubomi Learning Network representation at this meeting with most of the farmers being part of the learning network, and those who weren't aware of the network were encouraged to join.

Towards the end of 2018 and the beginning of 2019 Mr Mandisi Mali and Justin Nika have taken over from Mr Dongi to lead the partnership between Food for Us, SPAR and the Raymond Mhlaba Development Agency. The RMDA is very involved in the planning of the second phase of the Food for Us project, therefore assisting with project scoping research, connecting the local farming networks with the project, and making suggestions on how the Rural Hub initiative will best work in the Raymond Mhlaba context.

Figure 3.9. Second Rural Hub scoping field to visit some of the important stakeholders including IBLN members (May 2019)

The IBLN and RMDA played a pivotal role in enabling the successful piloting of the Food for Us application. The welcoming enthusiastic members of these entities have made it possible to explore further opportunities of working alongside the networks in developing a second phase of the Food for Us project (in partnership with SPAR and the Rural Hub initiative), a process which is ongoing, and which also shows the validity and value of local learning networks, as they tend to have capacity to mobilise community engagement with extended initiatives such as the Food for Us initiative and the subsequent SPAR Rural Hub deliberations that can further support farmers.

A similar example of the IBLN providing a foundational experiential learning platform for other learning networks and the taking up of learning network principles and practices can be found in the response of the learning network to the COVID-19 pandemic in 2020. In response to the critical need for reliable and locally relevant information on the COVID-19 pandemic in the rural Eastern Cape many members of the IBLN joined forces with other networks in the Eastern Cape to establish the Eastern Cape Together[15] ***Iqonga LoThungelwano*** Learning Network which is now working with experience gained from the IBLN to communicate with 200 community champions (many of whom are IBLN members) across the Eastern Cape. This 'split off' network with a different focus (i.e. COVID-19 response) adds value to, and emerges from the IBLN, but because farmers and IBLN members wanted to keep the agricultural learning focus of IBLN, they proposed another network platform for the COVID-19 response, which was equally needed, but which they judged would be better run of a separate but related platform. This provides evidence that there is 'learning about learning networks' emerging from the IBLN which is capable of serving other needs of local farming networks. This is a key 'catalytic validity' finding emerging from the IBLN social learning model.

These insights into the expanding application of the Learning Network Principles and practices out of and associated with the IBLN were only possible to observe via ongoing contextual profiling, indicating that it is important to stay 'close to the ground' and involved in the learning

[15] https://easterncapetogether.co.za/; https://web.facebook.com/easterncapetogether/?_rdc=1&_rdr

networks to continue to monitor ongoing changes in the learning networks and their interests as well as the conditions that affect the learning networks, and how learning networks respond to changing conditions and circumstances. This allows for flexibility and reflexivity in learning network formation and praxis.

3.4 Site 2: University of Mpumalanga as Hosting Learning Centre and the Sinakekela Sibusiso Semanti Learning Network

3.4.1. General background information on the area

Mpumalanga Province is endowed with a diversity of agro-ecological regions ranging from the Highveld to the Lowveld. The main sites for the Amanzi for Food project are in the southern Lowveld and Middle Veld area, which is part of an area known as the Maputo-Nelspruit corridor. The municipal areas that the project is engaged with are the Gert Sibanda and the Ehlanzeni District Municipalities (green and blue areas in the map), although the project has some involvement in all three districts, including Nkangala, where the Nkangala FET ATI is situated.

Figure 3.10. The three District Municipalities in Mpumalanga Province

Largely a wildlife and tourism area, the areas not covered by game reserves are primarily agricultural, producing tropical fruits, vegetables with sugarcane being introduced as a new crop. Agriculture in Mpumalanga is characterised by a combination of commercial farming, subsistence and livestock farming, and emerging crop farming. Crops such as subtropical fruits, nuts, citrus, cotton, tobacco, wheat, vegetables, potatoes, sunflowers and maize are produced in the region.

The Lowveld has an almost tropical climate, experiencing warm sub-tropical temperatures. High rainfall is usually experienced in summer, totalling approximately 620 mm between September and March. Despite such advantages Mpumalanga has not been spared by

climate variability and change and has experienced serious droughts as recently as 2015 and 2016 (Drought SA, 2015[16]; DWS, 2016[17]).

The province has a strong focus on supporting smallholder farmers into commercial agriculture. For example, SAFL and PLAAS (2013) report that “In Mpumalanga more than 2000 smallholder farmers supply maize to AFGRI silos in the small towns of Gert Sibande and Nkangala district municipalities. A greater proportion of the said smallholders are located in Chief Albert Luthuli Municipality, which falls under Gert Sibande district”. Rainwater harvesting and conservation practices therefore need to be considered in this context. Additionally, the rural former homeland areas in Mpumalanga are also experiencing regular water cuts, which is affecting those smallholder farmers and household food producers who are trying to produce food to supplement basic income and ensure household food security. In visits to these areas we observed communities trying a range of different approaches to harvest rainwater, some of which was being used for household level food production, but some also being used for household water supply needs, as shown in the pictures below. The pictures show a general lack of rainwater harvesting infrastructure, despite the fact that many of the houses have relatively large roof surface areas that could be more optimally used.

Figure 3.11. Typical strategies for collecting rainwater for use in households and gardens observed in Mpumalanga former homeland areas

The food production areas in Mpumalanga are however, also being impacted by mining. In October 2012, the Bureau for Food and Agricultural Policy released a pilot study on the impact of coal mining on agriculture. 46% of South Africa’s total high potential arable soils are found in Mpumalanga, and the study found that "at the current rate of coal mining ... approximately 12% of South Africa’s total high potential arable land will be transformed". A further 14% of that arable land was subject to coal prospecting applications. The study assessed the impacts of this transformation, ranging from the loss of maize production and resulting price increases to the loss of employment, soil degradation, water and air pollution and health impacts. It

[16] Drought SA. (2015). The October 2015 report on drought conditions across the country. Accessed on May 23, 2017 from http://www.droughtsa.org.za/images/SA7_2015_10_Drought_report.compressed.pdf

[17] DWS. (2016). Water Scarcity and Drought Status 14 January 2016. Accessed on May 23, 2017 from http://niwis.dws.gov.za/niwis2/UserFiles/documents/drought_status_report.pdf

concluded that "the effects of coal mining on agriculture are immense and some effects are irreversible." This potentially also impacts on smallholder agriculture development as well as agricultural water, and one of the main problems in Mpumalanga is water pollution from existing mines. Rainwater harvesting and conservation practice therefore needs to also be considered in this context.

There are also problems with water quantity and availability in Mpumalanga, which adds further impetus to doing more with what is available. Recently, in January 2018, it was reported that flows in the Olifants River, "reached alarmingly low levels … *and the levels of the Blyde Dam are also worrying, so all water users in the Olifants Catchment should act to reduce water consumption before the situation gets worse." (AWARD, 2018).* Dr Sharon Pollard, Director of the Association for Water and Rural Development (AWARD) reported that "The data on the river flows shows that were it not for the intervention of AWARD and SANParks together with DWS to release water from the De Hoop Dam, it is likely that flows in the lower Olifants River would be close to zero," she notes, adding that all indications are that the crippling drought of 2016-2017 has continued into 2018, despite rains elsewhere. (Source: www.award.org.za)

AWARD has an active programme supporting smallholder farmers and household food producers to implement integrated, systemic approaches to climate smart agriculture of which RWH&C is a core practice which the Amanzi for Food programme has linked into. AWARD is an important stakeholder for longer term support to the SSSLN in future, and Dr Zazu from AWARD, together with Bigboy Mkabela have been active participants and contributors to the ToT programme in the emergence of the SSSLN programme (see below).

3.4.2. The University as a Learning Centre

The University of Mpumalanga, Mbombela campus is a new and rapidly growing institution in the Mbombela area of Nelspruit. One of the main features of the new university is that it has incorporated the former Lowveld College of Agriculture, and agriculture is therefore a key offering in the new university. A B.Sc. Agriculture has been approved by the Council of Higher Education, and the Agricultural School forms part of a newly established Faculty of Agriculture and Natural Sciences. The School of Agricultural Sciences is seen as one of the stronger schools in the university at present. There are links between the School of Agricultural Sciences, and the School of Development Studies degree programme in the Faculty of Economics, Development and Business Sciences, as well as with the Environmental Sciences programmes in the School of Biological and Environmental Sciences. The School of Biological and Environmental Sciences will be establishing a major in integrated water resources management, which will also be available as an option for B.Sc. students in future. The School of Agricultural Sciences offers a Bachelor's of Agriculture in Agricultural Extension and Rural Resource Management, with graduates capable of performing as extension advisors among other agricultural roles. The University also has a Continuing Education Services unit which links to the community engagement arm of the university. This unit has shown interest in the Amanzi for Food programme, and will act as lead coordinator of the Training of Trainers programme with Rhodes University. The potential exists for this unit to further offer training based on the WRC material in future. The university currently has 3000 students, and aims to expand to 15000 students, and is therefore in a massive growth phase, with substantial support being provided by government for campus development, which included development of a new experimental farm for the university, where RWH&C demonstration sites were developed. The School of Agricultural Sciences services mainly medium to large scale farming

enterprises, but also has a strong commitment to supporting smallholder farmers to develop their enterprises into larger scale operations. Efficiency of irrigation systems and agricultural water use is a key area for further development in the School of Agricultural Sciences, hence also the interest in the WRC material on RWH&C, as well as the WRC irrigation for smallholder farmers material.

There were strong indications, particularly through the assignments produced by the key university contact and Amanzi for Food programme coordinator, Gerhard Viljoen, who is fully participating in the Training of Trainers course, that RWH&C is highly likely to be integrated into the curriculum, and become a core part of agricultural training, as shown from this extract of Mr Viljoen's fourth ToT course assignment that follows.

EXTRACT FROM THE ASSIGNMENT 4 OF GERHARD VILJOEN

There are four options where RWH&C can be introduced into the curriculum of the University of Mpumalanga. All four options will be implemented over time as it covers different segments of the University activity and interests of different stakeholders.

1.1. Include into the curriculum of the **Agricultural Qualifications** such as Diploma **in Plant Production, Bachelor of Agriculture, BSc Agriculture or the Advance Diploma in Agricultural Extension.** The inclusion can be done as part of the Water Management Module, Agricultural Engineering module in the Diploma, as part of the Soil science module and can also be included into the Vegetable Production and/or the Agronomy module. The inclusion into these programmes will strengthen the concept of collection and conservation of the scarce resource –rain water. It will also promote the concept of infield collection through improved production practices or using existing practises and increase the effectiveness there off or make it fit for purpose. The inclusion into the B Agric and Advance diploma in Extension can focus on the extension part, the transfer of knowledge and social learning that can be used to provide knowledge about RWH&C as well as the creation of learning networks and the promotion of social learning.

1.2. Include it as part of the curriculum for the **Bachelor of Education Degree** in Foundation phase education as a component to teach the children about the production of vegetables as food, where learning will take place through interaction and play. The concept of collecting rain water can be explained very basically, the availability of water makes it possible to grow plants – water is life, and that water should not be wasted. Very basic concepts can be transferred to the learners, the advantage of RWH&C is that it makes water available that can be used for educational demonstrations and practical activities of the learners.

As the curriculum expands and other school phases are included RWH&C can be included in Life Science, Geography and General Science to strengthen the importance of the collection of water and the value of available water. In South Africa this is a topic that need everybody's attention.

Creating a RWH&C demonstration site at the teaching school enables UMP to use it for the training of teachers and SGB members of different schools to implement the

practices at their schools and create food gardens that will be to the benefit of the learners.

1.3. RWH& C can be offered as a standalone **Short learning programme** that focus on the principles and practices of RWH&C, such as the Amanzi for Food programme, or the **principles of RWH&C can be included in SLPs** on Soil Science, Vegetable production and the programme we have on Sugarcane production. The collection component is a very important aspect, but the retention of the moisture is equally important as well as the effective use thereof.

The inclusion of RWH&C as SLPs provide possibility and opportunity for UMP to reach a large number of people and communities and emphasise the importance of the conservation of rain water and the effective use thereof.

1.4. **As Scholarly engagement programme involving the community** the social learning aspect of RWH&C can be incorporated as community projects that can be implemented at schools, orphanages, old age homes and anywhere in the community where it will be beneficial to the community. This engagement activity can be part of a more structured scholarly engagement programme or it can be a student activity through student organisations such as Enactus. This engagement activity will provide an excellent opportunity to facilitate further learning in different fields and areas, the creation of learning networks and the promotion of social learning is a further possibility and will be promoted throughout the programme.

This community engagement programme will provide numerous service learning opportunities for learners and also provide them with valuable practical experience. An added advantage of this is the opportunity to collect or record Indigenous knowledge and Indigenous knowledge systems.

RWH&C PRACTICES TO INCLUDE:

The first component to be focused on will be **roof-top–collection** using gutters on buildings and storage tanks to store the collected water and the effective usage of the stored water. Other **collection methods** such **as ponds, dams or underground tanks** will also be included as alternatives to roof-top–collection for the collection of a “bulk” of water. The physical conditions and available finance of the specific case will determine the collection method used.

In-field collection needs to be emphasised as it provides either additional methods of collection or it supplements the “bulk” collection of water. In-field collection should become standard practice and the promotion of the benefits thereof will be seen on the production side.

The water is now collected, what now or so what? The next very important steps are **the effective use** thereof and **the retention of the moisture in the soil**. **Effective use** includes the methods or use, watering cans, micro irrigation sprayers, drip irrigation all with the aim of using the available water for as long as possible during the production stage.

The scheduling of irrigation. Selecting the method of irrigation is one component the frequency of watering is the other critical component for a system. The methods of determining the water needs of a plant and the quantity of water to be irrigated is emphasised as it will bring together the effective use and the demands of the crop.

The retention of the irrigated water is the third important component of RWH&C as it prolongs the use of the collected water. It is critical to retain as much moisture for as long as possible and ensure that it is available during the critical stages of plant growth, when it is needed the most. Methods to improve organic content of the soil to retain water, improvement of the soil structure , cultivation or no till, cover crops and mulch to prevent evaporation is promoted as part of the retention strategy

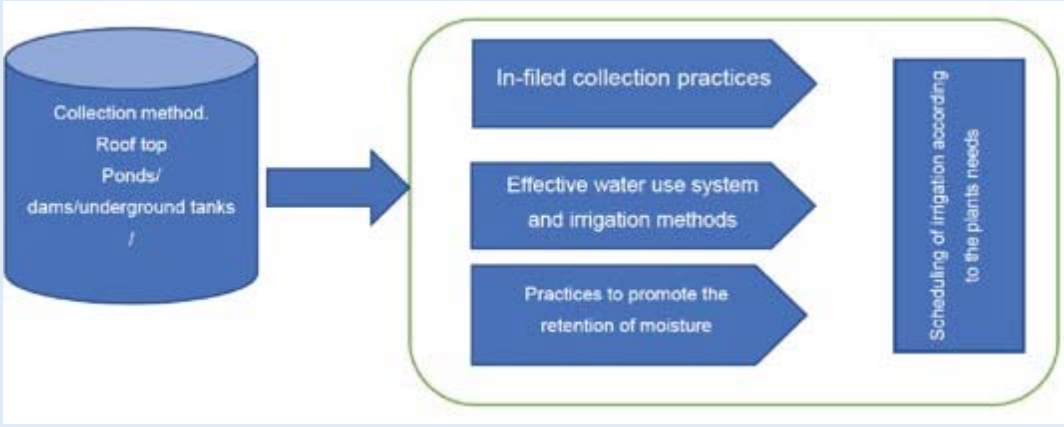


Figure 3.12. Extract from ToT Assignment 4 from Gerhard Viljoen, University of Mpumalanga

3.4.3 Educator / learning facilitators' knowledge of RWH&C

The Sinakekela Semanti Sibusiso Learning Network (SSSLN) evolved out of the ToT course facilitated at the University of Mpumalanga (UMP) in 2018-2019.This is the overarching learning network covering the entire province, within which there are 4 sub-networks, one in each district with involvement with the ToT course.

The majority of the members of the SSSLN are educators or extension officers, or working in NGOs supporting farmers; thus they all have a learning facilitation role of some kind or other. Most have formal qualifications in agriculture or extension but like most extension officers who had received formal training, their knowledge on RWH&C was still lacking, as the curriculum of most of the ATIs was focused on large-scale commercial farming and more expansive irrigation systems development. The evaluations of the ToT course session show that the extension officers were learning a lot from the Amanzi for Food training programme, especially in the following two areas:

- **RWH&C knowledge and practice:** A lot about the systems of RWH&C and the different options available to farmers and extension officers; especially more in-depth understanding of the different RWH&C practices, which were discussed via the course sessions, shared by lecturers and facilitators at UMP, Rhodes University and Fort Cox

AFTI of Agriculture where some of these had been tried out. They were also demonstrated practically via site visits, and smaller demonstration activities during the course sessions. This practical approach was highly appreciated. As one extension officer put it “We have learned that farmers and advisors should be proactive in the issue of water scarcity and not watch the rain water flowing away”. And another indicated “It is helpful to understand different techniques to put into common practice”. Another said “I have learned the importance of understanding that traditional rainwater harvesting methods are still relevant”. The assignments produced by course participants show increasing understanding (and confidence in this understanding) of RWH&C practices, and the contributions these can make to improvements in farm productivity. Many have indeed become passionate proponents of RWH&C practices in their work with farmers.

- **Social learning, facilitation and extension practice:** Here they commented especially on learning more about how to practically support farmers by co-learning and networking with other stakeholders that are involved with farmers. One said “I learned that I should listen to farmers and let them own the practices that is needed in their respective farm (top up approach)”, and another said “There is a lot of value in learning from each other, maintaining the flow of information”, and “Working together as a group is empowering”. While most MPLN educators and facilitators have been, and continue to be strongly focused on the practical aspects of the support they provide to farmers, they are showing considerable improvements in their understanding of learning processes, and the concept of curriculum. This has not been an easy process for many, and they continue to see themselves as essentially providers of practical advice and assistance, but they now cite a wide range of learning processes and material, including the WRC material and associated websites, which they are using in their farmer support activities. They are particularly enthusiastic about the use of productive demonstration sites as places of teaching and learning. However, they often ascribe the responsibilities for effecting the teaching and learning to others, such as colleagues with specialist educational functions, or to the farmers themselves. This suggests that they do not necessarily recognise the educational implications and values of their own contributions.

  There is therefore a clear need to give attention to both technical knowledge on RWH&C practices to expand the existing knowledge base of extension support services, facilitators and educators responsible for sharing such knowledge, as well as social learning knowledge on how to facilitate and work with smallholder farmers, including giving attention to their prior knowledge/indigenous knowledge of agricultural water and rainwater harvesting. This should include greater emphasis on the teaching and learning values associated with all aspects of the support they provide, and their own contributions to this through the social learning process, perhaps under the mantra of ‘we are all teachers and learners’.

  There is also need to develop knowledge of RWH&C in practice, as shown by the response to the discussion and analysis of agricultural water problems and extension service problems undertaken during the ToT where the following contextual challenges related to agricultural water/RWH&C for smallholder farmers were noted and discussed:

  - Water contamination of dams, rivers, and boreholes by agricultural, industrial and domestic activities (reported by 2 groups)
  - Sedimentation/silting up of dams (reported by 4 groups)

- Drying out of dam during dry season
- Vandalism through the theft of pumps and irrigation systems
- Leakages of canals (reported by 3 groups) due to illegal diversions of water (reported by one group) and maintenance (reported by 1 group)
- Pollution (reported by 2 groups)
- Mining of river sand
- Rainfall patterns inconsistent (reported by 3 groups)
- Productive demonstration site development (it was noted that there were few of these easily accessible).

The focus here on entirely practical challenges, with no reference to challenges to learning, reinforces the inherent separation of the practical and the educational in the minds of many people. However, in discussions on the value of productive demonstration sites it is clear that they do recognise the practical *as* educational. In recognition of this the provincial SSSLN has formed four sub-learning networks that were working on the following productive demonstration sites:

- **Group 1 – Nkangala District:** Proposed to work with farmers to channel water to an existing dam. During the ToT they were encouraged to think about how, the inputs, the equipment, the funding. The productive demonstration site development commenced in November 2017, with members of this sub-network stating they had already consulted with the beneficiaries in terms of their needs and they identified the channelling of water to an existing dam as the need. Later in the process the team identified roof water harvesting to feed into underground tanks as an additional practice for implementation on the site, although the costs, particularly for the latter component, were not calculated and are likely to be beyond the scope of the farmers and the team.
- **Group 2 – Ehlanzeni South:** Proposed contour construction for a colleague in the group as the land is 'slopey'. They were planning to engage neighbouring farmers in Plaston and Whiteriver. The productive demonstration site activity commenced in November 2017 with a site inspection/potential assessment for RWH&C options and to plan out RWH&C practise. This group will be supporting farmers who are planting vegetables and grains on approximately 4 ha of land. A range of practices, including roof water harvesting, diversion furrows, a silt trap for the existing pond and mulching were identified with the farmers. There was also discussion of contouring as discussed originally.
- **Group 3 – Ehlanzeni North:** To develop a productive demonstration site, this group proposed assisting an established farmer with minor RWH&C improvements. The farmer has 27 ponds, 2 big dams and is actively doing RWH&C. Aim is to assist her in inspiring neighbouring farmers, to assist as she expands her land use and to assist with sustainability. They were encouraged to consider Aquaculture farming and warned against taking on a champion and missing out on opportunities to learn for her and for them. The productive demonstration site development commenced in November 2017 with a site visit and development of a plan of action for RWH&C practises which would include contours, dams/ponds, and roof water harvesting. This is clearly a large-scale project, and a range of different practices were proposed, with these sometimes differing between team members. However, those that were consistently identified included tied ridges and *gelesha*, both to be implemented on areas currently under cultivation. Other suggestions included refurbishment of some dams, including the addition of clay to increase water-holding capacity, and trench beds.
- **Group 4 – Gert Sibande.** For productive demonstration site development, this group proposed homestead ponds and mulching for subsistence farmers in the DonDonald rural area in Chief Albert Luthuli. They were also encouraged to look at aquaculture farming. They were encouraged to be mindful of the pond construction, observe toil type, presence of rodents as

they work towards year-round production through the use of these RWH&C practices. In addition to the original practices identified, roof water harvesting was added as the farmers had already been provided with the necessary material, but lacked the skills to set up the infrastructure.

The province-wide coverage of the SSSLN required sub-networks to conduct local level contextual profiling around the proposed demonstration site development activities. This was done in the various assignments that the participants, working in these four sub-clusters undertook during the initial stages of the ToT course. This provided more insight into the Farmers' contexts and existing knowledge of RWH&C practices, as well as that of the facilitators / extension officers. The addition of further RWH&C practices, and occasional abandonment of earlier ideas following additional site visits suggests a critical engagement with the practicalities of implementation.

3.4.4 Farmers knowledge of RWH&C practices

The farmers are almost all involved in one way or another with RWH&C practices, although they do not necessarily articulate what they do in this way.

The most common practice, encountered in almost all situations, was the use of farm dams. These were primarily used for the watering of livestock, although increasingly the water was also used, where possible, for the irrigation, or more properly, 'watering' of vegetable crops. On a smaller scale, the use of '*matamo*' or farm ponds was fairly common, with these ponds already found on 3 out of the 4 productive demonstration sites, with the water used almost exclusively for vegetable crops. One issue uncovered by most sub-network teams was the reduced functionality of the dams and ponds through inadequate run-off or siltation, or both. This is exacerbated by long periods without rain when they dry up. A strong focus of the teams' interventions has been to see how to improve the effectiveness of such existing infrastructure through the introduction of diversion furrows and silt traps. Another issue, paradoxically, is excessive overflow from dams during wet periods, causing erosion and damage to crops. The teams then look for ways of redirecting and/or reducing the overflow. There was a good recognition generally of the limitations of rainwater storage due to the small capacities of most tanks and ponds, and the expense involved in increasing storage capacity.

Figure 3.13. Farm Pond (Matamo), Mgwenya homestead, Clau location Mpumalanga (VA Madide, 2017)

Another practice which appeared to be widely understood was that of 'gelesha', where land is cultivated immediately following harvesting in preparation to receive the first rains, after which the land is replanted with fresh crops. The farmers showed considerable understanding of the benefits of this practice, in particular the reduction of compaction, caused by cultivating when the land is saturated, and improved infiltration into the cultivated ground. The additional benefits in terms of reducing evaporation and maintaining soil structure are probably less well understood.

'Pitting' is also a practice that was implemented by a number of farmers, in particular a cooperative called Nghexana situated in Kildare A under Bushbuckridge municipality. This co-operative has even conducted field trials of maize with and without pitting, claiming increased productivity under the former. The farmers claimed to have learned both gelesha and pitting from their parents, suggesting that these can be considered indigenous (or endogenous) practices. However, other farmers claim to have learned about gelesha and other techniques from the white farmers, and some from their extension officers and agricultural advisors. One very interesting take on the benefits of Gelesha was recorded by Ms N Nxumalo in her Assignment 1: *"Most of the farmers had various benefits from the Gelesha practice. Land Reform producers responded that Gelesha, is used not primarily for the purpose of RHW&C for them it is mostly to minimise mechanisation in the wet field during the rainy season and to starve and reduce pests during the dry season, RHW&C aspect of it is a bonus"*.

Figure 3.14. Gelesha, Gert Sibande, Mpumalanga (NG Nxumalo, 2017)

Harvesting of roof water is another RWH&C practice which is quite commonly understood, with the greatest barriers to wider implementation simply being the cost of the material (gutters, downpipes, tanks, concrete bases, etc.), and, as evidenced by the experience of the Gert Sibande group (above) lack of the skills necessary to install the infrastructure.

Figure 3.15. Roof water harvesting, Mpumalanga Highveld (NV Nkosi, 2017)

Several groups identified the natural topography of the Mpumalanga landscape as lending itself to Dome (nature rocky outcrops) water harvesting, and farmers in the area have already been involved in capturing water from such domes, notably Mrs Moele at the Jubbelly fish and vegetable project in Bushbuckridge. This shows a quite sophisticated understanding of micro-catchments and water flow, although again, this is rarely articulated as such.

Greywater harvesting and *ad hoc* roof water harvesting through the placing of buckets and basins under roof run-off points are practiced quite widely, and it is claimed that: "*Some of them inherited from their grandfathers/mothers and the practise has been historically practised back in the days and carried over from generation to generation and are still practised to date. The so-called white farmers hired our great parents and they used the skills from these farmers for their farm practice."* This puts an interesting twist on the notion that the black African farmers must have learned from the white farmers, whereas it is here the other way round.

Less common, but still quite widely used are boreholes and wells, with one farmer digging his own well: "*He saw the opportunity to scoop the well because a portion on his farm is too waterlogged so by doing that (well) the water would fill up the hole he dug and it is currently working very well."* And further: *"He is also harvesting water by fertility pits and plant vegetables there. He uses the water to irrigate his plants and be able to support his family through production. He sells the vegetables to the community and donates to poorly disadvantaged families. The practice is very effective as he is still using the well today and it has not dried out from the drought. He is teaching or passing the knowledge to people who usually come buy straight from the farm and usually get the opportunity to see the well. He shares the information with his friends and farmers around him. During farmers' days where farmers usually meet to share the knowledge he also gets the opportunity to tell them the good things in rain harvesting water.*

Some farmers, including Mrs Mgwenya at Clau location, a rural community under the Mbuyane Tribal Authority, divert streams into their ponds, and also use water directly from the streams to water their crops.

A few farmers in Mpumalanga implement trench beds and mulching RWH&C practices, although this is not widespread, and farmers are keen to hear and learn about these and other RWH&C practices.

Certain individual farmers are clearly highly skilled in their harvesting and use of rainwater for their farming activities, and more than willing to share their knowledge with others. According to Ms Hlebela:

> *"Madam Mdluli is a farmer in Cunningmore B at Bushbuckridge who is minimising the use of borehole water by irrigating with water from a dam next to her farm. She has a borehole which was drilled and constructed by DARDLEA but she prefers to use the natural rain water from the nearby dam. Her commodities are vegetables (cabbage, onion, beetroot, spinach, tomato and chillies) and grains such as maize, cowpeas, groundnuts and jugo beans.*
>
> *She is currently working with her son, husband and other family members on the farm teaching them the ways to harvest and save water. She was in a project called Khanyisani with 4 members that had a well on their farm and decided to leave and farm on her own. The members of the project relied on her for assistance on ways of saving water. They used to give each other chances to irrigate so that water can fill up the well.*
>
> *This practice was hard for them because they could not irrigate on the time that they wanted. She shared the information with the project she was in before and now she is giving herself time to teach nearby farmers who are willing to learn from her. People working with her on the farm are also gaining knowledge and learning on the different ways to harvest rainwater."*

The sub-network teams have built on farmers' existing knowledge of RWH&C, and applied their own new understandings to introduce quite sophisticated practices, such as drip-irrigation, fed from a farm pond via a pump, on ridges constructed to reduce erosion on a slope.

Figure 3.16. Drip-irrigation on ridges, Itjhejo Agricultural Cooperative, Delmas, Mpumalanga (MB Shokane, 2017)

In Mpumalanga there certainly appears to be a good foundation of farmer knowledge on which to build understanding of RWH&C practices, and farmers who are both keen to learn more and to share their knowledge with others. This bodes well for future engagements between the university, the extension services and the farmers in the province.

3.4.5 Network interactions amongst key institutions/organisations/stakeholders in the local agricultural learning system in the area

Department of Agriculture and Rural Development and Land Administration (DARDLA) – DARDLA is headquartered at the Provincial Government Complex in Riverside Park, Nelspruit and administers extension services in the area, with various sector offices scattered across the city and districts. The DARDLA has a strong interest in supporting smallholder farmers, as well as household food production.

Sugar Industry: Tsano /RCI – Tsano/RCI is an organisation working with small-scale sugar producers to support improvements in their practices including in their use of irrigation practices. This is particularly important as conventional systems require electricity which is proving too expensive for these famers. Tsano/RCI is also supporting the farmers to diversify into vegetable production, an area in which RWH&C may well prove beneficial to them.

Ukulima Food Sovereignty – Ukulima is a Non-Profit Company (Section 21) that promotes food sovereignty through training and demonstration plots at its research Centre in White River, near Nelspruit. It promotes agro-ecology and RWH&C practices amongst women farmers groups, household food producers and small-scale farmers, and has expressed a strong interest in the WRC material and the RWH&C practices being promoted.

FET ATIs – there are FET ATIs in the area that are providing agricultural training, especially the Tompi Seleka Agricultural ATI in Limpopo and the Gert Sibanda ATI in Mpumalanga. These ATIs are also interested in further developing curriculum for RWH&C and improved agricultural water use.

AWARD (Association for Water and Rural Development) is an NGO based in the Limpopo Province which is implementing a large-scale USAID programme focusing on water, land and climate systems and climate change resilience. One of its key programmes is to support farmers' resilience to drought via use of climate smart agricultural practices and improved use of agricultural water, including RWH&C practices. AWARD is reaching out to farmers by connecting and networking the individuals, groups and communities that have managed to shift their thinking and practices. They are using a cluster program management system. Areas are identified geographically, survival means of households are assessed and livelihood gaps are identified. Through dialogue, they then help find appropriate synergy between indigenous knowledge systems and modern sustainable technologies, which leads to appropriate land use systems design to address the specific challenges and needs faced by each household and community, fostering resilience and stewardship (sustainable livelihoods) within communities. They work with 'lead farmers' who support networks of other farmers. They have also developed an innovative and practical monitoring and evaluation system for farmers to reflect on their practices and to improve them. The SSSLN had one of its meetings in Hoedspruit where it visited one of these sites, where the following RWH&C practices were observed:

Figure 3.17. Tower gardens, and shaded tunnels, with experiments being made between in-tunnel and outside of the tunnel practices; with mulching and diversification of crops.

Figure 3.18. Underground water storage systems, with furrows and filtering system, and mulching and raised bed construction

Mobile Agri Skills Development and Training (MASDT) – MASDT is a non-profit company that runs a training and incubator programme "to empower the Enterprise in all aspects of the value chain" (MASDT, 2016[18]). The training provides NQF level 2 certificates or Skills programmes in plant and animal production and new venture creation for agribusiness. They indicated interest in integrating a ToT in rainwater harvesting and have been very active in supporting the expansion of the SSSLN as it has been developing, offering also expert support and advice to members in the network.

[18] MASDT. (2016). *Annual review 2015-2016*. Nelspruit: Mobile Agri Skills Development and Training.

3.4.6 Existing linkages between the university and local stakeholder organisations

Table 3.3 Stakeholders and Linkages associated with UMP School of Agricultural Sciences

Stakeholder	Nature of relationship in existing linkage
DARDLA	Department of Agriculture and Rural Development and Land Administration
NGOs	Ukulima Food sovereignty: supported by Mr Viljoen at UMP; AWARD – supporting farmers to become more climate resilient
Local smallholder farmers	The irrigation section at UMP has links to smallholder farmers where students go for field work learning
Local Extension Offices	There is collaboration with the university on community engagement
FET	The university collaborated with at least two FETs in the province offering agriculture. There is also collaboration with Tompi Seleka Agricultural ATI in Limpopo and Gert Sibanda ATI of Education in Mpumalanga.
Business	The university is in contact with MASDT which is a non-profit company providing training and incubator programmes for farmers.

3.4.7 Current status of RWH&C knowledge and use for smallholder farmers and household food production in the university

The university has a programme focussing on irrigation management, and the lecturers indicate that there is need to strengthen the programme by giving more attention to irrigation efficiency, especially also in support of smallholder farmers. Until recently, little was done to include RWH&C in the curriculum, but after initial contact with the Amanzi for Food programme in the previous project, a lecturer in the university implemented the teaching of a course on rainwater harvesting that used the WRC RWH&C material provided by Amanzi for Food. This course stimulated the desire for more involvement with RWH&C practices. The university also conducted some practical work on rainwater harvesting with students working with farmers on their plots.

The university also has an active short learning programmes and community engagement division, and it is through this division that the Amanzi for Food programme is being rolled out. The intention is to embed the Amanzi for Food training programme into the University's short learning programme offerings, thus offering a longer-term support service to extension services in the province. Initial applications for the first programme showed a high level of interest in the programme amongst extension services, but also other training institutions and NGOS that are supporting farmers. At its Siyabuswa campus, the university is also implementing RWH&C demonstration site development to support education students who will work in local schools to develop knowledge and understanding of RWH&C practices that can support local communities as well as student teachers. As shown above, the university has plans for extending the scope of RWH&C knowledge into various aspects of the university curriculum and programmes.

3.4.8 Current status of RWH&C knowledge and use amongst multi-stakeholders, and interest in available WRC knowledge

The Ukulima Food Sovereignty NGO uses rainwater harvesting and conservation techniques of mulching and locally-adaptive seed-systems. Interest in extending their engagement with RWH&C knowledge and practices was indicated by a number of the stakeholders as follows in Table 3.4

Table 3.4 Current status of RWH&C knowledge and use amongst multi-stakeholders, and interest in available WRC knowledge at UMP School of Agricultural Sciences

Name of stakeholder	Current status of RWH&C knowledge and use	Interest in available WRC knowledge
Local extension officers	Knowledge RWH&C among extension supervisors and officers in minimal to non-existent except for the roof water harvesting using JoJo tanks.	Extension supervisors present indicated that farmers were struggling with drought and welcomed the idea of the ToT course to disseminate RWH&C knowledge.
Tsano/RCI	Limited	Keen to improve rainwater harvesting knowledge to improve sugar cane farmers' watering efficiency
Agricultural extension	Roof water harvesting familiar	Want to deepen and widen officers' and farmers' knowledge
Ukulima	Practice mulching and locally-adapted seed saving	Keen to develop own and farmers' knowledge of rainwater harvesting and conservation.
Provincial Department of Settlements	Roof water harvesting familiar	Keen to learn more on rainwater harvesting and conservation practices to integrate in settlement plans and improve household food security

3.4.9 Linkage to broader networks

The Mpumalanga SSS Learning network was introduced to the Climate Smart Agroecology Network through the Water Seminar held at UMP in July 2018. This network is primarily located in Mpumalanga and Limpopo provinces (primarily through the AWARD project), but also has connections in KwaZulu-Natal, through the WRC CSA project, and the Eastern Cape through the WRC Amanzi for Food project. It also includes members of national and regional networks, including the African Centre for Biodiversity (ACB), the AfriAlliance (an EU/Africa alliance for water and climate), and the WWF Green Trust Water Stewardship programme, represented by the Goromani Scheme in the Sabie river catchment in Limpopo. There are even links to global agro-ecological initiatives such as Via Campesina. Through these connections the members of the SSS learning network gain access to larger activist movements promoting the importance of sustainable agriculture and of smallholder farmers in feeding the growing African (and world) population. They can also engage in discussions

around a range of topics associated with RWH&C and related issues, and are informed of workshops and training programmes associated with these. Several SSSLN members have become quite active in these broader networks and share information from these with the local network.

3.5 Site 3: Taung ATI / North West ATIs / Dr Ruth Segomotsi Mompati District

3.5.1 General background information on the Taung ATI[19]

Taung Agricultural ATI was established in 1965 and has undergone several institutional and governance changes over the past 20 years. The ATI is situated at Greater Taung Local Municipality in North West Province at Dr Ruth Segomotsi Mompati District between Hartswater and Vryburg and about 30 km from Hartswater and 70 km from Vryburg. PH Moeketsi Agricultural Secondary School borders on the ATI's west side.

The ATI was previously known as L.M Mangope Agricultural ATI, and in 1994 the Taung Agriculture ATI Amendment Act No. 16 of 1994 changed the name of the body to "Taung Agricultural ATI" (DoA 1994). In 2002 the Taung Agricultural ATI offered a B. Tech in Agricultural Management over 3 years on behalf of Pretoria Technikon and was accredited at the same level as Technikon qualifications (Bapela and Mariba, 2002, p. 64). With the B. Tech the ATI also offered a Higher Certificate in Farming Management over 2 years. A provincial report (2002) indicates that these courses focused on skills relating to self-employment and employment in the public sector. There were a total of 35 students enrolled in 2002; 24 male and 11 females (Bapela and Mariba, 2002, p. 64). In 2002 the ATI lost its institutional accreditation from the Certification Council of Technikon Education (Department of Agriculture, Conservation, Environment and Rural Development 2009). Before the loss of accreditation, the trade union federation Cosatu led a march to Taung municipality in 2001 to protest against activities at the ATI. The North West Provincial representative for Cosatu, Solly Phetoe, commented on the loss of the ATI's accreditation to Farming SA. He said that "Corruption was rife at this ATI, and included theft of property from its premises" and the ATI stopped admitting agricultural students without informing or consulting the surrounding communities (Gwantyu, 2010).

After the loss of accreditation, the ATI offered vocational N3 to N6 programmes in Farming Management as well as Further Education Training (FET) for farmers. However, the vocational programme was discontinued in 2009 when new innovative educational programmes were developed (Department of Agriculture, Conservation, Environment and Rural Development, 2009).

A total of 200 students were enrolled at Taung Agricultural ATI in 2005. For the ATI as a registered and accredited agricultural ATI in 2008 (DAF 2008:19).

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[19] Information for this section of the contextual profile is taken from the PhD thesis of Wilma van Staden (2018).

Taung Agricultural ATI reopened in 2010 following the national transformation of ATIs of agriculture by DAFF and was ready to offer a Diploma in Agriculture specialising in mixed agriculture, effective from January 2010 (READ, 2016). About R3 million were allocated to the ATI to reopen its doors in 2010 (Gwantyu, 2010). Abrie van Vuuren was the Head of Campus during the reopening of the ATI. The Diploma offered at the ATI aligned with the Diploma in Mixed Agriculture offered at Potchefstroom ATI of Agriculture. According to Boitumelo Tshwene, MEC for DACERD in order to complete the upgrading process of the ATI, Taung ATI had to collaborate with Potchefstroom ATI in a sustainable partnership (Gwantyu, 2010). Seven (7) graduates graduated in 2012 with Diplomas in Agriculture, specialising in Mixed Farming (RSA 2012). Taung Agricultural ATI developed the National Diploma in Agriculture specialising in Irrigation in 2013. In December 2012 the ATI received candidacy phase accreditation from the Council of Higher Education and the qualification was then successfully registered with the South African Qualifications Authority (SAQA) (RSA, 2012). The acting Head of Campus at the launch of the Diploma in Irrigation in 2013 was Mr. F Klinck.

The ATI Head of Campus reports to the Principal also known as the Director of Structured Agricultural Training and Empowerment for The Department of Rural, Environmental and Agriculture Development (DREAD) for the North West province. The Director who reports to the Head of the DREAD, who in turn reports to the National Department of Agriculture, Forestry and Fisheries (DAFF).

During 2014 Taung Agricultural ATI received a R10 million donation from Haldor Topsoe (a global chemical catalysis company) to create a Centre of Excellence in Irrigation Technology. The ATI committed itself fully to this development which also included a soil science and water management laboratory of R3.3 million. The laboratory will be used for soil and water analysis for the ATI and farmers from the surrounding communities close to the Vaalharts irrigation scheme. The upgrade also included a specially designed multi-purpose truck termed “ATI on the Wheels” that will be used to access people who need services related to farming and farming management. This R1.1 million farmer training truck is fully equipped with TV/video, sound system, solar panel, and mobile stock handling facility while also including prepared training material in various languages (RSA 2015).

The ATI owns land for crop production and irrigation including 6 hectares for Horticulture, and centre-pivot irrigation plots of 30, 20 and 10 hectares. The dryland area covers 48 hectares. The ATI also runs a Tandem Dairy Parlour that is fully automated, a Broiler House, Layer House, a Piggery, a Small Stock unit, a Large Stock unit and 15 hectares of Paddocks. Learning resources include a Library centre with a study area for the students and a Computer room with the capacity of 40 students. There are 6 hostels with the capacity for 156 students. The Kitchen and Dining Hall can cater for 300. Various facilities for sports and recreational purposes are in place including a rugby field, a soccer field and two tennis or netball courts.

Taung Agricultural ATI is part of the Hartswater Irrigation Scheme that is a subsection of the Vaalharts Irrigation scheme. The Vaalharts irrigation scheme started in 1933 but were only completed in 1946. Bloemhof Dam was constructed in the 1970s to reduce the pressure on the Vaal Dam and feed the Vaalharts weir (Van Vuuren, 2010). Approximately 3 500 hectares are under irrigation in Taung area (READ, 2015, p. 31). Earlier year the irrigation scheme was used to grow mostly lucerne, ground nuts, potatoes, grains and vegetables, however in the

recent years farmers are successfully growing pecan nuts, cotton, olives, citrus, apricots, grapes, watermelon and peaches (Van Vuuren, 2010).

3.5.2 Taung ATI as a Learning Centre

Taung ATI aims to provide and facilitate education and training for all participants in the agricultural sector as stipulated by the Higher Education Act, 1997 (Act. No. 101 of 1997) as amended. The purpose of the ATI as outlined in the Prospectus is to "provide accredited higher agricultural education and training towards pioneering sustainable enhanced agriculture" (PAC, 2009 & 2014). The ATI comprises various sections and managers of Irrigation, Engineering, Economics & Information Technology, Animal Production, Crop Production, Farm Management, Corporate and Student Admin. A total of 102 personnel is required to form the full quota of staff for the ATI. An estimated 89 staff members are currently employed (F. Klinck 2017, personal communication 30 March 2017; also include the prospectus reference). The farm section has the highest number of staff (28 personnel), followed by student administration staff, while the technicians have the lowest number of staff. Academic staff consist of 15 lecturers.

The ATI still offers the National Diploma in Agriculture specialised Irrigation accredited by the Council of Higher at NQF level 6 (RSA 2012; TAC 2014). The Irrigation Programme is a unique course and currently Taung Agricultural ATI is the only institution in South Africa offering the Diploma in Irrigation. Ten (10) students were conferred with Diplomas of Agriculture specialising in Irrigation in May 2016 (Dean 2016). This Diploma consists of 360 credits and is completed through two and half years on campus with theoretical and practical learning, and 6 months of experiential learning on a farm or other relevant practical institute.

The curriculum is divided into four departments which each specialises in a specific subject area. The departments are Irrigation, Crop Production, Farm Management and Animal production. There are no short course enrolments or short course programmes presently established. Table 3.5 lists the subjects under each department (TAC 2013).

Table 3.5 Academic departments and Core Subjects at Taung Agricultural ATI

Department	Specialised subjects	
Irrigation	Fundamentals of Irrigation Hydraulics and Flow Measurement Irrigated Pasture Management Evaluation of Irrigation systems Irrigation Equipment and System design Automated Irrigation Systems Drainage System and Design	Soil and Water Conservation Natural Resource Management Chemigation Irrigation Management Irrigation Management Practices Irrigation System Evaluation Maintenance of Irrigation Dams
Crop Management	Agri Botany Soil Science Veld Management Crop Protection Soil Fertility Soil Survey	Vegetable production Winter Crop Production Fruit Production Summer Crop Production Chemigation Evaluation of Irrigation Systems
Animal Production	Anatomy & Physiology Pig Production Small Stock Production	Beef Cattle Production Poultry Production Diary Production
Farm Management	Agricultural Economics Computer Applications Agricultural Marketing Agricultural Financial Management	Rural Development Agri-business Management Research Principles Farm Trades

These subjects are presented in 5 lecture halls with the capacity of 30 to 50 students and the ATI also has an Exam hall with the capacity of 100 students. There are 3 Laboratories on the campus grounds for Soil Science, Animal Science and Crop Science. Practical workshops that the ATI presents for the students include Arc-welding, Gas welding, Carpentry and Mechanical workshops.

The assessment policy for the Diploma in Irrigation is informed by the following policies and requirements:

- SAQA policy document on Criteria and Guidelines for Assessment of NQF Registered Unit Standards and Qualifications (SAQA, October 2001)
- Requirements and guidelines for education and training quality assurance bodies: Establishing criteria for registration of assessors (SAQA, February 2001)
- Assessment practices and procedures for outcomes-based education and training (SAQA, October 2001:7)
- The HEQC Institutional Audit Framework (HEQC, April 2004)
- HEQF Implementation Handbook (CHE 2011)
- The Council of Higher Education Improving Teaching and Learning Resource (CHE 2003); and
- The NQF Act (2008)
- Taung Agricultural ATI Vision, Mission, Corporate Goals and Strategic Objectives

The policy objective is the foundation for the assessment of students' performance in modules/courses and is a key component of the ATI's teaching responsibility. The ATI design the process of assessment as an educational tool to teach appropriate skills, knowledge, values and attitudes within the framework of educational standards to achieving the following goals:

- *To set educational standards;*
- *To determine minimum levels of competence;*
- *To provide a measure of student ability for future employers;*
- *To determine whether students have met the outcomes of a module/course;*
- *To inform students of their competence;*
- *To inform academic staff about the quality of their instruction and to foster ongoing development thereof;*
- *To contribute towards the evaluation of a course;*
- *To detect learning problems;*
- *To contribute towards decision-making related to student progress;*
- *To provide students with feedback on their progress; and*
- *To inform curriculum development and review.*

The assessment at the ATI is based on the Learning Outcome assessment procedures which include a variety of assessment methods including: tests; examinations; practicals; reports; oral presentations; portfolios; posters; case studies; projects; observations and essays. Students are frequently assessed by using integration of knowledge, skills, values and attitudes across the assessment tasks. The ATI uses formative assessment, continuous assessment and summative assessment methods of assessment. Formative assessment is assessment which is conducted during instruction to provide students with feedback about what learning they have achieved in order to improve their competence as well as to improve the curriculum, while summative assessment is assessment conducted at the end of a module/course/programme to determine a student's level of performance.

Taung Agricultural ATI has aligned itself from a traditional base of learning programmes towards a transformative outcome-based education (OBE) approach (Prospectus: Quality assurance, design development, delivery and evaluation of training programmes, assessment and off-site work Page 4). All learning programmes are accredited by the SAQA or relevant SETAs for quality assurance. To initiate a curriculum development process for accredited programmes the ATI works closely with external specialists.

3.5.3 Educator/Learning Facilitators Knowledge of RWH&C practices

An extensive study was undertaken by van Staden (2018) which showed how educators' knowledge of climate smart agriculture, including RWH&C practices could be expanded via use of a reflexive monitoring tool, and identification of possible change practices in the curriculum. Some of the highlights of this study which was oriented towards supporting curriculum innovation show that curriculum innovation is shaped by diverse contradictions in the agricultural ATI system (see box below), but that if supported, lecturers can begin to plot 'ways forward' within such a difficult system. The results also show that the Amanzi for Food network is an important contributor to the resolution of some of these contradictions as was also found to be the case with the Fort Cox ATI of Agriculture (Pesanayi, 2019).

Table 3.6 The Innovation Plan modelled during the third Intervention-innovation workshop of Case Study One (Van Staden, 2018)

EXTRACT from the PhD thesis of Van Staden (2018) undertaken at Taung ATI of Education.

- **The Amanzi for Food programme provided the impetus and funding for this study, which lecturers at the ATI indicated should not only be on RWH&C, but on Climate Smart Agriculture, in which RWH&C has been identified as being an important new curriculum innovation to be pursued. The study provides helpful insights into the current context of curriculum innovation in ATIs.**

Contradiction between the demands of the academic programme versus the inclusion of relevant practical components:

- Lecturers stated that students needed more practical time (50:50 ratio to theory and practical) to be prepared for the outside world. At the workshop a timetable was considered with 60% theory and 40% practical. However, even with this schedule, the practical component was difficult to uphold.

  Participant 45: *The practical component of the programme needs to become more necessary and the focus must shift to the competencies in practical components.*
- The practical component of the Diploma is of utmost importance, but the practical aspects of the Diploma were assessed theoretically through a written examination with no practical component as mentioned earlier. The students do not practically have to show that they have attained the acquired knowledge and developed the necessary competencies, they just needed to be able to explain the practical process during a written exam. The lack of practical assessment within the Diploma also leads to students lacking the motivation to attend or participate during practical sessions, as mentioned. Lecturers were not only teaching, but also preparing practical sessions. The preparation of practical sessions was time consuming. This developed into stressful situations as the lecturers' struggled to complete the practical component of the curriculum, whilst also having to struggle with lack of participation of the students.

  Participant 47: *We are trying to encourage the younger students to do practicals. But, on the other hand our curriculum on theory in class, is very huge. They will have to do an overview on some work and not in depth, so there is enough time to do practical components.*
  Participant 53: *We have basically registered the programme, 60% theory, 40% practical. But at this stage, I don't think we are getting to that point. I think this is something that we will have to correct. I think we spend too much time on theory in class and not enough on practicals. I think the majority of staff was also not so fortunate to have that practical farming experience.*
- Within this contradiction, the transformation of Agricultural ATIs to Agricultural Training Institutes is also a tension. The ATI is a centre of excellence (Agricultural Training Institute in Higher Education) in practical application of modern commercial agricultural theory specialising in Irrigation. The ATI is shifting to higher education; once that happens the ATI will no longer report to DAFF and will instead be accredited by the Department of Higher Education (DHE). The ATI staff also expressed their concerns that the shift can lead to less focus on the practical component of the Diploma and more theoretical components.

Contradiction between the current state of flux: Institutional development versus innovation

- It was noted that the ATI activity system is undergoing structural changes (the expected change from Agricultural ATI to Agricultural Training Institute) and rule changes (policy shift to include Climate-Smart Agriculture as a climate response) that affected the character and

relevance of the object of the system. The system requires the curriculum and learning practices to support adaptive change to the Climate-Smart responsive approach with a solid relevant object and outcomes. Once Climate-Smart Agriculture was identified as a provincial response to climate change, the ATI realised that they also needed to integrate these policies and approaches. The proposed object of innovation stood in contrast with the existing ways of developing curriculum in an institutional context that was in continuous flux. The whole National Diploma programme changed in 2014. The North West Agricultural Strategic Plan has also included new strategies and policies that need implementation and adaptation within all the subsystems within the provincial Agricultural System. The head of campus has changed three times since 2013 (TAC, 2014) and the Principal of the ATIs in the North West resigned in 2016 and was replaced in 2017. Many staff changes occurred (six new lecturers joined the team, see Section 6.4) during the study and most of the new lecturers do not have the practical agricultural experience to maintain this component of courses.

Participant 51: *The problem is that many of the lecturers themselves do not have any practical farming experience and come from universities of other institutions with no farming background.*

- The immanent transformation of the Agricultural ATIs to Agricultural Training Institutes (ATI), had an influence on the curriculum and curriculum innovation during the study. The Agriculture Training Institutes (ATI) are the country's unique key to integrate the agricultural practical and theoretical sides. The Institutes focus on developing scarce practically oriented knowledge and competencies (DAF, 2008). There are direct objectives for the ATI to follow to develop into an Agricultural Training Institute.

These include:

- Within its earmarked field of specialisation each ATI should be developed and capacitated to become a Centre of Excellence. This implies that it will develop a pool of staff with specific expertise in the functional field;

- it will establish and develop its infrastructure, facilities and equipment to world class standards within the functional field;

- it will offer a range of programmes that caters in the needs of all farming sectors in the field (from short courses aimed at emerging farmers to highly specialised courses for the commercial sector);

- it will undertake applied research in the functional field; its programmes will also consider upstream and downstream (agribusiness) opportunities in the field, it could render a farmer consultancy service within the field, etc. (DAF, 2008, p.196)

- The continuous changes within the components of the system including policy changes, curriculum content changes, staff changes, system driver changes, leadership changes and student aspiration changes lead to the fragmentation of the system and the object of the system becomes fluid and unclear. Within this state of flux, the lecturers' role was also changing and more responsibilities outside the perimeter of education and training were expected from the lecturers. The ATI is assisting with other departmental projects.

  Participant 37: *I think the contradiction that we are dealing with here is exciting and worrying at the same time, we used to be the teachers in the ATI, but now we are also project managers in an institute. So, the question is how the ATI gets the balance between practical teaching ATI and a development agency, to research and supporting developmental projects, including students.*

Participant 51: *Instead of having four different departments, one needs to say let's have a Head of Department for academics. Clearly indicate that you have your Head of Department in academics, and then you have a Head of Department or manager for these other projects. We were not really involved in the project, but now we are and the project is running. And I mean, you get calls 24/7 from the Chief Director.*

- Time also became an issue, as there is not enough time to complete all the tasks and fulfil all the roles expected of the subjects.

Participant 45: *There is not enough time to do practical sessions.*
Participant 51: *We are currently overloaded and overworked. Now they are pushing us all the way, because they want this thing done.*

- The contradiction is embedded in the system towards innovation versus system in flux. An innovation plan for contradiction five was difficult to compile for the workshop participants as how do you model a plan to innovate a system if the system is in flux? From these contradictions, the main question that developed was:

- What curriculum and institutional innovations towards climate-smart responsiveness are necessary and possible within Case Study One's activity system within a state of flux?

- From this point, the participants compiled an innovation plan that could guide them towards Climate-Smart responsive curriculum and teaching practices. Box 6.4 is the innovation plan that the Case study participants formalised for the ATI staff, practical components of the curriculum and the students.

- **Innovation Plan**

- An innovation plan for contradiction four was modelled, but workshop participants were unsure how to devise a plan to deal with the realities of institutional flux they were experiencing. For that reason, an innovation plan for Contradiction 5 was not developed during the third workshop and instead a general "the way forward" Innovation Plan was structured that outlined the object for the staff, the practical components of the curriculum and the students.

- Box 6.4: The Innovation Plan structured for contradiction four during the third intervention-innovation workshop

Contradiction 4: Contradiction between the demands of the academic programme and the inclusion of relevant practical components

- Presently the time table is 60:40, but that practical component is even difficult now to uphold. More practical is required in the program (50:50 ratios to theory and practical).
- Practical component of the program needs to become more necessary and focus must shift to competencies on practical components.
- *INNOVATION PLAN:*
  - Practical components of the Diploma need to be practically assessed.
  - 3rd year students can be first year tutors at the practical components. Gives students a sense of achievement and contribution. Introduce a system of mentoring the first years.

Staff	Train staff in Climate-Smart Agriculture. Lecturers should articulate Climate-Smart Agriculture between the subjects by integrating relevant topics into their specific subject content, teaching and learning practices. Lecturers must be the example to the students and implement Climate-Smart Agriculture policies and principles on campus. Provide postgraduate degree funding for projects aligned with Climate-Smart Agriculture.
Practical components of the curriculum	Include Climate-Smart Agriculture practices in the practical assessment of 1st year students. Incorporate different irrigation methods with irrigation demonstration sites with the rural delivery system that can assist the community. Practical components of the Diploma need to be practically assessed.
Student aspirations and alignment with curriculum	Career counselling Have a day orientation to make sure that the students that register are serious about agriculture. As part of the registration process, students need to write an essay on why they want to complete a Diploma in Agriculture and which specialty are they interested in. Invite motivational speakers, such as successful young farmers and agricultural entrepreneurs, to come and speak to the students to inspire the students. 3rd year students can be first year tutors at the practical components.

Summary of workshop outcomes

As the "the way forward" Innovation Plan was discussed, the conversation turned to the fact that little Climate-Smart curriculum innovation had occurred within the system in the past two years. The workshop participants who had been participating since the preliminary consultative workshop felt that during each workshop, solid innovation plans are developed, but never fully initiated or applied. However, there were specific changes that had occurred during the two years, namely:

- Participant 47 included rain water harvesting and conservation into the practical component of his subject, drawing on the Amanzi for Food programme and WRC material (shared on the A4F website).
- Many of the workshop participants are involved in the Food in Developmental State project of DAFF.
- Participant 51 is establishing learning networks between the ATI lecturers, farmers, community media, extension officers and students to support students in developing sustainable agricultural practice.
- The Climate-Smart awareness programme was established again as part of the learning network development.
- The Irrigation Department included Climate-Smart Irrigation methods into the practical component of their courses.
- Use of the Climate-Smart Tool gave the workshop participants a better grasp of climate concerns and the agricultural practices associated with this approach in an Agricultural Innovation System.
- Communication between the ATIs and other agricultural organisations was established through the Amanzi for Food National workshop (end of Phase 1 A4F programme).
- Most of the participants attended the Intervention-innovation workshops and remained engaged in the curriculum innovation process despite setbacks and challenges.

- Online Climate-Smart Innovation Tools were developed to assist the lecturers to review individual lecturers, management and Departments' Climate-Smart responsiveness and the tool was utilised as a reflexive tool that provides additional opportunities of self-development of knowledge and competencies.

These findings indicated that even though institutional change was difficult, many workshop participants initiated or were involved in some sort of innovation during the expansive learning cycle over the three intervention workshop sessions.

One of the key issues identified by this study was the need for more intensive training on specific RWH&C practices. The ToT programme of the WRC Amanzi for Food project was facilitated in response to this need.

Although it had been hoped and intended that representatives from TAC partner organisations (as identified in the hypothetical TAC learning network map, section 4.3, below) would also participate in the course, in the end only staff and students from the TAC itself were involved. Despite the inherent limitations with such a relatively small range of participation, a strong dynamic developed between the lecturers, students and farm and technical staff who attended. It appeared that they had previously had little opportunity to work together and took advantage of the course to forge partnerships within the ATI. This was supported by the creation of working groups within the course comprising members from each of these sectors. These working groups, as part of a group exercise, went on to develop initial ideas for productive demonstration sites for the ATI grounds, some of which were subsequently implemented.

Of some 35 people who attended the course, 23 submitted assignments, with 9 achieving the required standard for certification. The assignments provided insight into the understanding of RW&C practices developed through the training, and through the interactions with the facilitators and colleagues.

The key outcomes of the course are described in some detail in Deliverable 6 of this project, and in relation to the ways in which the new knowledge of RWH&C was assimilated where it says:

> *There was recognition that RWH&C practices may not be immediately appealing to the commercial farming sector, although there is recognition that the water from the Vaal River, which is used for the irrigation systems, is very polluted. The new information from the WRC material, and shared in the course, appears to have provided an opportunity for stronger engagement with local small-scale farmers and household food producers, with whom this information and these ideas can be shared further.*

In relation to the building on existing knowledge the analysis showed that: *Although there is a considerable gulf between the underlying philosophies of RWH&C and conventional irrigation practices, discussions helped to identify the potential synergies. Basic understandings of soil and water management, from more conventional perspectives, were well reinforced through the deeper understandings of these required for RWH&C.*

The assignments suggested a range of practices that might be suitable for farmers and others in their area to implement, with greywater harvesting (much discussed during the course), mulching, and deep trench beds being the most popular, with diversion furrows leading to small dams and ponds, and roof-water harvesting also receiving considerable attention. The focus for most participants was therefore on relatively small-scale, low-cost practices that were feasible for the poorly resourced farmers with whom they intended to work. The following extract from the introduction to one assignment (NW4) summarises this approach:

> "The Water Harvesting and Conservation assignment is an assessment guide serving as a response to what I have learned at the Amanzi for Food workshop. It is where I have gained most of the information regarding water harvesting and conservation and the establishment of the new learning network #PULA_WISE. This assignment may also serve as a study guideline to students who will be learning about water harvesting management and also to the farmers so that they can work on a low cost when coming to the water bill so that he could irrigate. Water harvesting nowadays is very significant in such a way that the North West province (for example) is a semi-arid area receiving summer rainfall of which nowadays is late summer rainfall, conserving water could be essential for when the rain is not there so that we could be able to irrigate our crops and be able to recycle the grey water and reuse it again since water nowadays is a scarcity. The course taught a lot about different ways on how to harvest water like grey water harvesting, rainwater harvesting and storing water in the soil and then do mulching to prevent evaporation from the soil."

This extract is also interesting as it suggests that the assignment itself can be used to provide information to students and farmers.

In terms of integration of RWH&C into the existing TAC curriculum, the lecturers were very clear in how they saw this being done, from NW1:

> *"The aspects of Rainwater Harvesting and Conservation (RWH&C) will be integrated into the Taung Agricultural ATI curriculum by integrating them into a number of different modules with relevance to RWH&C; this means that relevant RWH&C practices will be covered (incorporated) in different (not all) modules in the curriculum for the 3-year Diploma in Agriculture in Irrigation.*
>
> *By so doing, the curriculum review process (which is a lengthy process) will not be necessary like when you are introducing a new module which will cover all the RWH&C practices in detail. However, it will be necessary to review the course content and include all the necessary information on the modules. A disadvantage to this type of integration is that justice won't be done to RWH&C practices in a sense that only limited information will be covered in the module as there are various topics that need to be discussed. But not all RWH&C practices will be covered in one module, therefore those can be covered in detail."*

And from NW2:

“According to the Taung Agricultural ATIs’ Teaching and Learning Strategy, the ATI recognises the current climate changes which lead to erratic rainfall in South Africa, as well as the need for water resources conservation.

The modules within the curriculum also aligned with this strategy, modules such as:
• Irrigation water management (second year)
• Soil and water conservation (second year)
• Natural Resource management (first year)

Taung Agricultural ATI allows the lecturers offering the modules to add information on current trends that are to be taught in class, this provides an opportunity to include the rainfall water harvesting practices into existing modules.”

The #PulaWise network has commenced implementing some of the practices identified during the course as productive demonstration sites on the campus. These include large trench beds and a tower garden.

Figure 3.19. Preparing a large trench bed on the TAC campus, using waste from maize harvesting as an organic material layer

3.5.4 Farmers knowledge of RWH&C practices

There has been little interaction between the ToT course participants and their local farmers, and none of the latter have as yet become members of the #PulaWise learning network.

3.5.5 Other key institutions/organisations/stakeholders in the local agricultural learning system in the area

These organisations, identified by Taung ATI staff, have some interaction with the TAC, and the intention was to bring them closer together through the learning network. At the time of writing it appears that the network is barely functioning, and few of these prospective partners have been engaged.

- **Taung Irrigation** is a section of the Rural, Environmental and Agricultural Department of the North West province which manages the irrigation scheme. It governs the distribution of water to the various hydraulic units and individual plots alongside the Irrigation canals. Taung Irrigation manages the farmers, determines irrigation times, advises farmers on irrigation methods and maintains the water distribution system.

- **Primary Agricultural co-operatives and Secondary Agricultural cooperatives** – These cooperatives consist of a collaboration of individual farmers working together towards the same goal managed by the Taung Irrigation. Collaborative arrangements benefit the farmers though easier market access, for both inputs and outputs.

- **Biocontrol** – BioControl Laboratory's mission is to assist traditional farming practices to move towards sustainable biological farming. Biocontrol currently has agents working with the farmers of the Hartswater Irrigation scheme. Biocontrol proved to be a great asset in the learning network as it brought sustainable pest control knowledge into the learning network and has provided considerable assistance in the fight against the Fall Armyworm that has caused a lot of damage in crops within the Hartswater irrigation system.

- **Agricultural Extension Services** – Extension officers in the district: The closest extension office is in Vryburg. There are 20 extension officers assigned to the Great Taung district.

3.5.6 Existing linkages between Taung ATI and other local stakeholder organisations

The ATI works closely with Taung Irrigation as Abri van Heerden, the previous campus head of Taung ATI is now a manager of Taung Irrigation. The water and soil laboratory that can assist farmers in sample analysis is a link between the local farmers and the ATI. Biocontrol is sharing information on natural control of pests within the Taung area that can empower all the farmers and others within the learning network.

3.5.7 Current status of RWH&C knowledge and use for smallholder farmers and household food production in the ATI

Food security and homestead farming is covered to a limited extent in subjects such as Natural Resource Management, Soil and Water Conservation and Rural Development. A RWH&C awareness programme was initiated in November 2016 on campus, when RWH&C literature and flyers were handed-out to students and the RWH & C material made available in the library. As the ATI together with the surrounding agricultural communities are linked to the Taung Irrigation scheme, and have seemingly unlimited access to water, Rainwater Harvesting is not seen as a priority. However, the water conservation methods through alternative irrigation is a priority for the ATI. No Rainwater Harvesting practices have been implemented on campus, but conservation practices have been implemented in the third-year student vegetable garden practicals.

Taung ATI have visited the WRC for support for their irrigation teaching. They have also met with the Fort Cox ATI of Agriculture Lecturers involved in the Amanzi for Food Programme. There was a strong interest in developing their capabilities for irrigation efficiency, rainwater harvesting within a wider frame of climate smart agriculture. The next period of the project will work more closely with mobilising these initial starting points.

3.6 Multi-Stakeholder Learning Network Mapping in the three sites and Learning Networks over the three-year period

The multi-stakeholder learning network maps that are presented below should be read as emerging learning network maps only; The IBLN Network Map has been updated recently, but it was not possible to do this with the SSSLN or the #PulaWiseLN due to the Covid pandemic. They have been expanding via the Training of Trainers programme and as other participants join the learning networks. A new methodology was introduced for mapping and understanding the relationships in the learning networks which substantially enriched our understanding of the learning networks and how they are operating (note: these are still ongoing).

3.6.1 IBLN (Eastern Cape) Learning Network

- *INITIAL PICTURE*

The Fort Cox AFTI, supported by the ELRC, became the coordinating hub for this learning network, which initially comprised mostly farmers and others involved in the first ToT course facilitated in 2017-2018.

Very soon many other key stakeholders showed willingness to participate in the Learning Network and in the Amanzi for Food Training of Trainers and other network activities. This expanded the reach and influence of the learning network considerably. These key stakeholders included:

- **Raymond Mhlaba Development Agency (RMDA)** [former NEDA] (under LED office). Willing to involve farmers in its smallholder farmer development programme value chains and its student learnership programmes in the course and learning network meetings and activities.

- **University of Fort Hare:** willing to develop a demonstration plot, and to do curriculum innovation in RWH&C and student entrepreneurship.
- **Raymond Mhlaba Farmers Association:** willing to continue involving more farmers in the ToT Course and learning network.
- **Raymond Mhlaba Municipality Agricultural Forum:** Willing to join and participate in the ToT course and learning network.
- **Lenye youth:** this youth group based in Lenye Village, Qoboqobo (Keiskammahoek) willing to improve its water for food knowledge and to participate in the learning network.

The figure below illustrates the learning network map at this stage, with the Agricultural Training Institute and the farmers' association at the centre.

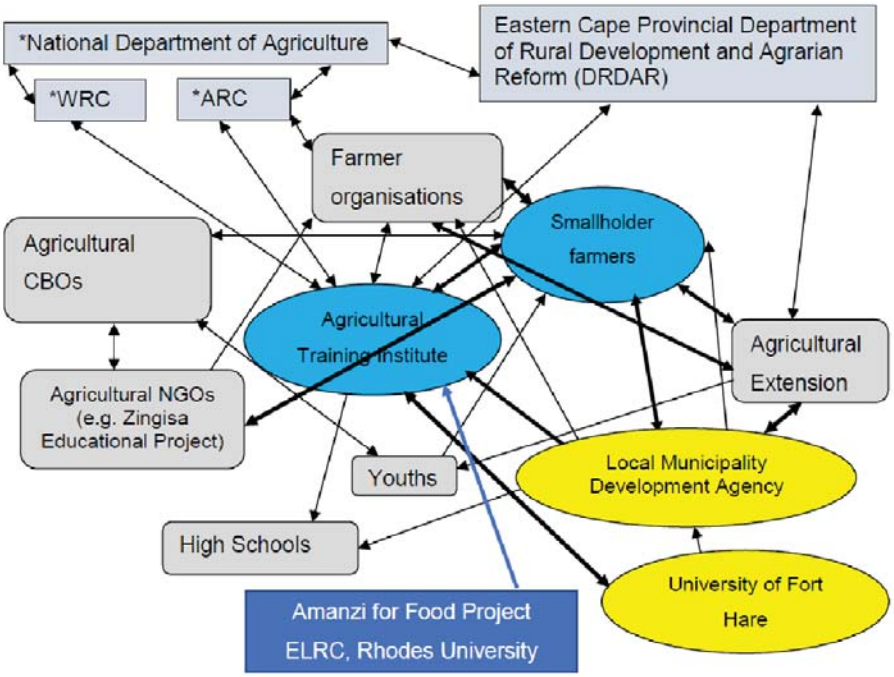


Figure 3.20. Early iteration of the Imvotho Bubomi learning network in Amathole District Municipality, Eastern Cape

3.6.2 Introduction of the net-mapping process[20]

Having identified a need for deepening the analysis of the networks, it was clear that a new methodology and approach was required. It was vital, in order to cohere with the participatory ethos of the project, to seek out an appropriate participatory methodology for this analysis. This was provided in the form of the Net-Map interview-based tool, in which different actors within networks could be asked to give their perspectives on the shape of the network and the degree of influence of each stakeholder. A series of net-mapping interviews were held, in the

[20] This network mapping work was introduced into, and developed in the IBLN and Amanzi for Food project by post-doctoral scholar Dr Luke Metelerkamp, who had pilot tested the method in his PhD study. He has since published guidelines for others to use this approach (Metelerkamp, 2020), and has also supported numerous team members in the Amanzi for Food programme to use this approach.

field, with a number of IBLN members. It had been the intention to follow a similar process with members of the SSSLN in Mpumalanga, but with the advent of the Covid-19 pandemic, it was not possible to travel to that province or meet up with any members. Nor was it possible to do this in the #PulaWise Network context. However, the insights from the IBLN offer enough insight into how this approach can be developed and used for mapping of Learning Networks in rural agricultural contexts.

Figure 3.21. A net-mapping interview and activity in progress in the IBLN

Through this process it emerged that the tool could also be used reflexively for supporting evaluative review and analysis of the networks. For example participants in the IBLN interviews noted that those who have not been strongly linked into the network via WhatsApp have tended to be 'left out' of some of the network activities. This new understanding led to the development of alternative strategies to include these members. The maps are also showing how important the WhatsApp tool has been for maintaining and extending network relations. An academic paper concerning the dynamics of such networks is in preparation, and a booklet 'Guidelines for Establishing and Supporting an Effective Learning Network' has been produced.

3.6.3 Brief Summary of Net-Map method

Net-Map was developed to better understand multi-stakeholder networks by gathering in-depth information about resource networks, goals of actors, and their power to influence system outcomes (Schiffer & Hauck, 2010). The Net-Map process supports network actors to surface their invisible webs of relationship and exchange by directly indicating who the relevant actors are and the ways in which these actors are connected to one another. Unlike systematic literature reviews and interview analyses (e.g. using Atlas TI) undertaken in other studies into knowledge and information brokerage (Kilelu et al., 2011, Klerkx et al., 2009, Geels, 2014), Net-Map enables an empirical cartography of the actor networks and power dynamics which constitute a given network.

This new process of network mapping was introduced to capture relations between these different stakeholders. The aim was to gain more insight into relationships, time-space dimensions, connectivity, and durability of network relations (amongst other insights) from this analysis, thus deepening our understanding of the social learning networked approach to knowledge flow and dissemination.

3.6.4 Net-Map interview process

The Net-Map interview process was conducted with 9 members of the IBLN. Each interview lasted between 1 and 2 hours and was conducted at the respondent's place of work; a farm, the Fort Cox AFTI, or the respondent's home.

A clear prompting question: "*Which actors are involved in the learning network and how are they connected?*" was required to demarcate the boundaries of the Net-Mapping process for participants. Working together on a large sheet of paper, interviewees and the interviewer drew up network maps according to their own perceptions by working through the following four steps:

1. Listing actors into one of 5 colour coded categories
    a. Farmers
    b. Community & Family
    c. Agricultural Training Institutions
    d. State Services & Extension
    e. Other

2. Identifying forms and directions of exchanges/connections using one-way or two-way arrows according to one of 5 colour coded categories
    a. RWH&C issues
    b. Practical farming issues
    c. Farmer Activism
    d. Personal time and energy
    e. Other

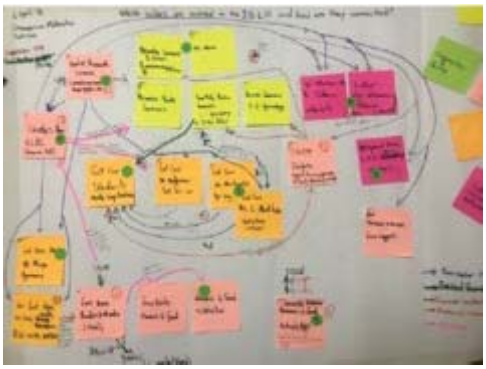
3. Attributing weightings to actors based on their contribution to the network

4. Reflecting on the network structure with opportunity for amendments

3.6.5 Summary of Amanzi for Food IBLN Net-Maps to date

Nine Net-Mapping interviews have been conducted with IBLN members in the Eastern Cape. Initial findings from this process of network mapping indicates that, while all actors agreed on the network's existence, no two views on exactly *who* constituted the IBLN were the same. This suggests that while it is tempting to think of a learning network as something which one is either part of or not, in reality the boundaries of inclusive, collaboratively-owned networks are highly subjective. They also change continually over time. These differing perspectives are clearly illustrated in the following net-map figures:

Net-Map 1. Mr Magomani – Fort Cox ATI



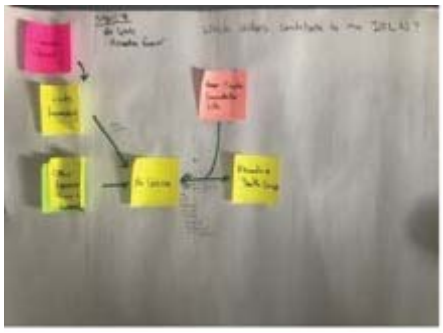
Net-Map 2. Mr Matambo – Fort Cox AFTI

Net-Map 3. Mr Dubasi – Middledrift Extension Co-ordinator

Net-Map 4. Mxumbu Youth Group

Net-Map 5. Mrs Biko, Dimbaza Farmer

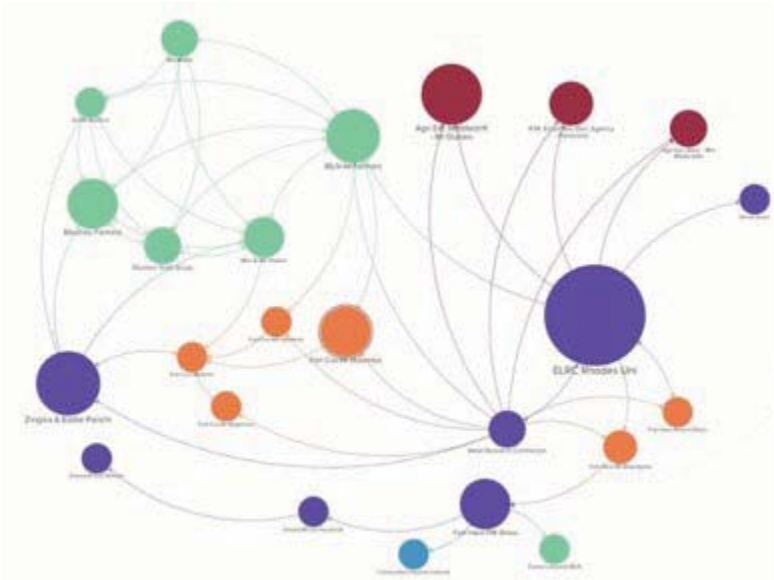
Net-Map 6. Mrs & Mr Peter, Farmer/Activists



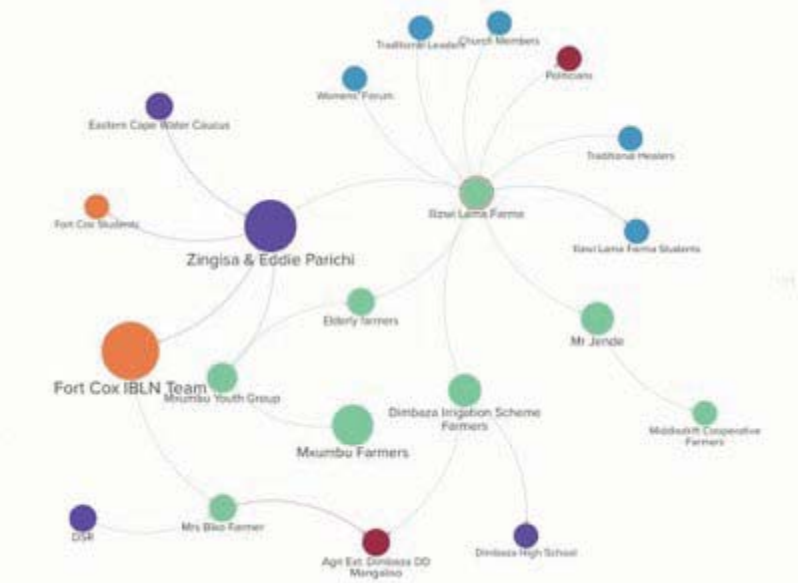
Net-Map 7. Mr Gova, Mxumbu farmer Cooperative

Net-Map 8. Mrs Maso, Seven Stars Dairy

Net-Map 9. Lawrence Sisitka, ELRC



Respondent 2, Fort Cox AFTI faculty member who plays a role in convening the network indicating central role of the learning institutions in the Learning Network



Respondent 5, farmer heading up a local farming collective showing connection to the FCATI and other central NGO groups and the farmers association in Learning Network

Figure 3.22. Amanzi for Food IBLN Net-Maps

3.6.6 Reflections on the process

The contrasts between the different maps is quite striking, which suggests strongly how subjective the experience of participating in the learning network is. For example, who constitutes the network, how these actors are connected and the value of the contribution each actor makes differs dramatically depending on who you are in the network.

That said, a number of key players repeatedly emerged as being richly connected and influential within the IBLN. These included a number of prominent farmers and the ELRC at Rhodes University as well as recognising the vital role which dedicated Fort Cox faculty members continue to play in the convening and providing continued motivation for the network members. Beyond a small number of central actors, the boundary of the network appears porous, gradated and changed over time. While it is tempting to think of the network as something which one is either part of or not, the flow of knowledge both in and out of the network, particularly around the fringes challenges this notion. Learning which began with the more central original actors of the network overtime began to be transmitted outwards as the following two things happened:

1. The networks and in particular practical demonstration sites garnered the attention of new actors.

2. Actors who had gained new knowledge from participating in the networks began to share their new insights and experiences with others.

Examples of this were the integration of new WRC material into ATI curricula by the faculty as well as the development of extended community training programmes by youth groups and others who had joined the learning network.

Respondents' reflections on what seemed to have helped catalyse the networks indicated that the both the course-activated learning and practical demonstration sites played central roles.

The IBLN Net-Maps also highlighted the importance of a) having things to share, and b) the platforms through which to share and communicate swiftly and simply across the networks. This is evidenced in the importance actors attributed to the WhatsApp group as well as Forte FM, the local community radio station which provides the network with a free slot each month to share its perspectives and insights with the broader community in which it was situated.

3.6.7 Changes over time and further analysis

Although the Net-Maps (above) were each produced at one point in time, and summarised the perceptions of each person involved in the mapping at that point, an attempt was made on a few maps through the 'weighting' process to explore what changes may have taken place over time; in particular looking at the relative contribution and influence of different actors. For instance, on Mrs Biko's map the Zingisa NGO is weighted at 3 in both 2017 and 2019, indicating that its contribution to and influence on the network (or on Mrs Biko) have remained consistently strong. Over the same period, according to Mrs Biko's perception, the influence of the extension officers has waned a little (from 2 to 1) and a Fort Cox lecturer has strengthened their influence (from 1 to 2). Similarly, while students were weighted at 1 for

2017 they were given no weighting for 2019, while elderly farmers who did not feature in 2017, were weighted at 1 in 2019. As with the other perceptions, the analysis of changes in contribution and influence varied considerably depending on the perspective of the mappers. This suggests that each member connects with other members and derives benefit from the network in quite different ways.

Such a high degree of subjectivity in experience and perception poses interesting challenges for future analysis, as it appears that there is unlikely to be great consistency across the membership. This is exacerbated by the fact that the membership itself is constantly evolving, with members leaving the group (the reasons for this are yet to be examined in depth) and others coming into it all the time. However, the Net-Mapping process has opened up some really interesting spaces and opportunities to explore the complex dynamics inherent to learning networks.

3.6.8 Expanded learning network map

The IBLN has expanded considerably since the initial picture was developed. Through the Net-Mapping process it has been possible to capture the changes, and Figure 3.25 provides a diagram of the expanded network. A number of new organisations were added to the initial diagram.

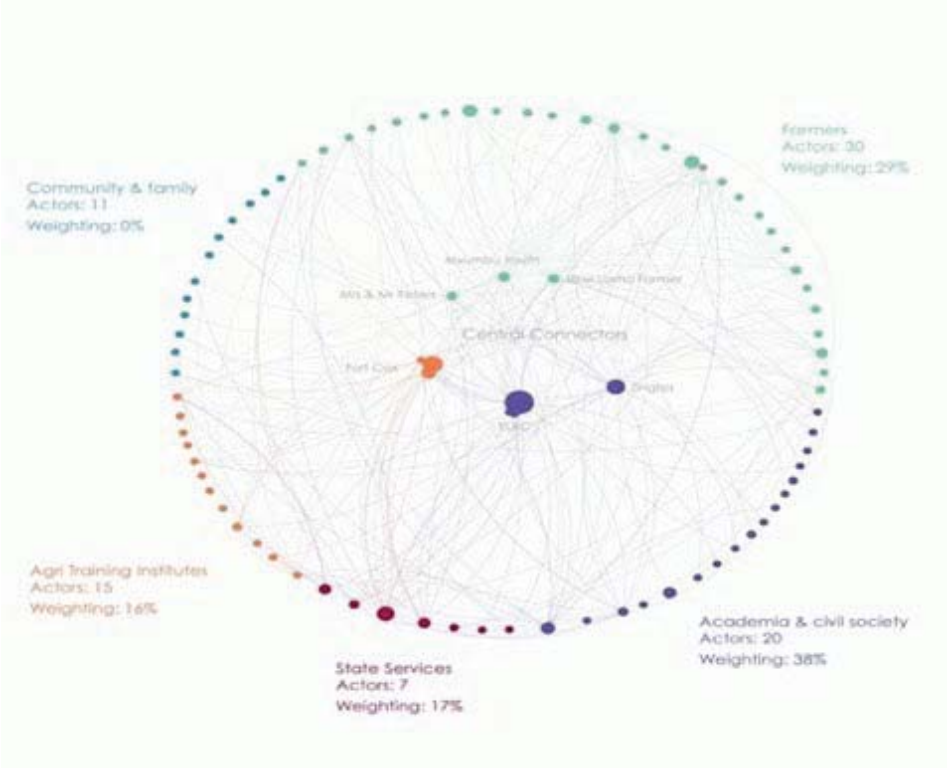


Figure 3.23. Expanded network map of the IBLN in 2020 (produced by Luke Metelerkamp, 2020)

Additional participating organisations are listed below:

- **Government Partners:** Department of Social Development – they play a big role in supporting and monitoring household food producers.

- **Farmers Organisations:** More farmers associations from a wider range are now included including the Cathcart Farmers Association, as well as the Illiwi Farmers Association and the Raymond Mhlaba Farmers Association
- **Agricultural NGOs and Development Organisations:** A new partner with a lot of capacity that has joined the network is the Masimanyane Permaculture Association and the Mayibuye Ndlovu Development Trust, both of whom support quite substantial networks of smallholder farmers and household food producers.
- **Small and Medium Enterprises supporting farmers:** These include small farming enterprises that are supporting other farmers, as well as support services such as geological and agricultural water services.
- **Youth:** More youth organisations have joined the programme, including youth co-operatives from the Middledrift Area, and the Mnxumbu Youth Co-operative. This addition to the IBLN is important given the high levels of youth unemployment in the area.
- **Students:** A significant expansion in this phase of the programme are the numbers of students from Fort Cox ATI and the University of Fort Hare that have joined the ToT programme based on their interest to learn more about RWH&C and to develop their networks.

This presents a very positive picture of an expanding learning network involving more actors that have a crucial role to play in supporting farmers with relevant knowledge and demonstration-based capacity for RWH&C practices, especially also impacting on women farmers and youth.

A new network member with strong potential to extend the social learning media component in this Learning Network is ‘Sunshine Cinema’ ambassadors. These cinema ambassadors have a low cost, mobile facility to show social impact films in local rural areas. In addition to the licencing of preselected films and the physical screening equipment, The Sunshine Ambassadors are trained to facilitate post-screening dialogues which deals with the content raised in the films. Two of the Sunshine Cinema Ambassadors have joined the IBLN and have planned on using this facility to also show other video material on agriculture, water, and local rural development. To date only one screening was held as part of the mobile journalism boot camp held in Burnshill in March 2020.

During the first phase of the network, the initial flow of information into and within the network, followed a number of distinct information pathways around central anchor institutions. Information about rainwater harvesting and conservation which flowed from the Water Research Commission, via Rhodes University to the participants in the training of trainers course was the clearest example of this first phase of these knowledge pathways being developed.

Following this it was observed that the relationships established around these knowledge pathways, opened up a fertile environment for broader exchanges to begin taking place. Beyond the initial pathways established around RWH&C, three more loosely defined phases of this broader exchange warrant mention.

Phase two saw an emerging exchange of information between the original network members on a range of topics not related to the initial RWH&C training they engaged in. Topics ranged from seed and tool exchanges to soil fertility management practices.

Phase three, (emerging in an overlap with the second phase) then saw a more diffuse engagement around the fringes of the network beginning to emerge as founding members began to share their knowledge with widening circles of secondary actors. For example, based on the Water Research Commission's RWH&C material, Fort Cox AFTI faculty members took advantage of a scheduled curriculum review process to update the Institute's curriculum on RWH&C (similar findings are reported in Pesanayi, 2019). Similarly, in a nearby village an active local youth group who took part in the ToT programme began independently running RWH&C training for their extended communities.

At the time of research, a well organised system of exchange activities was in place. This included quarterly network meetings, community radio slots, *Ilimas* (collective work days) and an active WhatsApp group (see also Pesanayi, 2019; Lupele 2017). These were helping to develop a fourth phase of network evolution in which existing pathways of exchange were widened to include a growing list of topics. At the same time, this is opening up a fertile environment for IBLN members to invite valuable pre-existing relationships and information into the learning network (see also Pesanayi, 2019 for similar insights developed via activity system analysis).

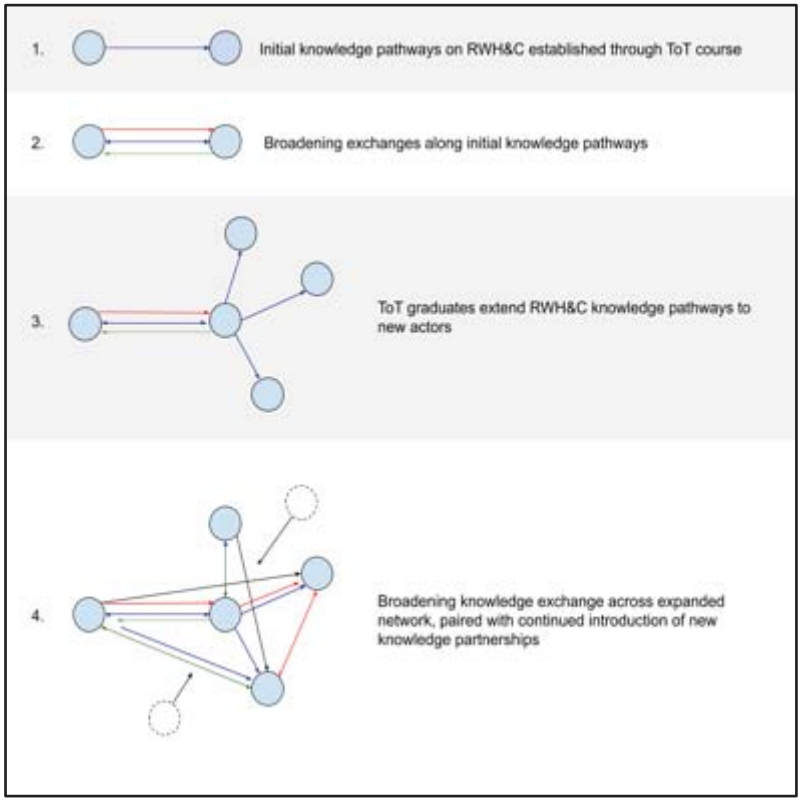


Figure 3.24. Four phases of network evolution

These four phases, summarised in Figure 3.24 above, provide a conceptual framework for understanding the evolution of this course activated learning network over time. The forms of relational social infrastructure which Figures 3.23 and 3.24 represent, support many of the

learning needs of the loose ecosystem of actors who surround smallholder farmers in the Eastern Cape.

The rich connectivity of rural individuals such as Mrs and Mr Peter and the high degree of centrality among groups such as the Mxumbu youth cooperative are markers of a relational civic infrastructure emerging within this social ecosystem. The Mxumbu Youth and Ilizwi Lama Fama groups have a wide reach across the whole ecosystem (close to that of the ELRC) clearly play a growing role in the sharing and distribution of information.

However, despite the growing network of relationships, Rhodes University and Fort Cox AFTI accounted for 48% of the total weighted contribution to the network. The very strong weighting attributed to the clustering of actors from these two founding institutions suggests an uneven share of responsibilities currently falling under the umbrella of these established learning institutions, but also points to the important role that learning institutions can play in supporting the establishment and formation of learning networks, as was the initial intention in focussing in on the learning institutions in the surrounding areas as potential sustainable supporting institutions for establishment of learning networks.

3.6.9 SSSLN (Mpumalanga): Initial and Expanding Learning Network Map

INITIAL PICTURE:

Co-ordinating hub for the learning network: University of Mpumalanga School of Agricultural Sciences (UMPSAS) agreed to co-ordinate the Learning Network and co-host the training of trainers programme. UMSA begun with the ToT in July/August 2017 after confirmation of their participation and the relationship with the Amanzi for Food project via an MoU between Rhodes University and the University of Mpumalanga which took place during a meeting in June/July 2017.

Stakeholders willing to participate in the Learning Network:

From within UMP:

- **Faculty of Agriculture (Irrigation Management, Extension)** – interested in the Learning Network for potential to broaden irrigation management training (for smallholder farmers) to include RWH&C knowledge, and for training of extension services. There is a big smallholder agricultural development initiative in the province, and a demand for the knowledge, especially for diversification of enterprise development.
- **Faculty of Commerce** (development studies) – interested in the initiative for the potential benefit to the Development Studies programme.
- **Short Learning Programme Unit** – interested in participating as the option for running community-service short learning programmes was a strong possibility; also willing to coordinate and host the Training of Trainers programme.

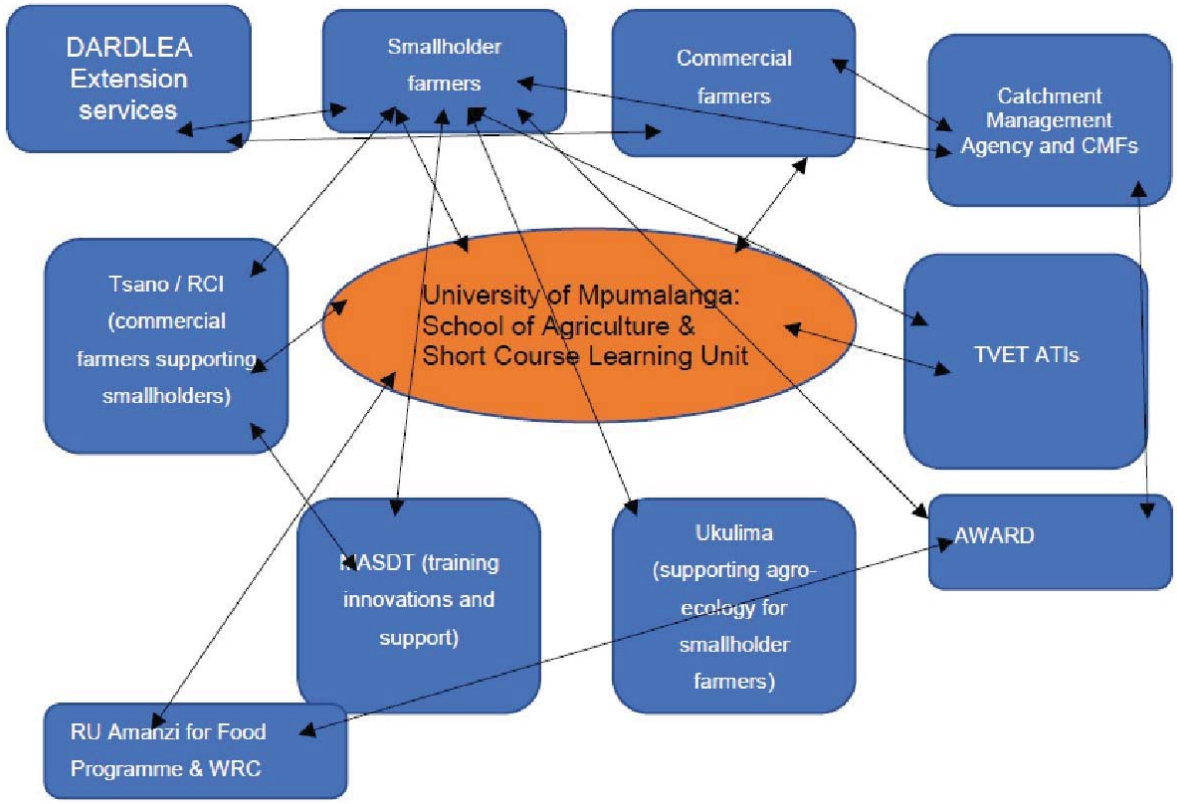


Figure 3.25. Initial University of Mpumalanga and SSSLN Learning Network Map

From the wider Agricultural Learning System

- **Department of Agriculture and Rural Development and Land Administration** (DARDLA) **(Extension Services)** – were interested in participating to expand extension services' knowledge and competences to support smallholder farmers
- **Mobile Agri Skills Development and Training (MASDT)**
- MASDT is a non-profit company that runs a training and incubator programme "to empower the Enterprise in all aspects of the value chain" (MASDT, 2016[21]). The training provides NQF level 2 certificates or Skills programmes in plant and animal production and new venture creation for agribusiness. They indicated interest in integrating a ToT in rainwater harvesting.
- **Tsano (RCI):** Tsano/RCI is an organisation working with small-scale sugar producers to support improvements in their practices including in their use of irrigation practices.
- **Ukulima Food Sovereignty**: this NGO works with smallholder farmers and expressed interest in participating in the learning network and course to broaden knowledge on rainwater harvesting in order to support farmers better and to be more connected with the wider food sovereignty movement. The NGO also works with **youths** and wants to involve them in Amanzi for Food.

[21] MASDT. (2016). *Annual review 2015-2016*. Nelspruit: Mobile Agri Skills Development and Training

EXPANSION:

- **Enactus Student Organisation:** A significant expansion here has been the student organisation Enactus, which encourages students to engage in community based social innovations. Students have seen engaging in RWH&C as an exciting opportunity for such innovation and have been keen to learn about the different practices as sources of ideas for their innovation projects.
- **Faculty of Education and Siyabuswa Education Campus:** The Siyabuswa campus is becoming an important site for productive demonstration site development, reaching the next generation of teachers, as well as communities surrounding the campus.

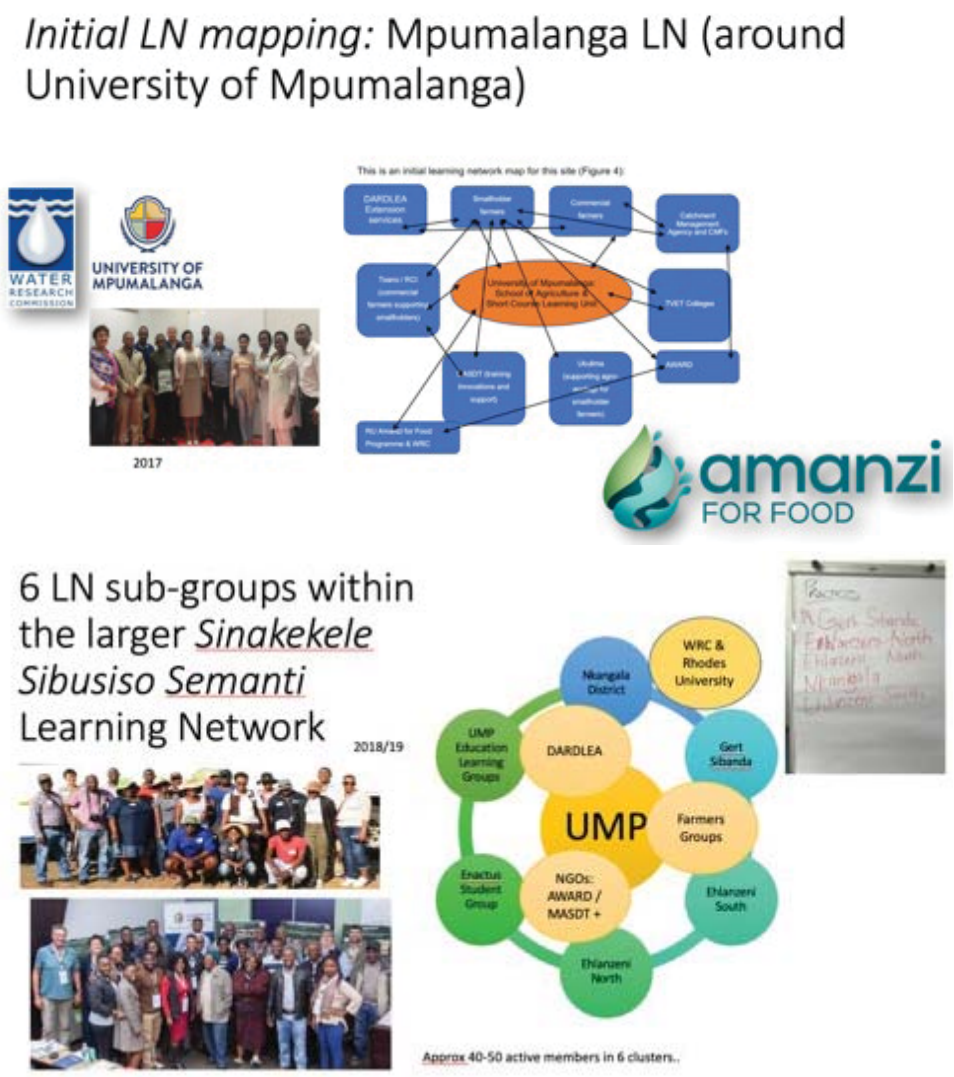


Figure 3.26. Expanded SSS Learning Network (2017-2018/19) following the ToT course

3.6.10 Site 3: Initial Learning Network Map for Taung Agricultural ATI and the #PulaWise Learning Network

Below is an initial learning network map for this site based on the contextual profiling data and the actors identified above who could have potentially contributed to this learning network, centred around the Taung Agricultural ATI:

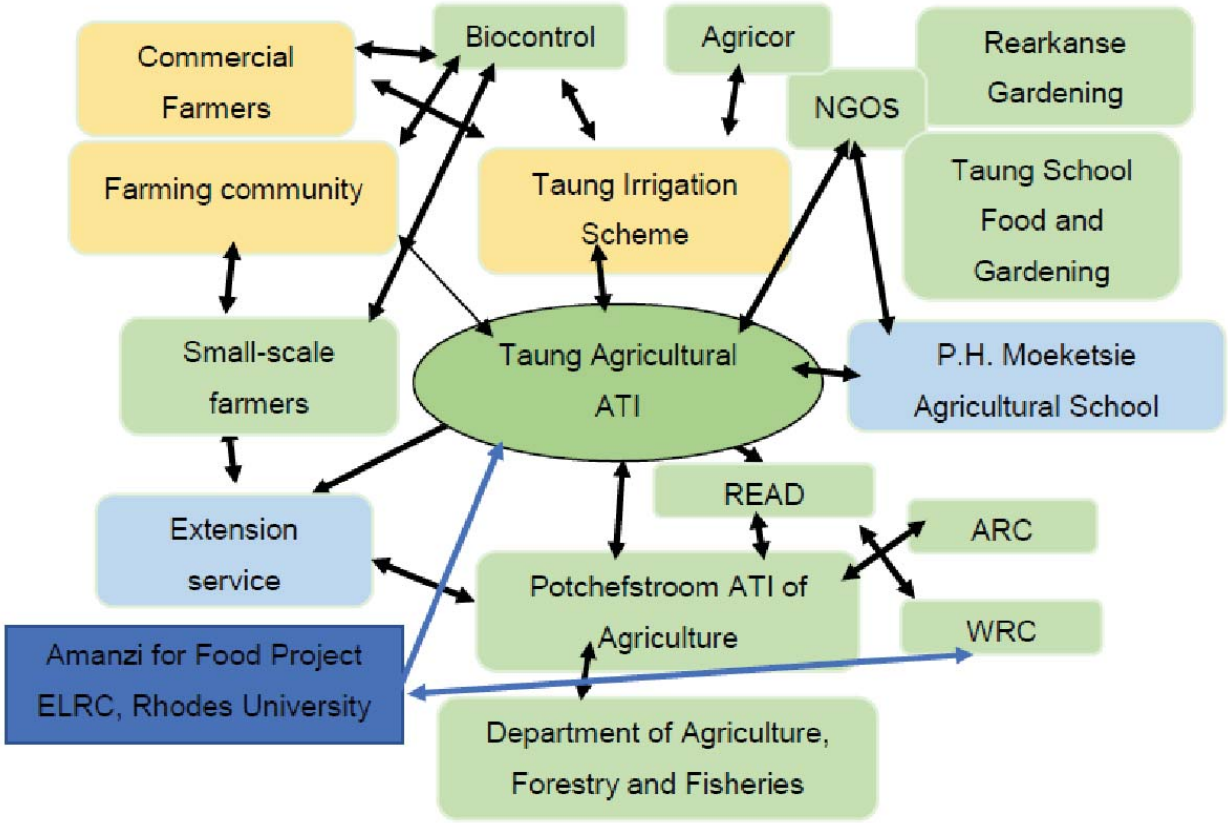


Figure 3.27. Taung Agricultural ATI, hypothetical Learning Network map

This map indicates the intention and desire from the Taung Agricultural ATI to connect with a wide range of partners in their learning network. However, as the time for the Training of Trainers course in October 2018 drew closer, it became apparent that most of these partners were unable to participate. In the final event, only staff (lecturers and technicians) and students from the TAC itself took part in the course. The membership of the #PulaWise learning network reflected this with its membership consisting entirely of people from the ATI, with the addition of the ELRC team members and one of the lecturers from Fort Cox ATI, Mr Chamu Matambo, who assisted with the facilitation of the course.

At the time of writing there has been no expansion of this network to include other role-players, so the initial hypothetical network map still stands as the guide to how the network is expected to evolve.

3.6.11 Emerging lessons

The need for long-term institutional anchorage for learning networks was highlighted in the literature and confirmed in this study. This implies that formal organisations involved in learning need to begin expanding their mandates to include long-term support for the kinds of

expansive learning that can develop in learning networks as was done by FCAFTI and the UMP in the Amanzi for Food programme. Beyond this, the involvement of actors with a variety of disciplinary specialisations remains key to providing the broad-based support and stimulation needed to grow and sustain dynamic networks.

Interdisciplinary courses offered (and accredited) by a respected institution, were an effective tool for enlisting founding members and developing the necessary network dynamic once areas of collective concern were identified. This was articulated in Weaver (2016)'s research as a 'course activated learning network approach', which has proven to be very productive and important for learning network formation in the Amanzi for Food programme in both the earlier phase (2014-2016) and in this phase of reporting (2017-2021). In fact, it was one of the most defining factors of the learning network formation. More is discussed on the course approach and its role in learning network activation and formation in Chapter 5. From this we suggest that ToT courses ensure that collaboratively built demonstration sites exemplifying the practices outlined in the course are positioned as a central course deliverable (see also Chapter 5). Furthermore, platforms should be in place for network members to share the demonstration sites they develop with others within and beyond the network (see Chapter 4)

This Network Mapping methodology would benefit from further testing in other environments. A second critical element in the evolution of such networks is achieving the fine balance between the need for a firm foundation and guiding framework for network activities on the one hand, while allowing sufficient latitude for organic evolution in meeting the evolving needs and interests of network members on the other. Experience from the IBLN indicates that during network inception, the need for structure was most acute but that as the network matured, it was able to handle increasing content fluidity, and also support the emergence of associated networks, with core members contributing to a range of networks in such a way that the concept of learning network began to be a key strategy that they were using to support their own and others' well-being and shared interests (as seen in the participation of learning network members in the Food for Us and Eastern Cape Together COVID-19 network). At the start, this meant being explicit about the focus of the network and the benefits members could expect from participation and then opening up to increasing emergence as the network matures. It was also interesting to note as the COVID-19 pandemic emerged, that the IBLN wanted to protect this network as a network for farmers' learning about farming practices, and rather than use this network for COVID-19 information sharing, they instead supported and helped to co-develop another similar learning network platform for another purpose.

From its inception, digital connectivity played an important role in supporting learning in the network. This should be kept as simple and inclusive as possible, using existing digital channels wherever possible, as will be discussed in more detail in Chapter 4.

A key output of the learning process associated with the contextual profiling and ongoing learning network development, and mapping of the learning networks and their engagement with and responsiveness to contextual dynamics, led to the development of a set of quite generic guidelines for learning network formation. These guidelines are captured as a Technology Transfer tool that accompanies the Knowledge Uptake Strategy (see Appendix 3.3). These are briefly summarised below.

3.7 Guidelines for Learning Network Formation

A full discussion of this is provided in the WRC/Amanzi for Food booklet 'Guidelines for Establishing and Supporting an Effective Learning Network'', available on the Amanzi for Food website and included as Appendix 3.3 in the accompanying Appendices document. The booklet is essentially intended as a Technology Transfer Tool accompanying the Knowledge Uptake Strategy to support people in the agricultural and other sectors to establish their own learning networks drawing on the deep experience of the IBNL and SSSLN. Here we just include some short extracts from the introduction, the opening chapter on '10 Important Considerations', and other crucial chapters in that publication.

The Introduction provides a concise definition of a Learning Network, and who they may involve:

> ***Learning networks*** *are groups of people and organisations that come together on a voluntary basis with the purpose of mutual learning. In a learning network, people work as equals, collaboratively sharing ideas and information in order to learn about something that affects them all.*
>
> *Effective learning networks involve people from a wide range of backgrounds who share an interest in a particular activity (such as agriculture, water management, fishing, entrepreneurship or any other shared activity). Membership of such networks can include: practitioners actively involved in the activity; trainers and educators who teach aspects of this activity; representatives of commercial organisations involved in this activity; representatives of NGOs, CBOs and associations with interests in this activity; government officials mandated to support this activity, and others.*

3.7.1 Ten important considerations

1. **Agreement on the network's focus** – For a learning network to work, people need to invest time and energy into it *because they benefit from it*. For people to invest in a learning network they need to believe that it will help them solve problems that are important to them. So, the big question is: what do people *really* want to learn about? Whatever the initial focus, it is likely that the needs and work of the group will change over time as the network evolves. This change is to be expected as it reflects the essentially dynamic nature of learning networks.
2. **Agreement on who to include** – A learning network is an open and inclusive space which should be there to support any who share a common learning objective.
3. **Establishing a simple structure** – Although networks are quite flexible and informal, they do require some organisational structure to provide a framework for network activities. Such a structure can provide a stable base from which the network can grow and evolve. The structure need not be complex, and will vary according to the needs and wishes of the membership. In many cases this may be as simple as the appointment of a convenor or chair with the general role of central coordination of the network activities. A convenor may be associated with a formal organisation, such as a tertiary institution, as this can provide an institutional base which might provide facilities such as meeting venues, or catering.
4. **Creating opportunities for sharing information from diverse sources** – One of the most important things a learning network can offer its members is access to new and wider

sources of information. Often this information will come from members of the network themselves based on their own education and experience. In other cases new information can come from external sources like websites, journals or books. Such information can be shared in response to members' concerns and questions, or simply as something that may be of interest and value to the members generally. At the end of the day, it does not really matter where this information comes from, as long as it's useful for the members in their context.

5. **Planning and running the first network activities** – One of the key factors in keeping learning networks alive is member involvement in a range of activities. The types of activity in which the network is involved will be determined by the membership. They can include events such as the shared development of demonstration sites, supporting members in developing different practices, field trips to learn from others in the sector, guest lectures, training days, visits to sectoral events such as agricultural shows or tourism indabas, and network meetings.
6. **Maintaining momentum** – One of the main challenges to learning networks is maintaining momentum; keeping the network alive. Over time, networks almost always suffer from a decrease in energy and commitment within the membership. This can be due to several factors, including the feeling that nothing is happening, or that everything has been done. Some of the more active members may move on, taking their particular energies with them. New members will join, bringing new ideas and energy. This coming and going is all part of the natural dynamic of learning networks
7. **Adapting to the changing (learning) interests of the group and actively supporting the network to acquire the knowledge it needs** – As the membership of the network changes and evolves, so do their interests and learning needs. A resilient and dynamic network embraces and adapts to these changes without feeling threatened or undermined. Changes in focus will require support through accessing different kinds of information and knowledge. This can be achieved through the recruitment of new members with relevant skills and experience, and through members conducting their own research into new topics and continuing to share their findings with the network. All of this will help keep the network alive.
8. **Actively ensuring that a culture of mutual learning and trust is maintained** – From the outset it is crucial to recognise that everyone has skills, experiences and understanding to contribute. While it is inevitable that a few members may dominate discussions, both in face-to-face meetings and on social media platforms, there must always be space for everyone to provide input. There should be no distinction between 'teachers' and 'learners' with everyone assuming either role at different times.
9. **Celebrating the small things and encouraging a culture of care** – Change is not usually a big dramatic event. Change mostly happens in small steps, over time. It may never be possible to achieve the biggest aims of any network, but there will certainly be many worthwhile achievements to celebrate. So the journey should be fun, and the network kept alive and active through the celebration of all the small achievements along the way.
10. **Being patient** – 'If you want to go fast, go alone. If you want to go far, go together.' This African proverb very neatly sums up the strength of collaborative working and learning. The establishment of a learning network is the beginning of a long-term process, as the network members build a lasting social institution together. Different people move at different speeds, so it is important that the network develops at a speed which is manageable by all members. This will require patience and for the members to be allowed to work at a pace that works for everyone.

3.7.2 The power of the practical

The booklet goes on to explain how important the development of productive demonstration sites are for the sharing of real life experience in different practices, and to maintain interest within any group. It promotes the idea of how the use of *ilima* days, where members come together to help each other in implementing specific practices.

The process of collaboratively developing the productive demonstration sites is described in detail, following a very similar process to that used in the ToT course (see also Chapter 5).

3.7.3 WhatsApp groups and other media

Drawing on the experiences, particularly, of the IBLN and the SSSLN, the booklet encourages the use of WhatsApp groups to hold the membership together, to share experiences, ideas, challenges and maintain an on-going conversation between members (see also Chapter 4).

There are also discussions on engaging through other social media, such as Facebook, and with conventional print and radio media.

3.7.4 Creativity

The booklet closes with an emphasis on the need for innovation and creativity in working with learning networks. This chapter also provides some strong motivation to give a Learning Network a try:

> *While we have developed these series of tools to assist you, your situation is unique and the solutions you'll require will also be unique. Experimentation is at the heart of what a learning network should be about so your learning network is going to have to be innovative and work things out along the way.*
>
> ***This means the most important tool in your toolbox is your own creativity!***
>
> *Don't be afraid to dive in and have fun trying new things together. They say that the way to eat an elephant is in small bites. So, one way to keep experimentation enjoyable (rather than daunting), is to focus on doing lots of small 'safe to fail' experiments, rather than trying to develop and execute grand plans that will have big implications if they fail. When trying something new, do it on a small-scale first to observe the results before applying it on a bigger scale.*
>
> *After all, if you don't try you'll never know.*

3.8. Conclusion

The contextual profiles detailed in this chapter shows that the project team have continued to gain more in-depth insight into the project sites where the three learning networks were being formed. Not only that, they have also engaged with more stakeholders and partner groups who have been joining into the Learning Network Activities. The team have also continued to develop a deeper understanding of farmers and educator's knowledge of RWH&C practices in deepening and further developing the contextual profile, noting also how farmers knowledge is expanding to other areas such as climate smart agriculture, use of ICT-based market

development tools (Food for Us) via the links that have been made possible via the existence of the Learning Networks, and extending experience of the learning network approach to co-learning to responding to the COVID-19 pandemic. This shows the potential of learning networks for systemic development of farming practice and more widely for responding to challenges experienced in rural areas, and in communities who are otherwise mostly cut off from connected learning systems. This has also led to us being able to identify expansions of the initial learning networks which formed the baseline data for this project. A new net mapping tool and approach has been introduced in this reporting period, which has provided interesting insights into the learning network dynamics, relationships, and areas of expanded influence. This process will continue as the programme continues.

There will continue to be a probing of further aspects of the networks, via the Net Map methodology, and of the contexts in which the Learning Networks are operating, with the aim of developing deeper understandings of educators and farmers' knowledge and practice as well as expanding partnerships and links between network members. This extended contextual profile has confirmed that there is great interest in the RWH&C knowledge being produced by the WRC material and the Amanzi for Food project which was set up to mediate these into contexts of practice using a social learning approach. The interactive mediation process and social learning Network model is leading to increased knowledge use and uptake at the level of practice, and it is permeating the practices of a wider range of agricultural learning system partners at grassroots level. It has also shown the potential for learning networks as wider knowledge dissemination hubs within a systemic approach.

The WRC/Amanzi for Food booklet 'Guidelines for Establishing and Supporting an Effective Learning Network' (Appendix 3.3.) provides a substantial addition to the information developed for the wider public out of the considerable learning that has taken place through the implementation of both the earlier, and the more recent iterations of the project.

In relation to the Knowledge Uptake Strategy, it is clear that learning networks are extremely productive in terms of the sharing of information that takes place between members. They also provide real opportunities for the introduction of new ideas and new information from outside the group, while recognising the skills and understandings held by the members themselves. This suggests the need to promote the establishment of learning networks in different contexts, something that will be supported by the information provided in the booklet. From the very beginning, with the initial establishment of the IBLN it was recognised, indeed expected, that the focus of a learning network is likely to change over time, and so it has proved to be the case, as farmers have used the IBLN to not only learn about RWH&C, but also about other sustainable agricultural practices, and other issues such as capacity building opportunities – see Chapter 4 for more detail on this. This can only be encouraged, as it helps maintain energy within the network, and ensures, to some extent at least, its sustainability. So while a learning network may initially be premised on sharing information on RWH&C, it is only right that new ideas will be brought in, which will augment the learning in this area and take it into other connected areas, such as, in the case of the IBLN, agroecology and food sovereignty.

It has also become clear that the role of an education and training institution such as a university or an ATI as an anchor organisation for a learning network, should not be underestimated. Again in the case of the IBLN, having both Rhodes University and the Fort

Cox ATI as founding and indeed central members has played a significant role in maintaining both the integrity and the dynamic of the network. The role played by UMP in the SSSLN in Mpumalanga is similarly critical, although here both the extension services and well-established NGOs also play pivotal roles. This suggests that it is advisable for any group considering establishing such a network to partner with at least one such functioning institution. This is not to say that learning networks cannot survive without these, but that there is a higher chance of long-term sustainability with such substantial anchors. The Knowledge Uptake Strategy should therefore be cognisant of this and look at how learning networks concerned with RWH&C knowledge and practice can best be centred with learning institutions or established organisations with the appropriate agricultural focus and willingness to engage beyond their existing practice boundaries, so as to also integrate innovations into their own systems of practice (see Chapter 6).

CHAPTER 4
TOWARDS A KNOWLEDGE UPTAKE STRATEGY PART 3 – Development and use of social media tools for social learning in learning networks

4.1 Introduction

This chapter reports on the Amanzi for Food website (www.amanziforfood.co.za) and associated social media channels. It documents the developments that have taken place with the website over this reporting phase of the project (2017-2019). The report by Lotz-Sisitka et al., (2016) details the work that went into establishing the website and social media component of the programme. The intention in this period was to expand upon, and consolidate, and learn more from this component in terms of knowledge dissemination and uptake.

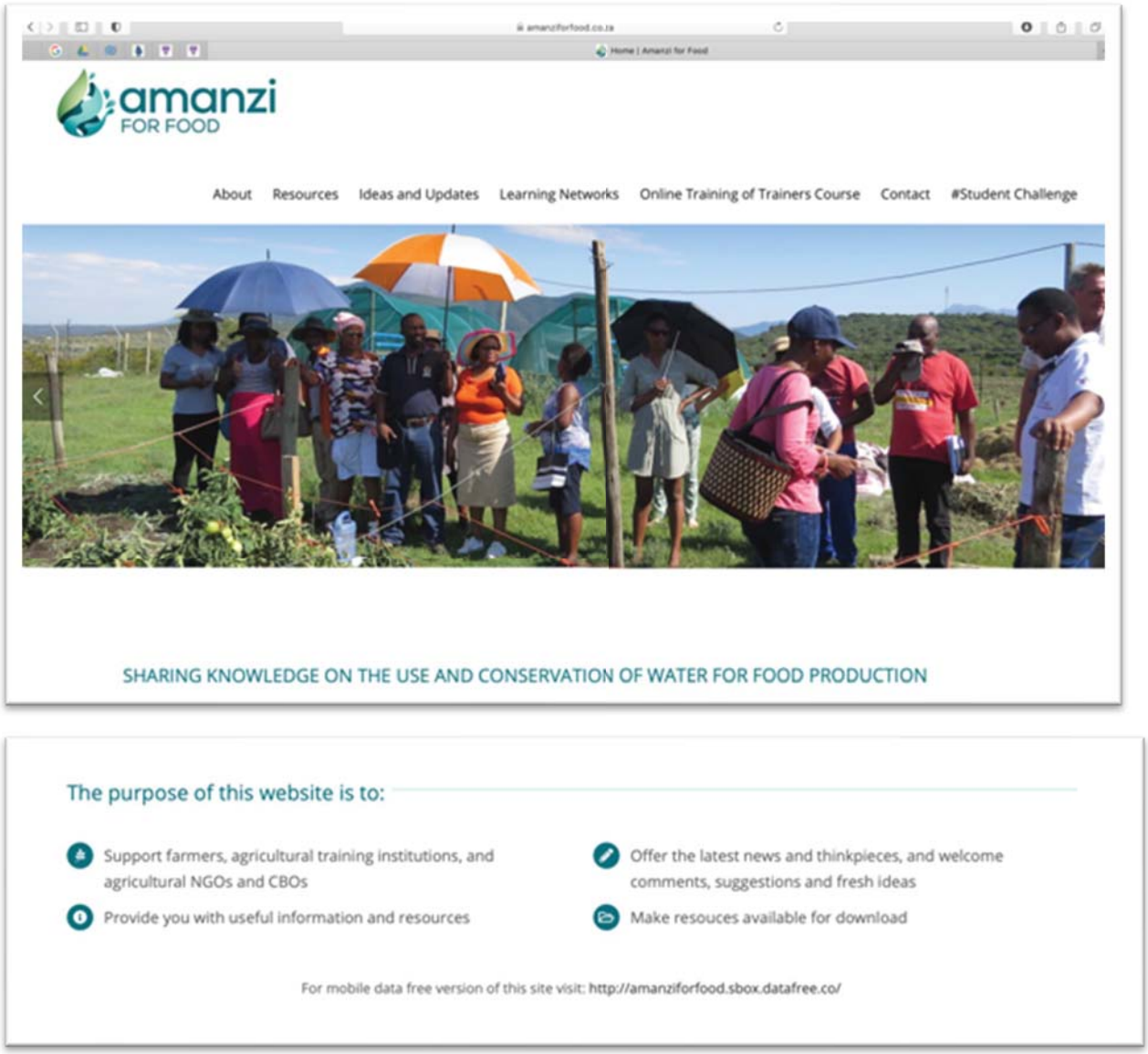


Figure 4.1. The Amanzi for Food Homepage, showing the different sections of the website and its purpose

Almost certainly the most exciting and promising development on the website in this project reporting period has been the evolution of the Training of Trainers course as an online course, a development which is reported in detail in Chapter 5, but in this Chapter we report on the media-based backend responses, and show how this is enlivening the use of the Amanzi for Food website and WRC material access tools. The online course was initially announced in October 2020 via a WRC Webinar when the site went live, with a more substantive launch taking place in February 2021. The need for the latter more substantive launch became evident from the low numbers of people accessing the course at the end of the 2020 year due to the challenges of end of year closures, examinations and other factors which did not enable people to engage adequately with the course opportunity late in 2020. The intention of the online course is not only to make the training more accessible to a national audience, but also to greatly increase the access to the website itself and all the WRC material housed there. This should also spill over into increased use of the Amanzi for Food Facebook page and other media platforms. The Facebook page can also be used to direct the public to the Amanzi for Food website and to share project updates.

This chapter further reports on a comprehensive analysis of the engagement of the different learning networks and the use of the WhatsApp platform, with more emphasis on the IBLN as the WhatsApp group of this network has been in existence since 2014 and continues to be a vibrantly active networking platform. WhatsApp groups have provided a platform used by the learning networks to communicate, share information and engage in discussion, and as indicated in Chapter 2, our preliminary and ongoing media analysis work has shown this to be an important platform with potential to reach more people in South Africa than other platforms – both from an accessibility point of view, and age range usage point of view, and it has low tech-readiness requirements, although it still does not reach all people, especially those most marginalised socio-economically and technologically.

In particular, the focus is on the shared learning opportunities presented by the use of this online platform, and how the IBLN members have responded to these; which also provides insight into *how best to use such platforms for social learning using a learning network model*. The chapter explores the nature of the interactions between members in the IBLN, evidenced by the chat records over nearly 6 years of the project, and charts the ever-changing dynamics within the network and the shifts in focus of their interests. The underlying ethos which guided the interactions are discussed in detail, and the social ecosystem that has emerged over time to characterise the group was mapped. An in-depth reflection on the Amanzi for Food IBLN WhatsApp groups can be found in section 4.7.1 below.

4.2 Mediation of WRC Material using a Navigation Tool and a Diversity of Social Media

4.2.1 The Amanzi for Food website

The social media component of the Amanzi for Food project is very important in making sure that rainwater harvesting and conservation learning material are easily accessible and freely available to everyone. The social media and Internet platforms also enable sharing of the Amanzi for Food news and project updates. The main platform for sharing the WRC material and information contained within them has always been the WRC Amanzi for Food website

(https://amanziforfood.co.za). This has now been augmented with the addition of a data-free link: http://amanziforfood.sbox.datafree.co/ which will enable people who struggle to afford the high data costs in this country to access the website with all the WRC and supporting material, and the associated Training of Trainers Course without any cost to themselves[22].

The website has been specially designed and set up to provide access to the rainwater harvesting and conservation practices and associated knowledge resources that are provided via the WRC material. When the project was first set up (cf. Lotz-Sisitka et al., 2016) a decision was made to focus in on the rainwater harvesting and conservation practices and knowledge of these as contained in the WRC material. There was, and remains a strong acknowledgement and recognition that there is much more valuable information in the sets of WRC material, but we purposefully confined ourselves to knowledge of RWH&C *in the first instance.* This was to maintain a clear focus to the project, and to stay focussed with the view to developing the social learning model which can then be adapted for other purposes. So for example, we have noted that in the Amanzi for Food programme there is a strong interest amongst farmers for expanding their knowledge to principles and practices of organic agriculture, in addition to learning about RWH&C practices. This means that in future the Amanzi for Food website and its approaches *can expand* to include a wider range of material, practices, portals, courses and more, but for now we have limited it specifically to the 26 rainwater harvesting and conservation practices that were identified across the eight sets of material.

As shown in Figure 4.2 below, the website has a resources page, and this resource page has been set up to provide various types of access.

[22] The costs are charged to the host institution (i.e. Rhodes University ELRC), but are generally not very high. A decision was made to use this approach to support open and free access to the online course and the Amanzi for Food website and the WRC resources via this platform and via the guided strategies for access to the website. We are researching how this may further facilitate knowledge uptake and use as part of our ongoing interest in this topic (despite the ending of the project period in March 2021). The data free option is particularly set up for those accessing the platform with mobile phones. The online course has been designed to be done on a mobile phone or computer and has been purposefully designed to be a ‘low data use’ course.

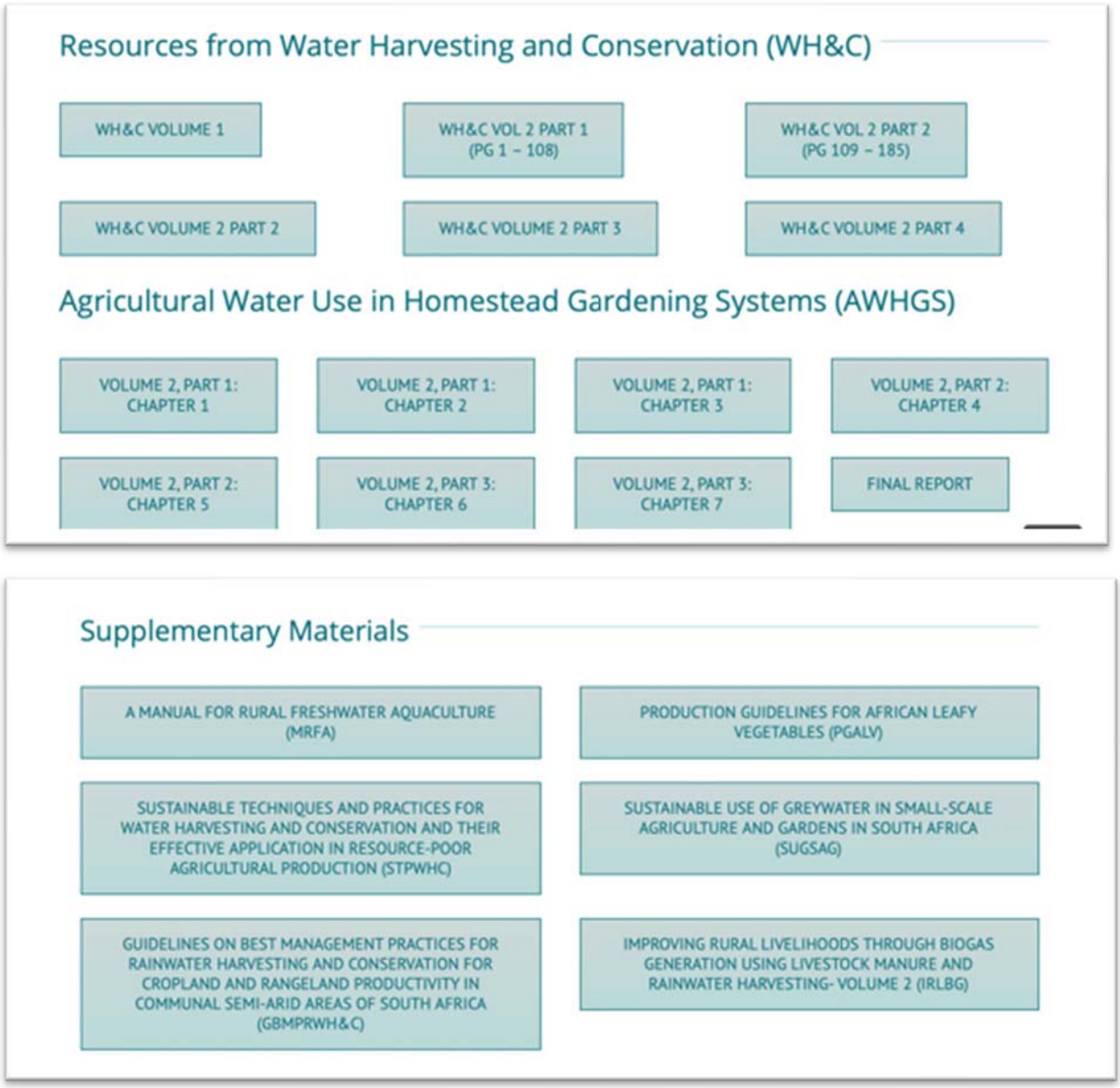


Figure 4.2 The resources page of the Amanzi for Food website provides direct access to all eight sets of material. Access to these material is also mediated and supported via the Navigation Tool (discussed below)

4.2.2 The Navigation Tool – organising framework for the website access to WRC material

In order to facilitate swift and easy access to specific information in the material a Navigation Tool (Appendix 4.1 in the accompanying Appendices document) was developed as described in Chapter 2, initially in Phase 1 for the 2 main sets of material, and then adapted in Phase 2 to include the 6 additional sets of material. Each material was coded according to its title:

- **WH&C –** Water Harvesting and Conservation (Volume 2, part 1)
- **AWHGS –** Agricultural Water Use in Homestead Gardening Systems (Volume 2, Parts 1, 2 and 3)
- **SUGSAG** – Sustainable Use of Greywater in Small-scale Agriculture and Gardens in South Africa

- **MRFA** – A Manual for Rural Freshwater Aquaculture
- **PGALV** – Production Guidelines for African Leafy Vegetables
- **STPWHC** – Sustainable Techniques and Practices for Water Harvesting and Conservation and their Effective Application in Resource-poor Agricultural Production
- **GBMPRWH&C** – Guidelines on Best Management Practices for Rainwater Harvesting and Conservation (RWH&C) for Cropland and Rangeland Productivity in Communal Semi-arid Areas of South Africa
- **IRLBG** – Improving Rural Livelihoods through Biogas Generation using Livestock Manure and Rainwater Harvesting (Volume 2)

As indicated in Chapter 2, the Navigation Tool was designed according to the scales of smallholder farming, and according to different types of practices. This then informed the construction of the website platform to share the WRC material, as shown in Figures 4.3-4.9 below.

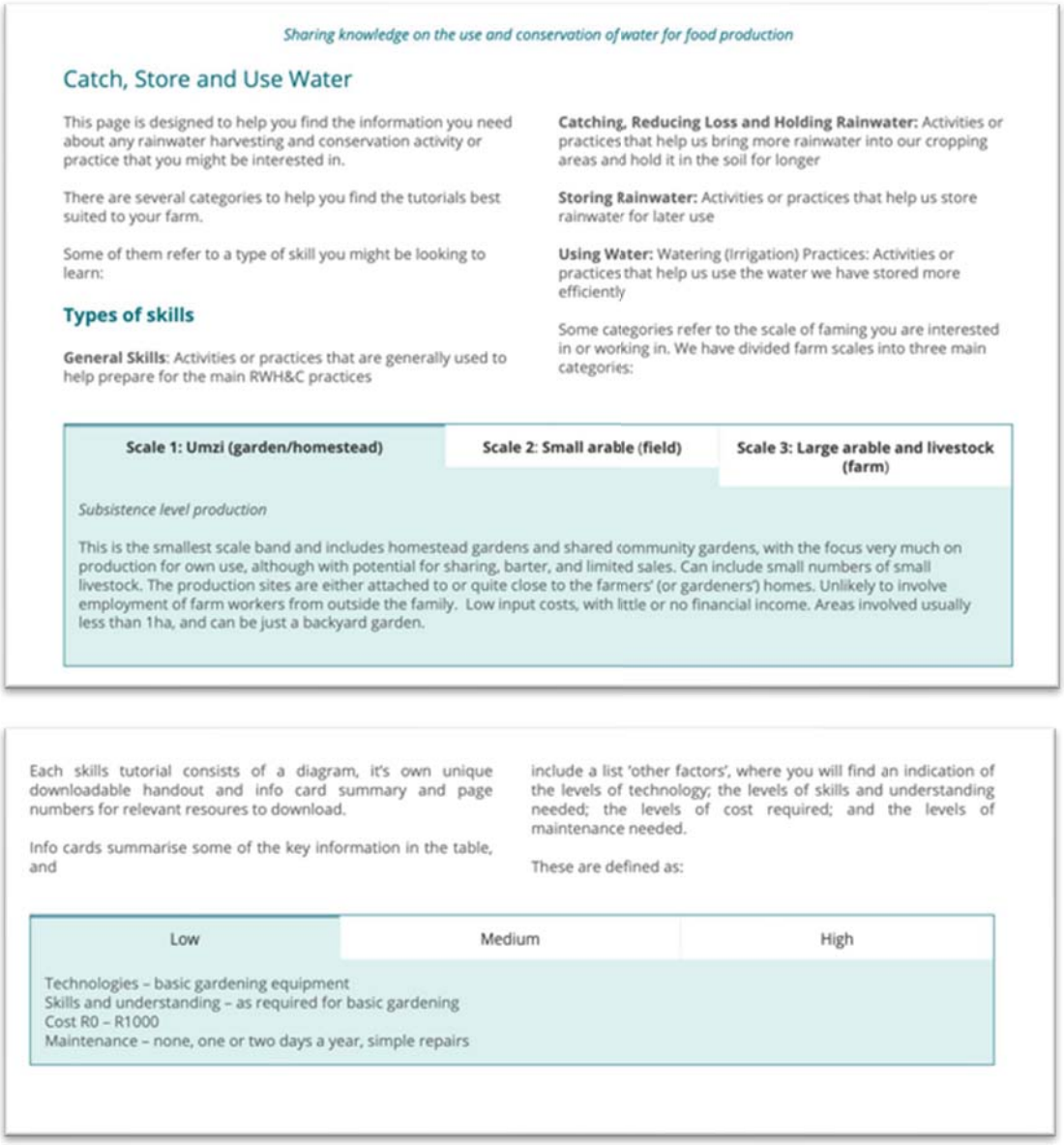


Figure 4.3: Extract from website page showing how the farming scales and technology levels were transferred to the website, to create an access mechanism to find material on the RWH&C practices

With the above structuring, farmers, extension service workers, students and other interested parties can search according to the farming scale, and level of technology available to identify which RWH&C practices are most suitable.

From here, there are also a set of additional access tools that have been developed for each of the practices, organised under the way in which the navigation tool clusters the practices, i.e. under 4 headings:

- General Activities (Skills) Applicable to and Underpinning Many of the Key Practices
- Collecting, Reducing Loss and Holding Rainwater
- Storing Rainwater
- Using Water: Irrigation Practices

The Navigation Tool which is available for direct download on the website, and as an integral part of the provides access to information about general activities, such as constructing an 'A-frame' or 'Line-level' that are needed to support the construction and development of rainwater harvesting and conservation practices. The same organising structure was used to create access to the WRC material on the AmanziforFood website, as shown below.

Figure 4.4. Navigation Tool – General Practices

In terms of the practices themselves, people wishing to learn about practices for 'Collecting, Reducing Loss and Holding Water' can find information on, for example, 'Saaidamme' and how to construct them. The navigation tool indicates that this information can be found in the WH&C material text on page 169-170, with a case study of this practice on page 7 of these material. In the navigation tool there are detailed references as to where lecturers, trainers and farmers can find information on the 26 different rainwater harvesting and conservation practices that were covered in this project.

Collecting, Reducing Loss and Holding Rainwater				
Practice (and other names)	**Type and scale (1,2 or 3)**	**Main purpose and description**	**Other factors**	**WRC materials: Text (T), Case studies (CS), Handouts (H)**
Saaidamme (Wadi floodwater system, flood spate) 	Harvest, conserve and use Floodwater harvesting (3)	Involves the diversion of floodwater from non-permanent rivers into a series of flat basins which are used for cropping. Diverted water from the flooding river is channelled into the fields and completely submerges the land for 1 to 3 days, where it fully saturates the soil.	Medium to high technology, medium skills and understandings, medium to high cost (depending on scale), medium to high maintenance	WH&C (**T**: pp.169-170, **CS**: p.7)

Figure 4.5. Navigation Tool – Collecting, Reducing Loss, and Holding Rainwater

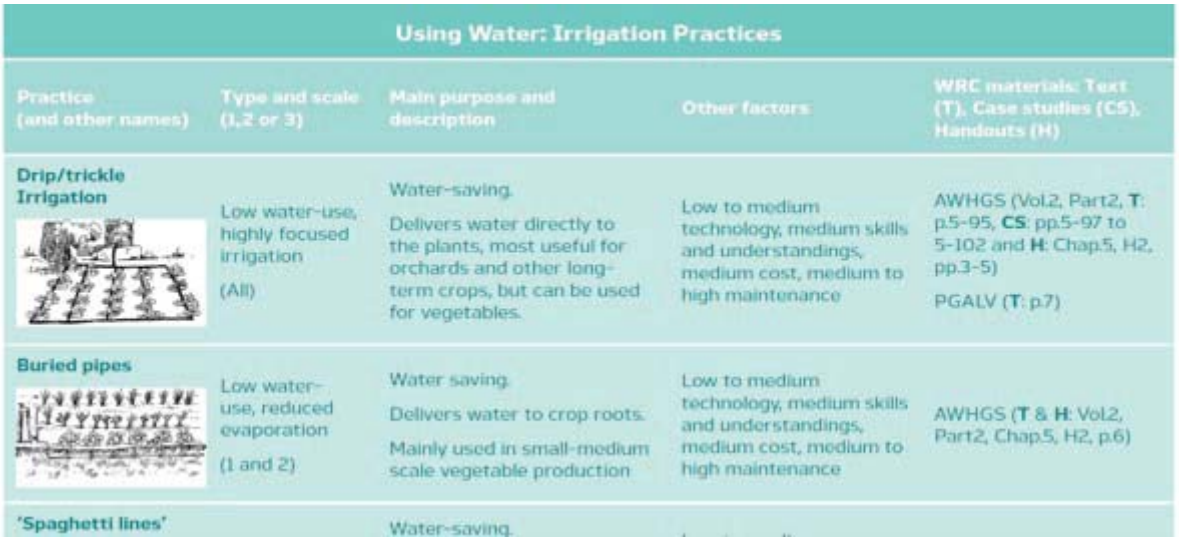
Those wishing to teach or learn about practices concerned with 'Storing Rainwater' can, for example, according to the Navigation Tool, find information on Dams in the WH&C material (on page 18), or the AWHGS material in Volume 2, Part 2. The Tool indicates that there is also a case study on Dams on pg. 5-85 of this text, and also practical handouts in Volume 2 of these material in Part 2, Chapter 5, specifically Handout 1 which can be found on page 11. There is also further information on Dams in the MRFA material on page 19-26. This offers lecturers an easy to access tool for finding information, case studies and handouts for use in their lectures, and for interested individuals wishing to learn about such practices.

Similarly, the Navigation Tool provides direction on where to find information on *matamo/ipitsi* (or homestead ponds).

Storing Rainwater				
Practice (and other names)	**Type and scale (1,2 or 3)**	**Main purpose and description**	**Other factors**	**WRC materials: Text (T), Case studies (CS), Handouts (H)**
Dams 	Harvest and store Simple storage of runoff in purpose-built ponds (3 and 2)	Generally fairly large-scale storage ponds from which water can be taken for either crops irrigation or used directly for livestock (or aquaculture)	Medium technology, specialised equipment, medium skills and understandings, medium to high cost (depending on scale) Medium to high maintenance	WH&C (**T**: p.18) AWHGS (Vol.2, Part2, **CS**: p.5-85 and **H**: Vol.2, Part2, Chap.5, H1, p.11) MRFA (**T**: pp.19-26)
Matamo/ipitsi **(homestead ponds)** 	Harvest and store Simple ponds for homestead gardens (1, possibly 2)	Small-scale storage ponds to catch and store surface runoff. Water used for irrigation or livestock (or aquaculture).	Low technology, basic equipment, low skills and understandings, low cost, low to medium maintenance	WH&C (**T**: p.18, **CS**: pp.2-6) AWHGS (**H**: Vol.2, Part2, Chap.5, H1, p.11) MRFA (**T**: pp.19-26)

Figure 4.6. Navigation Tool – Storing Rainwater

In the same way, those who want to teach or learn about ‘using water’ or irrigation practices such as drip irrigation or buried pipes can find access to information about these practices in the WRC material that are referenced in the right hand side column of the navigation tool.



Using Water: Irrigation Practices

Practice (and other names)	Type and scale (1,2 or 3)	Main purpose and description	Other factors	WRC materials: Text (T), Case studies (CS), Handouts (H)
Drip/trickle Irrigation	Low water-use, highly focused irrigation (All)	Water-saving. Delivers water directly to the plants, most useful for orchards and other long-term crops, but can be used for vegetables.	Low to medium technology, medium skills and understandings, medium cost, medium to high maintenance	AWHGS (Vol.2, Part2, **T**: p.5-95, **CS**: pp.5-97 to 5-102 and **H**: Chap.5, H2, pp.3-5) PGALV (**T**: p.7)
Buried pipes	Low water-use, reduced evaporation (1 and 2)	Water saving. Delivers water to crop roots. Mainly used in small-medium scale vegetable production	Low to medium technology, medium skills and understandings, medium cost, medium to high maintenance	AWHGS (**T** & **H**: Vol.2, Part2, Chap.5, H2, p.6)
‘Spaghetti lines’		Water-saving.		

Figure 4.7. Navigation Tool – Irrigation Practices

The navigation tool also provides insight into different ‘levels’ of farming, and which of the rainwater harvesting and conservation practices might be best used at which level of farming. For example it shows that the **WH&C** book containing information on Rainwater Harvesting and Conservation practices (Denison *et al*., 2011) contains useful information for farmers working at all three levels: household food production level (level 1); smaller arable lands (fields) (level 2); and in larger arable lands (level 3).

Figure 4.8. Summary of Water Harvesting and Conservation (Denison et al., 2011)

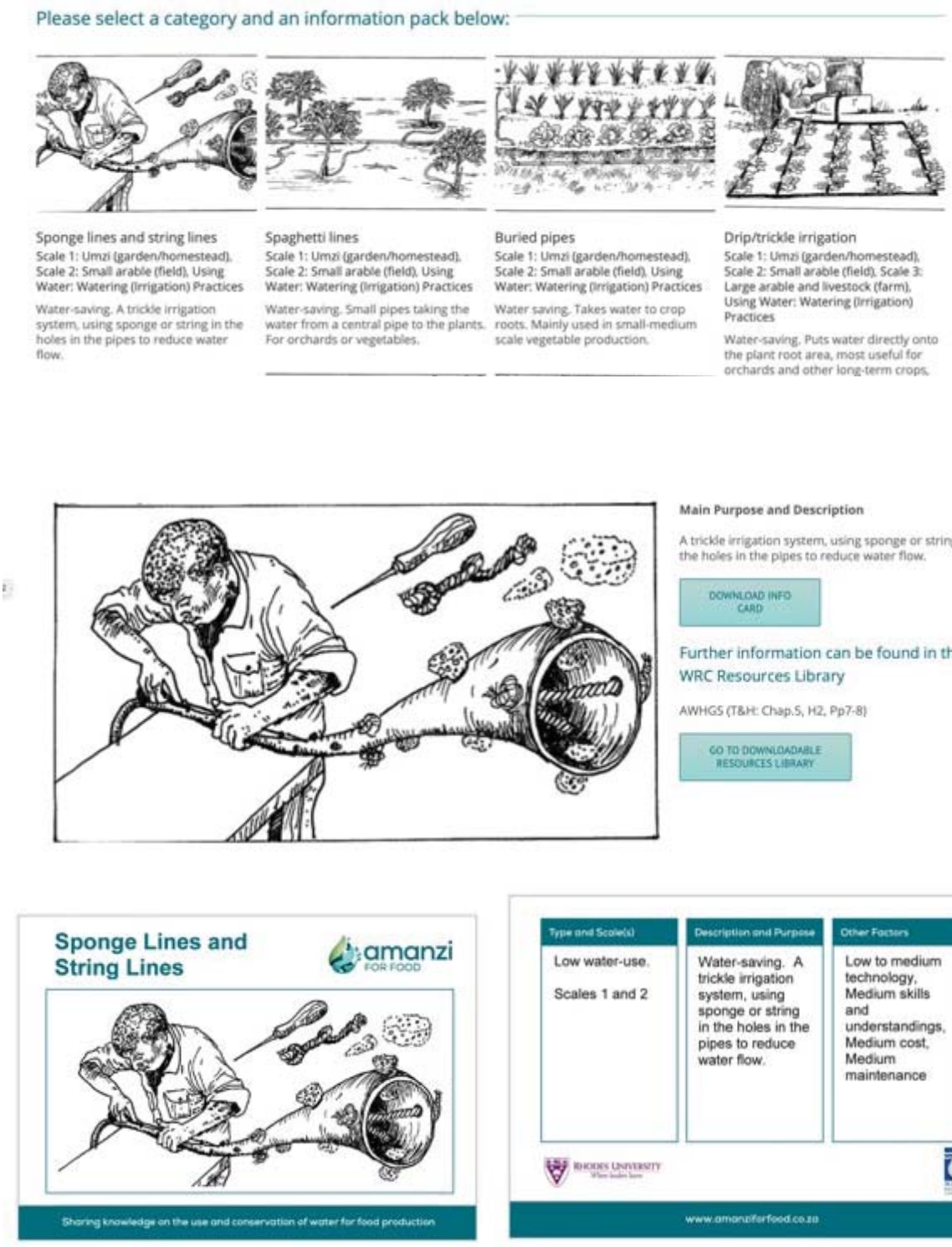


Figure 4.9. Extracts from the website showing how the navigation tool opens access to information on the RWH&C practice for particular scales of farming and practices, and links then to the WRC material where further information is provided.

The figures above show that a lot of work and thought went into the process of creating access to the core content in the WRC material using the Navigation Tool, which was extended for use in this period of the projects reporting to link to all eight WRC material, all of which is facilitated by the way in which the website was constructed.

In addition to this core function of the website, which is to give access to the eight sets of the WRC material through the access mechanism of the Navigation Tool explained above, the website also carries additional resources (e.g. on Climate Smart Agriculture), Ideas and Updates, information on the Learning Networks, the Online Training of Trainers Course (to be discussed in Chapter 5); and the most recent addition to the website is the #Student Challenge.

Over the past few years (2017-2021) 20 blog posts with Ideas and Update items have been added to the website:

Training of Trainers online Course Data free for South African mobile users

January 27th, 2021 | 0 Comments

With the massive shift over the past year towards the 4 th Industrial Revolution (4IR) with everything going online, including education, banking, shopping, and meetings, one of the most pressing issues [...]

Launch of the online Training of Trainers Course in partnership with the Water Research Commission

October 9th, 2020 | 0 Comments

In a time when community interactions and traditional training and workshops have become difficult due to the global COVID- 19 pandemic, the Amanzi for Food team has been working hard to develop an online [...]

Long time IBLN member makes Learning Network Proud

July 22nd, 2020 | 0 Comments

The IBLN is excited to announce the appointment of one of our members, Mrs. Busisiwe Mgangxela -Peter, as one of the new executive directors of the Movement in Africa NGO. Busi (East London) and [...]

Youth Permaculture Farmer Returning to His Roots

May 11th, 2020 | 0 Comments

Ludwe Majiza is a talented young permaculture farmer who has moved back to his home village Mkhubiso, in the Amathole district Eastern Cape. We are lucky enough to have Ludwe as part of one [...]

Mojo Journalism Workshop

March 10th, 2020 | 0 Comments

March 2020, the Amanzi For Food Programme at Rhodes University in partnership with Media Academy South Africa launched a Mobile Journalism training short course at Mkhubiso Village, Kieskammahoek in Eastern Cape. Prior to the [...]

Start of 2020 for the Imvotho Bubomi Learning Network

March 10th, 2020 | 0 Comments

On the 4th of February the Imvotho Bubomi Learning Network held their first meeting of 2020. Members from all over the Raymond Mhlaba District Municipality and beyond travelled to Mr and Mrs Peter's new [...]

A Taste of the Agroecology Conference – Video

September 12th, 2019 | 0 Comments

In February this year the Amanzi for Food team attended the Agroecology for the 21st Century Conference in Cape Town. This was a very fruitful conference that highlighted conversations around the developing Agroecology movement within [...]

Mapping learning networks, sharing lessons

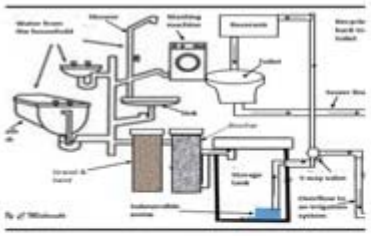
June 7th, 2019 | 0 Comments

The Amanzi For Food programme has been working to share and develop effective rainwater harvesting and conservation approaches for five years now. A core component of this process has been to promote collaboration and [...]

Farewell Dear Tichaona

April 23rd, 2019 | 0 Comments

Dr Victor Tichaona Pesenayi passed away at his home in Makhanda last week surrounded by his wife and family. Tich's passing came days after he graduated with a PhD from Rhodes University on 11 [...]



Greywater harvesting and Filtration system in Fort Cox

October 18th, 2018 | 0 Comments

The experimental project herein undertaken endeavors to explore grey-water reuse by way of setting up a circulation system where the water undergoes a process of filtration before it is pumped back to the house for [...]

Enactus productive demonstration site

August 6th, 2018 | 0 Comments

As part of the Amanzi for Food, Mpumalanga symposium participants were tasked with developing posters showcasing their productive demonstration sites. Youths in the Enactus group from the University of Mpumalanga also participated in the development [...]

Mpumalanga training of trainers certification process

August 6th, 2018 | 0 Comments

On the 9th of July 2018, Mpumalanga Learning Network members who completed the Amanzi for Food Training of Trainers course received certificates to celebrate this achievement. The training of trainers course comprised of 4 assignments; [...]

First Imvotho Bubomi Learning Meeting of 2019

April 1st, 2019 | 0 Comments

On the 7thMarch 2019, the Imvotho Bubomi Learning Network held their first meeting of the year. The meeting was attended by a large number of members including new and old from all over the [...]

Eastern Cape training of trainers graduation

October 28th, 2018 | 0 Comments

Amanzi for Food, Eastern Cape training of trainers' graduation was celebrated at Rhodes University on the 11th of October 2018. The graduation commemorated the successful completion of the Training of trainers' course which was [...]

2018 World Food Day commemorations, Mxumbu village

October 28th, 2018 | 0 Comments

World Food Day (16th October) was commemorated in style in Mxumbu Village this year, with an 'Ilima' event celebrating traditional farming practices, seed diversity, and food sovereignty. 'Ilima' traditionally involves many people from the community working together [...]

Climate Smart Agriculture comes to the Eastern Cape

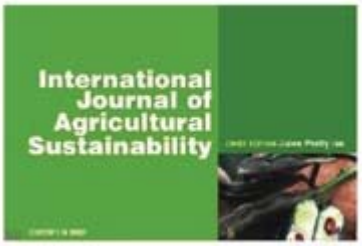
March 26th, 2018 | 0 Comments

A sister project to Amanzi for Food is based in KZN and is focussed on Climate Smart Agriculture (CSA). This project is also funded by the Water Research Commission and is led by Mahlathini [...]

Busisiwe shares her Eastern Cape seed route

February 20th, 2018 | 0 Comments

Busisiwe Mgangxela, an emerging rural farmer near Hogsback who is passionate about keeping things natural and traditional, shares her Green Route. My background as a nurse educator where good quality nutrition is the first line [...]



Towards sustainable vegetable growing with farmer learning videos in Benin

February 15th, 2018 | 0 Comments

Vegetable production plays an important role in nutrition, food security and poverty reduction in Benin. However, vegetable production is hampered by pests and farmers rely on pesticides to control them. Improving farmers' knowledge is important [...]

Agriculturalist learn about Rainwater Harvesting at UMP

October 12th, 2017 | 0 Comments

Prof Heila Lotz-Sisitka, Crispin Dirwai, Chamu Mutambo and Gerhard Viljoen at the course The Amanzi for Food Training of Trainers course kicked off at the University of Mpumalanga on Wednesday September 13. MBOMBELA – Water [...]

Amanzi for Food wins Greening the Future Awards

October 11th, 2017 | 0 Comments

A unique approach gives Amanzi for Food the edge. Unlike many programmes that use "Research-Develop-Disseminate-Adopt" strategies to produce knowledge without continual in-the-field integration, Amanzi for Food involves farmers, extension officers, agricultural educators and trainers. There [...]

Figure 4.10. Blog posts on the Amanzi for Food website

The blog posts vary in content – at times celebrating members of the IBLN and their achievements, other times reporting on achievements of the network (e.g. when the Amani for Food Network won the Mail and Guardian Greening the Future Awards in 2017), sharing key activities taking place in the network (e.g. courses, ToT graduations, IBLN meetings) new developments in the programme (e.g. announcement of the online course and #StudentChallenge) or useful information for farmers.

4.2.3 Diverse social media

The website is the most substantial of the project's social media platforms, and also forms the main Technology Transfer Tool as it will also hold all of the other TT tools and the Knowledge Uptake Strategy as well as all of the material and other artefacts from the project, including the Online Training of Trainers Course, are located. However considerable use has been made of other social media. Key among these are the Facebook page and the WhatsApp groups established by the three Learning Networks. Each of these are described in detail in the following sections. Given that this project was also trying to research the development of this social learning model, while also enabling its praxis, we also gave attention to what could be learned from the use of social media tools, so as to better inform the social learning network model and its development.

4.3 Communications, Branding and Project Identity Creation

4.3.1 Communications – developing a concept identity

From the very outset of Phase 1 of the project in 2013 it was recognised that communication, through the use of multiple platforms, should be a central component. This recognition was based on the primary obligation to share the information in the WRC material as widely as possible, and that there were many diverse potential audiences for this information, each accessing information in different ways. One of the initial tasks was therefore to identify these potential audiences, and then understand which communication platforms would be most appropriate for each.

In the beginning the focus was very much on the formal education and training sectors, in particular the agricultural extension services and the tertiary institutions responsible for education and training in the sector. Considerable effort was expended in developing an understanding of the situation in each of these areas, indeed this was a main focus of the very first Deliverable 1 submitted in August 2013 in the earlier project (Lotz-Sisitka et al., 2016). This process was aided greatly by the provision by the WRC of a seminal study into extension services: '*Development of training material for extension in irrigation water management'* (Stevens et al. 2012), which provided valuable background into the functioning of the extension services and the ways in which they accessed information (briefly summarised in Chapter 2 above). In parallel with this an intensive consultation process was initiated with Agricultural Colleges (now referred as Training Institutes), with visits to seven colleges involving discussions with their principals and other lecturing staff. Out of these processes grew a quite profound understanding of the ways in which these institutions accessed information, which informed much of the initial communication strategy.

Over time, and through the experiences of the project, the understanding of the potential audiences grew considerably. It was recognised that while, in principle, there should be strong connections between the extension services and the formal education sector and the ultimate intended beneficiaries of the project, namely the small-scale farmers and household food producers, in reality there was less contact than might have been expected, a finding that was also noted and confirmed by the ASSAf (2017) study referred to above in Chapter 2. This understanding led to the realisation that no assumptions could be made about the transfer of knowledge and skills between different groups, and that a proactive approach to communication of the WRC information would be needed, especially to be conceptualised not as an 'awareness raising type of communication' or a 'promotional or social marketing type of communication' but a form of communication activity that would support meaningful social learning and that would help to develop and strengthen learning networks. As this type of communication work is not well described in the literature as the communication sciences tend to focus mainly on technologies and approaches oriented towards the former two types of communications, and the educational sciences tend to focus more towards the latter but in ways that are limited by an interest in individual cognitive gain, rather than collective social learning, there was need to do substantive research to develop this new model. All of the masters, PhD and post-doctoral work undertaken in this project has contributed towards the development of this particular type of communication model, with special emphasis on how boundaries between farmers, extension services, agricultural colleges and ATIs, and media practitioners could take place in the service of the productivity and well-being of the farmers in rural areas that are also affected by historical marginalisation. Hence we undertook in-depth research into appropriate models for knowledge dissemination and boundary crossing co-learning as outlined in Chapter 1, and as is reflected in more depth within and across the Amanzi for Food associated Masters and PhD studies of Pesanayi (2019); Weaver (2016); Lupele (2017); Van Staden (2018); Matiwane (2020); Durr (2020); Maqwelane (2021); Metelerkamp (2020) [these are all produced by scholars[23] who have been involved in the Amanzi for Food project; their studies all relate to, and contribute to the project and its objectives and overall they contribute to the in-depth theorising and empirical testing of various dimensions of the emerging social learning network model that has been developed in this project].

While there was a natural and justifiable initial focus on communication through broad-based platforms, such as the internet, with the establishment, early in the process, of a project website and linked Facebook page, more conventional and grounded media were also brought into play to enrich the social learning network model. These included community newspapers and community radio. With a growing recognition that, despite all the various platforms available for information sharing, people preferred to share directly on a face-to-face, person-to-person basis, the idea of Learning Networks took shape. These networks, the first of which evolved out of the first running of the Training of Trainers course in the Eastern Cape, brought together people from different areas within the agricultural sector to work and learn together

[23] The studies are all available for download on the Rhodes University Library's thesis repository, and are included as an appendix to the body of work that has been produced out of this project.

in ways that had not been done before. This proved the ultimate communication medium within the project, with important lessons for others, both within the agricultural sector and beyond.

4.3.2 Branding and project identity creation

In a world saturated with brands, and particularly where the internet is bombarded constantly with brand names demanding attention, it was vital to develop an immediately recognisable concept brand which spoke clearly and directly to both the mandate and ethos of the project. It also needed to be seen as different from the torrent of commercial brands seeking to sell products at every possible opportunity, again, particularly on internet platforms. And it needed to be differentiated from organisational brands such as the WRC brand, or the Rhodes University brand.

The brand also needed to be one with which the primary project beneficiaries, the farmers themselves, could relate, and which incorporated the essence of the project, namely the harvesting of rainwater for food production. After considerable deliberation within the team and consultation with key partners, including the WRC, the concept of 'Amanzi (the isiXhosa and isiZulu for water) for Food' emerged. It was then necessary to design a logo, which captured this simple yet powerful message in a stylish and potent image, which combined visual references to both water and food, in colours appropriate to the essential naturalness of the concept and the context in which farmers live and work. Out of these deliberations the Amanzi for Food logo was born:

Figure 4.11. The Amanzi for Food logo

The project has a primary mandate for the sharing of information, with a focus on conservation, water, and food. It was therefore vital to capture these ideas in developing a project identity, which would be both recognised and understood, and summarise the core message. The tagline (or strapline) developed for the project, to accompany the logo, became:

SHARING KNOWLEDGE ON THE USE AND CONSERVATION OF WATER FOR FOOD PRODUCTION

Figure 4.12. The Amanzi for Food tagline/strapline

This tagline, while conveying a clear sense of the project focus, allows scope for wide interpretations of the means of sharing, the kinds of knowledge, different approaches to conservation, and different means and scales of food production. The details of the process of coming to this 'conceptual brand', i.e. in which a core idea or concept is branded, is contained in Lotz-Sisitka et al. (2016) and is therefore only briefly conveyed above. The brand and project identity developed some 7 years ago have remained constant and are increasingly recognised and respected by partners in both the agricultural and water sectors, and the education and conservation fields, which reflects well on the status of the project.

This conceptual brand is always used with the WRC logo, and the Rhodes University Environmental Learning Research Centre logo's and with the logos of other participating organisations, as seen below.

The branding tools developed at the start of the project have helped the project team to develop the graphics for the websites, and also for many of the project's tools and material in such a way that they are recognisable and that look professional and attractive to users, as can be seen by the covers of two of the draft TT tools emerging from the project, as seen by some examples of the project's publications and communication tools on the next page.

Figure 4.13. Examples showing how the concept branding has been used to create a consistently attractive and professional image and identity for the project.

4.4 Amanzi for Food Website/Online Platform Monitoring and Improvement

4.4.1 Amanzi for Food website/platform monitoring and improvement

As was reported in Amanzi for Food first iteration report (Lotz-Sisitka et al., 2016), the Amanzi for Food website and blog went live in February 2015 after a careful process of developing the site, as also indicated above. It was key for the site to be accessible and easy to navigate in a way that a diverse audience could obtain various information required as it was created to make the WRC material more accessible to users in an easy to follow way breaking the RWH&C practices into categories. These categories are designed so that any agricultural practitioner can identify themselves in the way that they plan to use the information in their practice. As indicated above, the website was designed to have the following features:

- Information on the WRC material
- Accessible structure for downloading the WRC material framed by the farming scales and the specific practices under the user friendly concept of 'Catch, Store and Use Water'
- Ideas and updates – to carry ongoing news and blogs, think pieces and other material of interest
- Learning Networks – to carry information on the learning networks and their activities
- Trainers Course – to carry the course material and information on the course
- Contact details – to allow for interaction and enquiry
- Links to a Facebook page, and to other related internet sites

Besides the ongoing additions to the website as indicated above, a major development activity on the website in the reporting period has been the decision to include the **online ToT course as an integral part of the website**. This has been designed in such a way that participants can do the course open access and free, and through this get to know more about, and also access the WRC material via the access approaches reported on above. It is expected that this will increase traffic on the site considerably, and vastly increase access to the information in the WRC material. Below are the details of the website and its usage. The monitoring of the website and its usage is a useful 'window' into how people are interacting with the project via this social media / internet based tool, hence we have continued to monitor the website and its use.

*4.4.2 Diagnostic report for an overall strengthening of the Amanzi for Food Website (**www.amanziforfood.co.za**)*

Diagnosis of website usage entails a particular terminology, which is explained in Box 4.1 that follows.

Box 4.1. Terminology associated with website usage diagnosis

TERMINOLOGY

Users – website visitors who have initiated at least one session during the date range

New Users – the number of first-time visitors during the selected date range
Sessions – number of times the site is visited by users
Number of sessions per user – the average amount of times the is visited per user
Page views – the number of times any specific page has been viewed by users
Average Session Duration – time spent on the site per session
Bounce rate – the percentage of visitors to a particular website who navigate away from the site after viewing the page only once
Unique Page views – is the number of sessions during which the specified page or screen or set of pages or screens is viewed
Average time on page – the average amount of time users spent viewing a specified page or set of pages

In the last website report a thorough analysis was done of the traffic on the website between January and December 2018 and in 2019. Out of this report the conclusion was reached that there was not enough traffic to the website and quite limited engagement with the website resources and website content. In comparing the analytics of the 2020 year with that of 2019 one can see that there has been a substantial increase in viewership, and engagement on the Amanzi for Food web page.

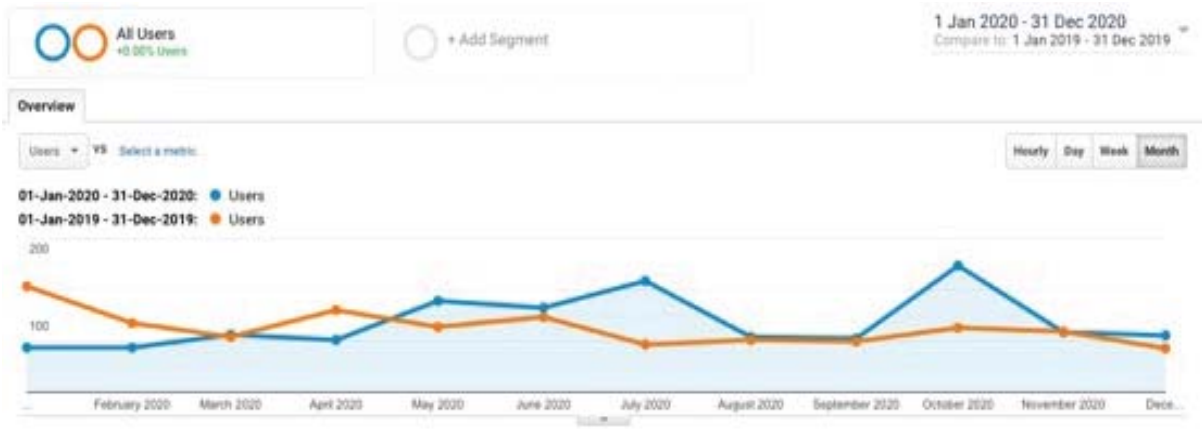


Figure 4.14. Graph comparing number of website users in 2019 compared to 2020

Figure 4.14 illustrates how throughout the year there has been a general increase in users in 2020 as opposed to 2019. The 2019 year experienced one spike at the beginning of 2019 whilst the 2020 year had an overall increase of users with notable spikes in May, June and July and then again in October.

Figure 4.15. Figures showing the overall positive increase in all analytics when comparing 2019 and 2020 (a negative bounce rate is in fact a positive sign).

Figure 4.15 gives an indication of the overall increase in users, sessions, page views, average session duration and decrease in bounce rate. The increase in sessions (41.78%) and page views (119.60%) is notable as it displays the increase in traffic to the site. The page views have gone up from 3,021 in the 2019 year to 6,634 in 2020. The bounce rate has reduced by 18,75%, which means that more people are spending more time on the site engaging with the content. The increased average session duration from 3 seconds to 6 seconds in 2020 is also testimony to increased user engagement.

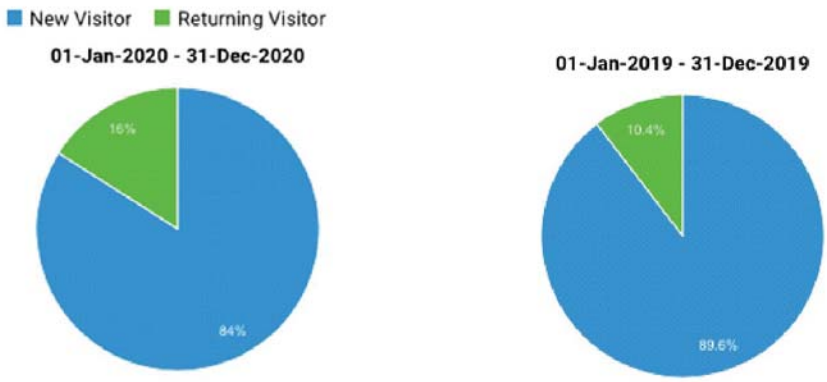


Figure 4.16. Graphs showing the ratio of new to returning users in 2019 to 2020.

Figure 4.16 illustrates the ratio between returning and new website visitors. In 2019, 89.6% of all visitors to the site were new visitors with only 10,4% returning visitors. In 2020, 84% of visitors were new, while 16% returning visitors. This increase in returning visitors is viewed as a positive metric as visitors are returning to the site to utilise the material and resources and keep updated with the work showcased on the Amanzi for Food website. It is expected that this number could rise as the online course becomes used more widely.

Overall, the above metrics are still very low and further work needs to be done to encourage longer session durations, higher returning visitors and a reduced bounce rate. The number of

users also needs to increase going into 2021. With consistent website updates and advertising of the online course and available resources the goal of increased traffic in 2021 should be achieved.

Looking at 2020 in more detail:

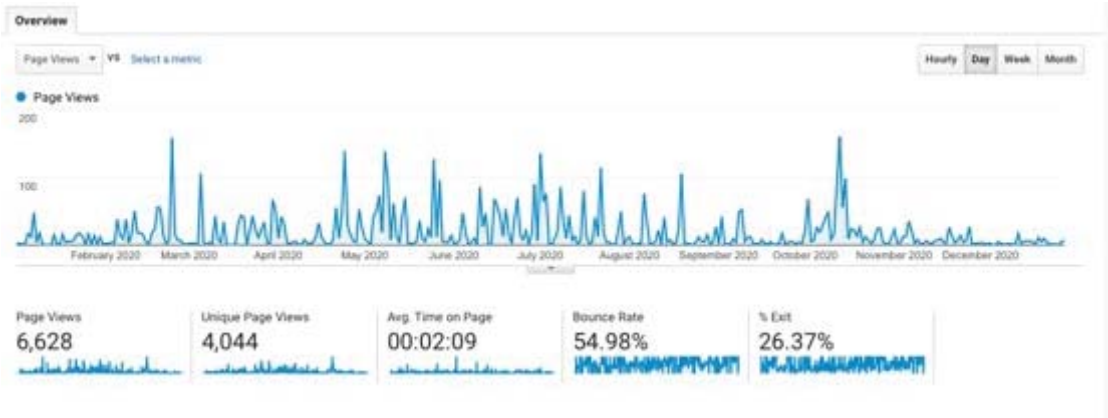


Figure 4.17. Amanzi for Food website analytics showing the page views overview for 2020

The total number of page views spiked several times over the year with a total of 6, 628 page views between January 2020 and December 2020. This is significantly higher than 2019 as seen in Figure 4.17 above.

The spikes in page viewership correlates directly to new content published onto the updates and ideas Amanzi for Food page.

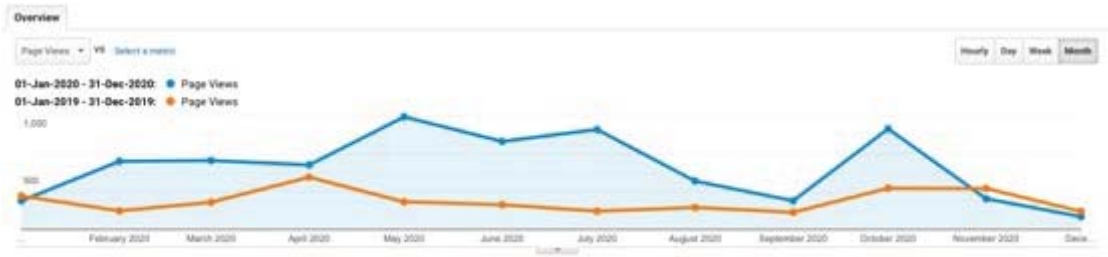


Figure 4.18. Graph showing monthly breakdown of website page views comparing 2019 to 2020.

Figure 4.18 indicates that according to the monthly page views there was a notable increase in May, June and July and then again in October. Overall the page views were much higher than that of the previous year. The May, June and July increase can be attributed to the increase in activity on the site with publishing of two update articles as well as a number of successful Facebook articles which redirected traffic from the Amanzi for Food Facebook page to the Amanzi for Food website.

The spike in October can be attributed to the WRC webinar and initial announcement of the Amanzi for Food Training of Trainers online course. The website was advertised continuously throughout the Training of Trainers online course webinar launch as well as in all pre- and

post-communications and advertisements. This activity around October resulted in an increase in users visiting the site.

When investigating the origin of users, the top three countries were South Africa (53,8%), United States (14,1%) and China (4,37%). The United States and the Chinese users appeared to have very short average session duration, which was less than a second, which implies that these user engagements were not meaningful. The top three countries of users' whose average session duration was over 5 seconds were South Africa, Zimbabwe and the United Kingdom. The bounce rate for users from these countries was also significantly lower at 46%, 65% and 38% respectively, while they were significantly higher for United States (86%) and China (97%). Therefore, users from South Africa, Zimbabwe and the United Kingdom are spending more time on the Amanzi for Food site, therefore presumably engaging with the content more deeply.

Finally, when looking at the viewership of the individual pages for 2020 (see Figure 4.19), the top three pages were the Amanzi for Food Home Page (15,27%), the Online Training of Trainers Course (12,67%), and the Module 1 Core Text (4,42%). When one looks at the pie chart in figure 4.19 below, one can see that in 2019, about 20,5% of all page views were on the Amanzi for Food Home Page and there after the Catch, Store and Use water resource page (8%) which was followed by the Downloadable Resources page (6,5%).

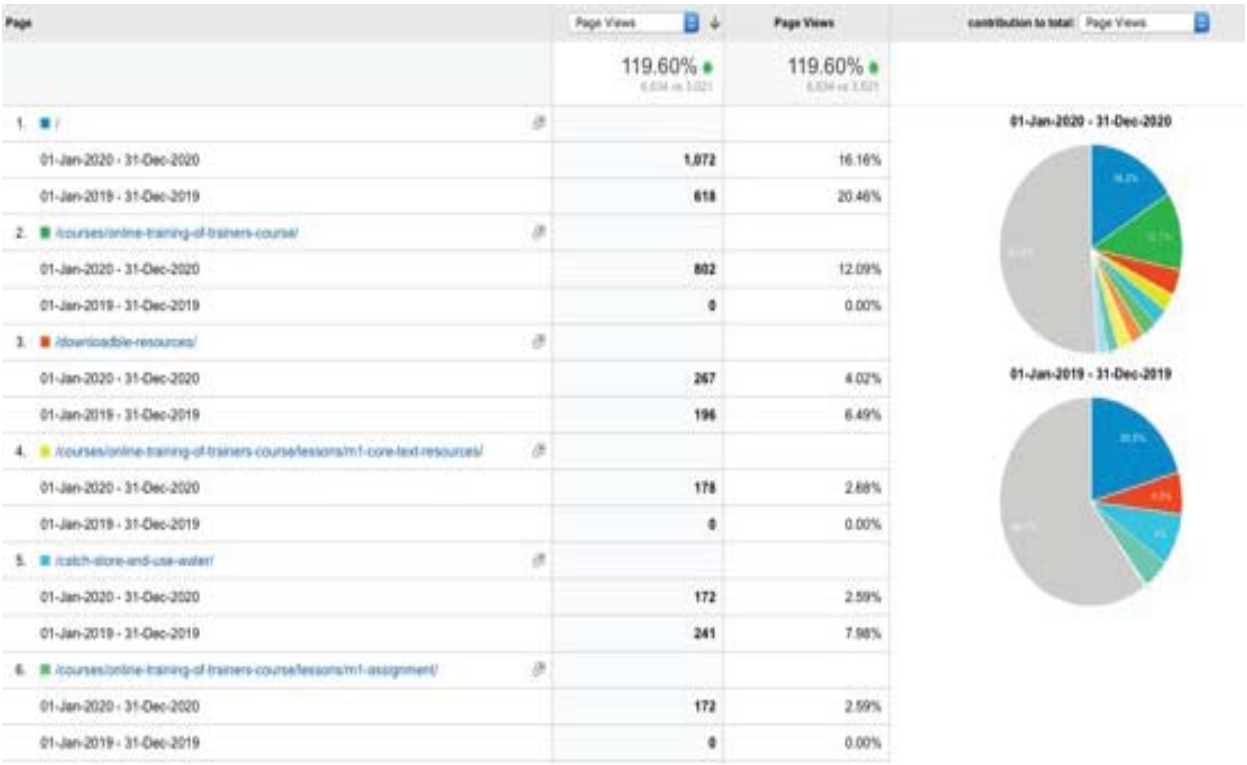


Figure 4.19. Table and Graph showing the page viewership for 2019 and 2020

This shows the change in page views to reflect increasing interest in the Training of Trainers course and the associated material and learning resources, which went live and was announced and initially advertised in 2020.

There has been much work on refining the Amanzi for Food website, keeping content up to date, material and resources accessible as well as curating and designing the content of the online course to allow for easy access to information for all. The Amanzi for Food team anticipates high retention on the site profile. An increase in the retention rate will increase the website Google ratings, which may place the website among the top search results if people search for any content related to water harvesting and conservation practices. Research indicates that this increases trust in the website as the higher the rating of a website in a google search, the more confidence the audience has in it.

4.4.3 Potential impact on website use of the online training of trainers course

An online version of the WRC Amanzi for Food Training of Trainers Course has been developed and was initially announced and pre-launched at the end of 2020. (This is described in detail in section 5.5 of this report.) It was expected that the online course should lead to a considerable increase in the use of the Amanzi for Food website, on which the course is located, and in the access to the WRC and supplementary material available on the website. A particularly encouraging development has been the securing of data-free access (via the link: http://amanziforfood.sbox.datafree.co/) to both the website and the course for those using their cell phones. Such access should make the website and course much more accessible to farmers and others in the rural areas who cannot afford the high charges for data in this country, and open up these sites to many more people.

The course is accompanied by the WRC / Rhodes University sponsored Amanzi for Food #StudentChallenge (section 5.6 in this report), which should also attract more people, in particular students and other youth, to the website.

4.4.4 Initial impact following the initial (pre) launch of the online course

The expectations of an increase in website usage following the initial announcement and (pre) launch of the online course have been exceeded as evidenced by the following report of website analytics conducted in mid-February 2021:

Following the first announcement in October 2020, in early 2021 the team has put a big effort into generating support and interest in the WRC Amanzi for Food Online, Open Access Training of Trainers course. Since then there has been a very considerable increase in traffic on the Amanzi for Food website. The series of graphs below clearly demonstrates the increase in users on the website from mid-January when the marketing campaign for the online course was launched.

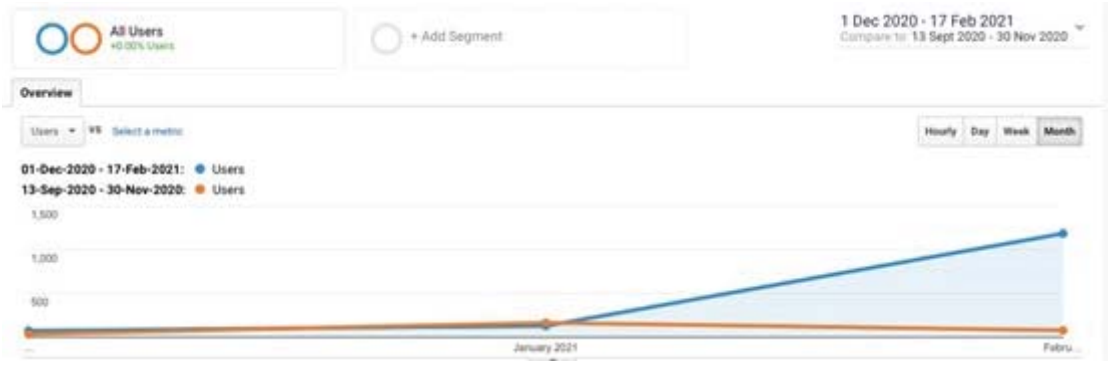


Figure 4.20. Graph showing the number of users (monthly) accessing the course between December and February compared to the prior three-month period. – Google Analytics

Figure 4.20 illustrates the number of users on the Amanzi for Food site on a monthly basis. The number of users in December (74 users) and January (129 users) were lower and similar to the number of users in the previous three month period, however this number increased dramatically in February which saw a jump to 1,187 users.

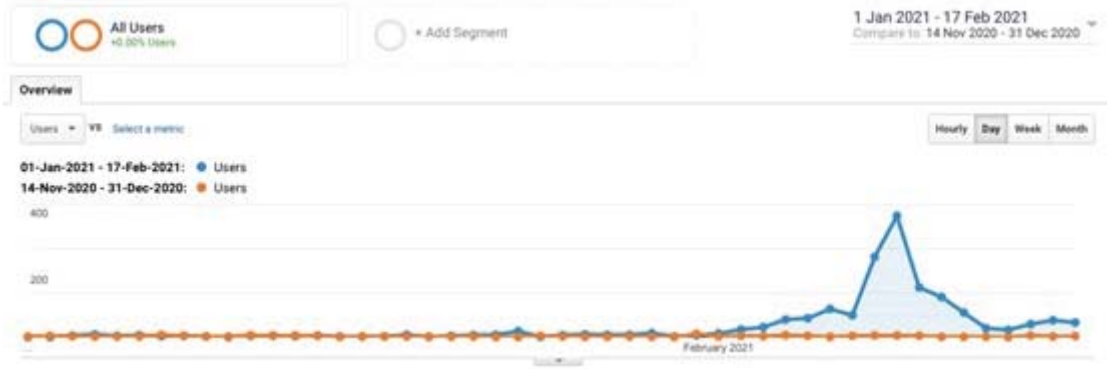


Figure 4.21. Graph showing the number of users (daily) accessing the Amanzi for Food website between 1 January and 17 February compared to the month prior. – Google Analytics

Figure 4.21 shows a more concentrated view of the period over which there was increased traffic. The increase in activity started at the beginning of February and peaked on 9 February. On Friday 8 January the number of users visiting the site was 8 while a month later on 9 February the daily number had increased to 366. Since 2 February 2021 the daily number of users visiting the site has not fallen below 22 (average of 90 users per day) which is significantly higher than previous months where the average daily figure was 4 users per day. The peak on 9 February can be attributed to a large push in marketing of the course. On 2 February a series of posters was posted on the Facebook page and shared with a number of different partners. A Mailchimp advertisement was emailed out to the wide network of interested parties during the first and second week of February. On Tuesday 9 February one of the Amanzi for Food team members discussed the Online Course and Amanzi for Foods work on a National Radio Talk Show (Cape Talk) providing the website as a point of reference for those who wish to find out more about the project. This marketing push can be directly attributed to the massive increase in website traffic.

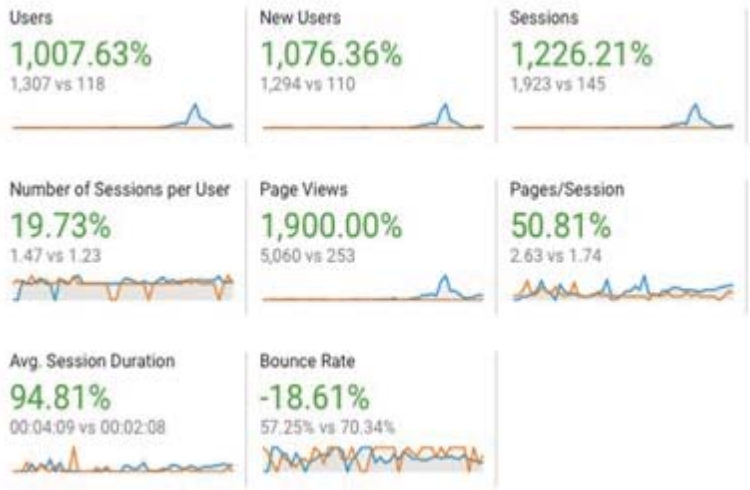
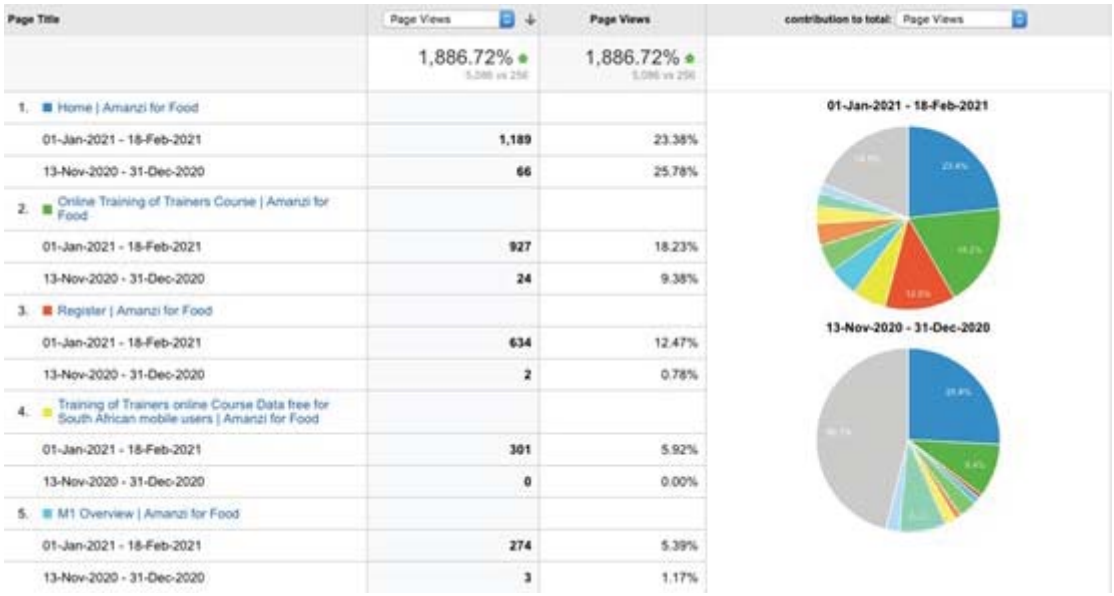


Figure 4.22. The Amanzi for Food Website Analytics for the period 1 January 2021 to 17 February 2021 in comparison to the period 14 November 2020 to 31 December 2020 – Google Analytics

Taking a closer look at the analytics (1 January 2021 to 17 February 2021 compared to 14 November to 31December 2020) shown in figure 3, it can be seen that the number of users increased dramatically from 118 (November-December 2020) to 1,307 (January-February 2021). The number of page views increased from 253 (November-December 2020) to 5,060 between 1 January and 17 February 2021. Not only was there a dramatic increase in the page views but more people were spending more time on the site with the average session duration increasing by 95% from 2 minutes to almost 4 minutes.

Figure 4.23. Graph showing the increase in Page Views on the Amanzi for Food website from the 1 January 2021 to 17 February 2021 – Google Analytics

Figure 4.23 illustrates the page views for the period of 1 January 2021 to 17 February 2021. The daily views remained at a fairly constant low for the most of January and, similar to the increase in users, there was a very noticeable increase from the beginning of February with a peak occurring around 9 February.



Page Title	Page Views	Page Views
	1,886.72%	1,886.72%
1. Home | Amanzi for Food		
01-Jan-2021 - 18-Feb-2021	1,189	23.38%
13-Nov-2020 - 31-Dec-2020	66	25.78%
2. Online Training of Trainers Course | Amanzi for Food		
01-Jan-2021 - 18-Feb-2021	927	18.23%
13-Nov-2020 - 31-Dec-2020	24	9.38%
3. Register | Amanzi for Food		
01-Jan-2021 - 18-Feb-2021	634	12.47%
13-Nov-2020 - 31-Dec-2020	2	0.78%
4. Training of Trainers online Course Data free for South African mobile users | Amanzi for Food		
01-Jan-2021 - 18-Feb-2021	301	5.92%
13-Nov-2020 - 31-Dec-2020	0	0.00%
5. M1 Overview | Amanzi for Food		
01-Jan-2021 - 18-Feb-2021	274	5.39%
13-Nov-2020 - 31-Dec-2020	3	1.17%

Figure 4.24. Diagram showing the top 5 pages visited on the Amanzi for Food site between 1 January 2021 and 18 February 2021 compared to 13 November to 31 December 2020 – Google Analytics

Figure 4.24 shows the pages that were most viewed between 1st January and 18th February comparing them to the previous period (13 November-31 December). The Amanzi for Food Home page was the most viewed page with 1,189 views which made up 23% of the total views. This was followed by the Online Training of Trainers course home page, which is the Course Orientation page, with 927 views representing 18% of the total views, this increased from 24 views and only 9% of the total between 13 November and 31 December 2020. The registration page for the online course was the third most visited page with 634 views making up 12.5% of the total page views. This was a significant increase from the previous period when the registration page was only viewed twice and made up just 0.7% of the total views. The registration page has been promoted extensively through recent course marketing which was done through the Amanzi for Food website, social media channels and email networks.

The fourth most visited page was a blog post on the news and updates page of the Amanzi for Food site. The blog post, titled 'Training of Trainers online Course Data free for South African mobile users", was visited 301 times between 1 January and 17 February 2021. This post was only published on 27 January 2021 and therefore received a large page viewership in a very short period of time. This indicates that there might be a lot of interest in the data-free version of the Amanzi for Food site and what this site has to offer.

Finally the fifth most visited page was the Module 1 (M1) overview page. This is one of the first pages, following the Course Orientation page of the Training of Trainers online course and, like all other aspects of the course, can be accessed without needing to be formally registered. The overview page went from being viewed 3 times in November and December to 274 times in January and February with the percentage of total views increasing from 1.17% of the views to 5.4%. The order of the 1st, 2nd, 3rd and 5th most visited pages follows the natural sequence of steps taken by people interested in the Online ToT course: Amanzi for Food Home Page → ToT Course Orientation (where people learn about how the course

works) → Course Registration (where they formally register as course participants) → M1 overview (where the learning on the course actually starts).

These analytics indicate that there has been great interest in the online course with three of the top five pages being part of the online course which has been newly added to the site. It is also encouraging to see that there was navigation towards the blog posts which could be the result of successful channelling of the audience from the social media platforms (Facebook and WhatsApp) to the website.

This rapid increase in activity is very encouraging but needs to be tracked on a continual basis in order to monitor the level of engagement that course participants have with the website and the course content. The page views and number of sessions should remain consistently high with traffic occurring on not only the first module's page but on all subsequent pages, including the assignments.

4.5 Amanzi for Food Facebook Page

The Amanzi for Food Facebook page was created in February 2015 and has been growing in its following ever since. The Facebook page was created with the aim of providing a platform for people to share ideas around Learning Networks and RWH&C practices for small-scale farming and household food production. The Facebook page is used as a platform to keep people informed about what is happening in the Amanzi for Food project, share interesting articles and opportunities that are aligned with the Amanzi for Food ethos, to direct people to the Amanzi for Food website where they can access resources and rainwater harvesting and conservation learning material. It is also used as a platform to encourage the development of a network where people are able to communicate and engage in dialogue around articles, news and opportunities that have been shared.

In 2020 there has been an increase in likes on the Amanzi for food page from 254 on 1 January 2020 to 337 on 31 December 2020. The increase appeared to occur in July and August in which period Figure 4. 25 below displays an exponential increase in page likes.

Figure 4.25 Graph showing the increase in Facebook Page Likes throughout the 2020 period

The number of page followers also increased during this time in a similar fashion from 257 on the 1st January 2020 to 337 on the 31st December 2020. There is a need to increase the number of followers and likes on the Facebook to page so as to achieve a greater reach on all social media platforms. This can be done via the engagement with the online course in the next few months.

Figure 4.26. Graph showing peaks in Total reach of the Amanzi for Food Facebook Page through the 2020 period

Figure 4.26 shows the overall reach of the Amanzi for Food content over the duration of 2020. Overall the reach has been poor with only one spike going over 20 people. There was a large spike in October with 61 people seeing the Amanzi for Food Facebook page content. This can be attributed to the Training of Trainers online course launch webinar, which occurred on 13 of October 2020. The launch was advertised by Amanzi for Food and its partners (the Environmental Learning and Research Centre and the Water Research Commission) on several different platforms (email, social media, print and word of mouth).

A second launch of the Amanzi for Food online Training of Trainers course is scheduled to take place early in 2021. In preparation for this launch it is important to ensure that a greater reach is achieved by increased activity on the Facebook page.

From January 2020 to December 2020 there were a total of 14 posts. 2 posts in January, 3 in February, 2 in March, 1 in June, 3 in July, 1 in August, 1 in October and 1 in November. Figure 4.27 below shows the posts and their associated interactions. The *'Amanzi for Food team in Partnership with the Water Research commission'* post achieved the most reach, reaching 221 people through shares and likes. The rest of the posts have achieved a smaller but consistent reach of between 30 and 60 views.

Figure 4.27. Analytics showing the performance of the Facebook posts published on the Amanzi for Food website in the 2020 period

The posts include a combination of links to articles on other websites (6 links), status updates (2) and the sharing of pictures with news and captions (6). These posts share opportunities, information about events, updates on the project activities, the successes of network members as well as links to interesting information that is aligned to Amanzi for Food's work.

There is great potential in the reach that Facebook and other social media platforms affords, and therefore one of the recommendations when looking at the Amanzi for food Facebook page is improvement in reach. This can be done by enhancing the social media strategy which can include scheduled posts, tagging and following of aligned projects and organisations and engaging more actively in online discussion and forums. The Amanzi for Food Facebook page receives a particularly high level of engagement from its Facebook followers in the form of photograph likes. For example, a large number of photographs which were added to the Facebook page to showcase what the different learning networks were doing as seen in Figure 4.28 below 84 likes.

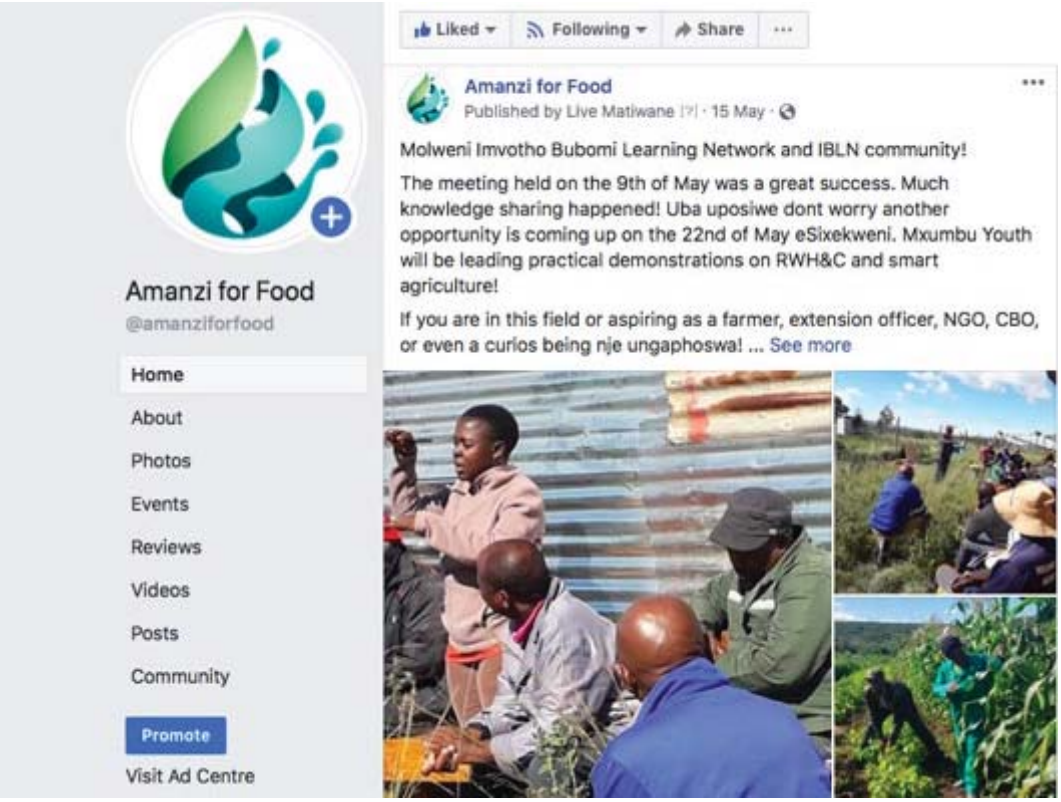


Figure 4.28. Screenshot of a post on the Amanzi for Food Facebook page which shares a number of pictures, showcasing the work of the learning networks

The Amanzi for Food Facebook following resides mostly in South Africa (87%) with a small number of African, European and Asia followers. The followers come from all over South Africa including, Alice, Amahlathi, Cape Town, Dimbaza, Durban, East London, Grahamstown, George, Keiskammahoek, Johannesburg, King Williams Town, Mafikeng and Mbombela amongst others. The majority of users come from the Eastern Cape Province and are situated within the Raymond Mhlaba Municipality where the Imvotho Bubomi Learning Network is very active. It is interesting to see that from January 2019 to date, there has been an increase in page likes from the urbanised centres such as Cape Town, Johannesburg, and King Williams Town. It is very encouraging to see that the Amanzi for Food Facebook page is being viewed in communities all over South Africa.

When looking at the demographics of the followers of the Amanzi for Food Facebook page (as seen in Figure 4.29 below), we can see that the page is engaged by predominantly women between the ages of 25-34 (23% of total followers). This is followed by men between the ages of 25-34 (16%). There appears to be a higher number of women between the ages of 18 and 24 that are following the Amanzi for Food page compared to men (9% compared to 4%), with the majority of followers across the age categories being women (54%). It is interesting to see that the majority of the people engaging with this Facebook page are young people who are of work seeking age.

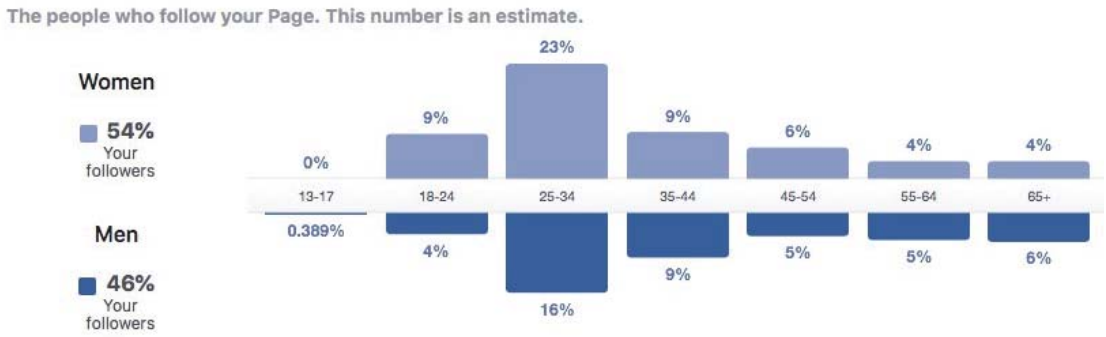


Figure 4.29. Facebook analytics indicating the demographics of the Amanzi for Food Facebook page followers

In the past year, the Amanzi for Food Facebook page has been effective in sharing what the Amanzi for Food team has been able to achieve and acting as a point of reference for learning network members and small-scale farmers seeking information about water harvesting techniques. As part of the 2020 Amanzi for Food Communication strategy the team aimed at increasing the number of followers and likes on the Amanzi for Food Facebook page; increasing the reach of the work that is being done in the Learning Networks. With increased frequency of posting and increased engagement with the Facebook followers the Amanzi for Food team hope to have a continuous and substantial increase in followers, therefore extending the reach of the Amanzi for Food project.

4.6 Radio Programming and Community Newspapers

4.6.1 Radio programming

In Phase 1 of the WRC Amanzi for Food project a strong relationship was established with the community radio station, Forte FM, covering the area of the Imvotho Bubomi Learning Network. The most active period for these radio broadcasts was in 2017, with some continuation into 2018 and 2019. One challenge which emerged was that the station required payment for any time taken for any broadcasts. This made it impossible for the farmers to continue to produce their radio programmes. After considerable negotiation it was agreed that a short time slot (15 minutes) could be made available, and the programmes continued for a short time. Each involved different members of the IBLN and a range of topics related to RWH&C were presented and discussed. The Workplan envisaged one broadcast a month throughout the year, and this was achieved with the exception of January 2019, when there was insufficient time following the Christmas break, and too many activities associated with the beginning of a new year to arrange the broadcast.

The radio programmes covered a wide range of topics of interest to local farmers. An example of a radio programme in this period comes from a brief report on the October 2017 broadcast that follows.

> ***Topic:*** *Water for food and adaptable seeds, Implications for small-scale farmers*
>
> *The aim of the radio program was to discuss how water for food and adaptable seeds impacts on the farming practices of small-scale farmers.*
>
> ***Panellists:*** *Tichaona Pesanayi – from Amanzi for Food, Mr Azwindini Rampinwa – from Fort Cox AFTI, Mrs Peter – Farmer, Mr Mhlobo – Farmer*
>
> ***Presenter:*** *Songezwa Saidi*
>
> *Tichaona introduced the Amanzi for food program and mentioned the upcoming TOTs on 2 and 3 November 2017 and encouraged the listeners to attend the course. Mrs Peter introduced herself saying she is a farmer who plants natural seeds or seedlings and that she focuses on planting using natural resources rather than chemicals. She mentioned that she also breeds traditional chickens (Umleqhwa). Mr Mhlobo mentioned that he specializes in broilers, and he also conducts training with farmers. He mentioned that his organization (Raymond Mhlaba Agricultural Forum), works closely with Amanzi for Food programme, because farmers are facing drought challenges and so they can benefit through having a partnership with the Amanzi for Food project. Tichaona mentioned that today's radio programme is specifically looking at the relationship between water, food and the seeds that we grow so we would like our listeners to try and see the connections that are there between what type of seed can they plant if there is not enough rainfall. Mrs Peter said the proposed Seed Bill does not allow them to exchange, share or store seeds. She also mentioned that the Seed Bill favours the conventional way of farming rather than the smallholder way of farming, and that as farmers in Amathole district they are fighting the Seed Bill.*

In the period following this the appetite for working on these broadcasts seemed to disappear, and no further broadcasts were made. An attempt early in 2020 to revive this aspect of the IBLN's activities was halted by the advent of the Covid-19 pandemic.

An in-depth study on the use of radio in expanding the IBLN community of practice was undertaken by Lupele (2017) as part of the Amanzi for Food programme. Importantly, her study found that the work done by the IBLN in engaging with community radio broadcasting and listener clubs helped to build the social learning within the emerging learning network. Her study concludes as follows:

> "The participants in the Imvotho Bubomi Learning Network identified with the object of rainwater harvesting. This process then led to the identification process where they identified with and came to identify themselves as rainwater harvesting custodians. In this way they both began to see themselves and came to be seen as a knowledge community of the rainwater harvesting knowledge. In the same way, this identification process was evident in the second half of the study – the micro level – where the participants in the simulated participatory radio listening group identified with the object of rainwater harvesting which was evident through the various articulations made. This

> created space for learning in such a way that the identifying process was embedded in the tracking of social learning sequence moments in a learning system. For the study, this means that the radio programming process on rainwater harvesting was developed and enacted through a relational process to the object which made it an identifying process at both the macro and micro levels of emerging learning and learner-led engagement. This can be seen in the expansion of the social competency dimension of a community of practice and through the tracking of social learning sequence moments in a learning system, thus bringing about and expanding the actual learning process in both cases". (Lupele, 2017, p 83).

This indicates that there is significant learning potential for participants in a learning network if they are part of communication activities such as radio programming where they share their experiences around a key practice that they are developing. This learning was an important contributor to the establishment of the IBLN.

A Radio Handbook was produced out of the experience of supporting community members in the IBLN to contribute to radio programming. The radio handbook covers ways of using local radio and community programmes. This is also a useful Technology Transfer tool, especially if media practitioners use the content on the website, and links to community activities to produce radio content and also support listener groups as was also discussed and recommended out of Lupele's (2017) study.

4.6.2 Community newspaper channels

While some contact had been made and articles shared with community newspapers in the earlier phase of the project (Lotz-Sisitka et al., 2016), there was little feedback from these activities, and subsequent media efforts were directed more at radio and online platforms. However, in Mpumalanga the main partner, Mr Gerhard Viljoen of UMP established good connections with newspapers in Mbombela (Nelspruit), which led to some effective coverage of the Training of Trainers Course. The newspapers concerned were the Lowvelder (a member of the Agri Pulse newspaper syndicate) and NewsHorn (a fully independent publication). The Newshorn produced the following article:

Farmers in Mpumalanga trained in water harvesting

Tumelo waga Dibakwane

The Water Research Commission in collaboration with the Rhodes University Fort Cox Agricultural Training Institute held a two-day training seminar with the theme Amanzi for Food (water for food), rain water harvesting and conservation at the University of Mpumalanga.

According to facilitator Tichaona Pesanayi from Rhodes University, the main idea behind Amanzi for Food is to support those in the agricultural sector. Those who will reap benefits from this programme include small scale farmers and homestead food producers, especially women and youth workers. Lecturers, trainers teachers and agricultural NGOs will also now be able to teach others to implement different ways of harvesting and using rain water according to their needs to improve food production.

"South Africa is a water-scarce and water-stressed country with all the available water resources already being used. The situation is likely to become even more serious as climate change leads to less rainfall and increased heat waves especially in the central and western areas of the country," said Pesanayi.

He stressed that Amanzi for Food can never on its own address all the challenges in growing sufficient and good quality food for everyone. It can however make an important contribution to increasing food security at local and regional levels.

The main aim of the project is to create learning cycles which can operate in communities and promote the concept of water harvesting amongst household gardens, subsistence and commercial farmers. If water is available or retained in the soil, production of value crops becomes possible and that in turn promotes food security with any surplus to be sold for additional income.

Gerhard Viljoen, Deputy Director of Continuing Education Service at the University of Mpumalanga said "the good thing about rainwater harvesting and conservation is that it's cheaper and the water can be re-used without any cost."

NewsHorn also talked to Collen Mashego from the Mobile Agricultural Skills and Training unit(MASDT) who said that they are thrilled with the programme because they knew about rainwater harvesting but never took it seriously before. After the course he is now adamant to train others. "The rainwater harvesting and conservation was there but due to technology we tend to ignore it, but after the programme, we will make sure that we share the information with all farmers from our organisation and ensure that that they use it since there is no additional cost in this process."

Figure 4.30 NewsHorn Article on the Training of Trainers course in Mpumalanga

The journalist, Tumelo waga Dibakwane, responsible for this article became very involved with the process and the people in the SSS Learning Network, and promoted their work as often as he could.

In addition, an online edition of the Lowvelder (https://lowvelder.co.za/405602/agriculturalist-learn-rainwater-harvesting-ump/#.WdtzjXvOHIk.email) also provided excellent coverage of the course, and included the following images and text:

MBOMBELA – Water is precious. To help agriculturalists make the most of this resource, the University of Mpumalanga (UMP) joined forces with Rhodes University and the Water Research Commission to present the Amanzi for Food Training of Trainers course.

According to Prof Heila Lotz-Sisitka from the Environmental Learning Research Centre at Rhodes the aim of the course was to provide added support to local people working in the agricultural industry by teaching them how to implement various rainwater-harvesting techniques and water conservation practices and by teaching them how to train farmers to use the water-harvesting techniques.

The course is a part of a larger research project previously implemented in the Eastern Cape three years ago. The project is now being implemented in Mpumalanga, and is expected to extend to the North West in 2018. According to Gerhard Viljoen from UMP, the project has the ability to be modified so as to cater for the needs of the areas where it has been implemented.

Reflecting on the way forward after the course, Viljoen said, "We want people who attended the course to actively apply the skills which they have learned so that they can construct rainwater-harvesting systems. This will benefit not only their lives but the lives of others in their communities as well."

Figure 4.31. Extracts from Lowvelder online edition

These articles certainly provided a wider audience the opportunity to learn something about the training and about the importance of RWH&C for farmers in the province.

Discussions were held with both publications with the idea to produce a series of articles on RWH&C practices among local farmers (cf. Figure 4.32 below), with the article produced in the Lowveld below being a good example of the potential of this media-based approach.

Figure 4.32 A good example of a content-based community newspaper article that facilitates understanding of RWH&C

As can be seen from the above, there is real potential for working more closely with local newspapers, but this requires considerable time and effort, especially to support journalists to translate the WRC material into articles. As indicated in Chapter 2, community newspapers and the IPA network that supports them has a wide reach.

4.7 Mobile Journalism (MoJo)

The role of video in supporting farmer learning in gaining increasing recognition globally, and as indicated in Chapter 2, video is increasingly an important social media tool, as shown also by the high usage of YouTube and the new entrant TikTok platform. A growing number of institutionally supported video learning databases such as https://www.accessagriculture.org/

are now available to farmers. And, similarly, a growing number of farmers are moving online through video in order to share their knowledge and practices.

Within the IBLN there is evidence that video (and image) are used as part of the digital 'language' of the IBLN and form a part of how the network learns and shares with each other. In an analysis on the IBLN WhatsApp group, it was shown that 996 photographs and 65 videos were shared over a 5 year period. As access to video-enabled smartphones and internet access increases, the use of video has been steadily on the rise.

In support of this, a partnership with the Cape Town Media Academy was developed to run a placed-based mobile-filmmaking workshop for the IBLN. This training was specifically designed to support IBLN members to develop compelling films using their mobile phones, so that members could document their practices and teach/learn from one another more effectively.

This workshop was run over five days in Mkhubiso village in March 2020, shortly before the national COVID-19 lockdown was announced. The attendees included Mkhubiso community members, Imvotho Bubomi Learning Network (IBLN) members, representatives from Hamburg and Mxumbu villages, and students from the Fort Cox AFTI and Rhodes University.

Figure 4.33. MoJo in action at the workshop

The workshop was very well received as evidenced by the feedback from a participant in the workshop report:

Mrs. Busisiwe Peter, a farmer and an IBLN member, expressed her gratitude for the MoJo training saying "*The mobile journalism workshop was an eye-opener as a tool for storytelling more especially with us rural almost forgotten communities".* She further said that *"I feel like we have been given a chance to fill the gap for communities that have much to offer in the line of indigenous knowledge".*

While uptake has been limited thus far, primarily due to the restrictions resulting from the Covid-19 pandemic, some uptake has taken place. With the right support, we believe the creation and sharing of mobile journalism videos could still make a meaningful contribution to

the development of responsive place-based learning material by the IBLN. Further support could include: investment into local film-screening events, more site visits and learning journeys, support in access to technologies and general encouragement to make and share films. One interesting application of the Mo-Jo workshop was that community members and students who attended the workshop turned their skills to use to facilitate local isiXhosa-based learning about the COVID-19 pandemic, and while not many farming practice videos were made, a number of short videos have been made in support of community learning in response to the COVID-19 pandemic. These are available on the YouTube Channel of the Eastern Cape Together network (which as noted above, was formed by members of the IBLN and other community networks in response to the need for sharing reliable and culturally relevant information on the COVID-19 pandemic). This has become the focus of a new master's in Education study by Lukhanyo Matshaya who is being supervised by post-doctoral scholar Dr Metelerkamp and Prof Lotz-Sisitka. We are hoping that they will be able to support the #StudentChallenge with MO-JO skills in the next period. Again we aim to research how this form of social media advances social learning network building and collaborative learning.

4.8 Use of WhatsApp as a Tool for Advancing Network Building and Learning

Each of the learning networks in the 3 provinces communicates largely through their WhatsApp groups. This is particularly the case in the Eastern Cape, where this is the main means of communication for the IBLN. In Mpumalanga, although there is some continuing communication between SSSLN members through the WhatsApp group, this has declined somewhat over the past year, as apparently people are more active in the sub-networks, rather than the province-wide learning network. In the North-West province at Taung Agricultural College, although there is some interaction through the #PulaWise WhatsApp group, it is possible for learning network members, all of whom are based at the college, to communicate with each other directly in person. In the section below, we share some of the interactions on the WhatsApp groups to illustrate the type of social learning and network that the WhatsApp platform has afforded the IBLN. In many ways the WhatsApp groups are the strongest social media tool that holds the networks together, helping also to advance collective social learning and advancement of sustainable agricultural practice, of which RWH&C is a key feature. The archive of data from the WhatsApp groups extends to some 600+ pages of printed text, therefore we share only some of the data and examples of interaction below.

4.8.1 Imvotho Bubomi Learning Network (IBLN), Eastern Cape

Membership

The IBLN WhatsApp network was established in 2014 out of the early meeting in which the IBLN was established, and which was then further activated through the first ToT course (Weaver, 2016). The WhatsApp group quickly grew in popularity as an important communication and co-learning tool, and members started sharing posts of their work on the productive demonstration sites which caught a lot of attention during the ToT course. Following that, ongoing communications and knowledge sharing has continued to grow, as has membership of the WhatsApp group, which now has a clear identity and purpose. Over time new influential members have joined the group (e.g. Ms Peters who is a strong farmer association leader and activist), and others have left, some such as Tichaona Pesanayi sadly passing away. Students have also been active members of the group and have contributed a lot to the sociality of the group as well as the technical know-how that is shared on the group.

The WhatsApp group has a welcoming orientation, and the group are always welcoming especially also of young farmers and anyone who can add value to the farming practices and interests of the group. The group also carries debates, shares examples of practices, deals with problem solving, practical organising of the network, and a range of other matters as indicated below. Today the IBLN WhatsApp group has approximately 90+ members (from an early group of approximately 15) and it shows about 3-15 posts per day, indicating this to be a very active WhatsApp group. As indicated above and below, it is also catalysing other learning networks around specific interests (e.g. COVID-19 responses, and cannabis farming opportunities).

Types of information shared through the WhatsApp group

While the establishment of the IBLN and the WhatsApp group was premised on the sharing of information on RWH&C in 2014 when it was first set up, in particular the information provided in the WRC research material on this topic, it was always understood that the group should be open to share information on whatever agriculturally related matters it chose. This has proven to be the case, and a very wide range of information is now being shared between members as illustrated in the following sections.

Network members sharing and requesting knowledge on rainwater harvesting, conservation and use

Below are some examples of conversations around specific issues of interest, providing some insight into the richness of the interactions between network members using the WhatsApp medium. They also show the increasing use of both English and isiXhosa languages, with many members now preferring to use the latter, in which they feel more comfortable and confident. This has opened up the space for a wider range of contributions.

Throughout most of the year 2019, the area covered by the IBLN faced very dire conditions with an ever-deepening drought, and water rationing occurring in parts of the area. The situation became extremely acute towards the end of 2019. Below is an extract in which a Keiskammahoek farmer garnered support from Seymour and Xesi (Middledrift) farmers concerning the issue of drought. An Amanzi for Food team member then shared resources from the website that could be of assistance.

'[8:09 AM, 11/27/2019] Mzwebongo Paprika Com Lenye: Morning farmers
In Keiskammahoek as farmers this absence of rain is destroying our main focus to feed the nation and creating jobs for our communities. But I won't give up loving the land
[8:44 AM, 11/27/2019] Nolitha Nyikana: Eish mfama, kunzima mpela ngoku, kuzakubanzima futhi [It is really hard, and it is still going to get harder], researchers help us in identifying more water harvesting ways.
[9:05 AM, 11/27/2019] Lawrence: Molweni I wish we could help but when we have been without real rain for so long there is nothing to harvest, but what it says to me is that we must look at collecting and storing as much as we can when it does rain
[9:09 AM, 11/27/2019] Nolitha Nyikana: Yes bhuti, harvesting and storing is the best option.
[10:56 AM, 11/27/2019] Mamu Nombasa Esixekweni:Yinyaniso emsulwa leyo mfama [that is the absolute truth farmer].
[7:47 AM, 11/28/2019] Live: Everything we have is on the Amanzi for Food website. The most useful books are the first ones the blue ones. They have all the practices. The other books are various applications of the practices.
If you go on the website and go to resources you'll find the navigation tool pops up first then you can look at all the practices there and where the practices information can be found. Let me send you the resources link – https://amanziforfood.co.za/downloadble-resources/
The navigation tool will tell you everything farmers can do to collect, store and harvest rainwater!
[8:06 AM, 11/28/2019] Live: on this link ezantsi there's also posters which will be quicker and easier to read
[8:06 AM, 11/28/2019] Live: https://amanziforfood.co.za/catch-store-and-use-water/
Also useful printable, easy to read examples'

New knowledge shared and a sub-network established

Knowledge shared in the group increased as an opportunity for Cannabis farming opened up in the network through IBLN member networking, following a presentation to the group by researchers from Walter Sisulu University, who had been commissioned by the provincial government to establish a cannabis growing research programme involving small-scale farmers.

Below is an extract from Mrs Peter presenting feedback on her own external networking activity, which led to the presentation to the group.

> *'[7:40 AM, 8/6/2019] Mrs Peter: Morning team. We have not been active in the group for some time due to the challenge we have with our farm in E.L, most of you know the story but we have not stopped being farmers and involved members of the group. I attended the conference on Cannabis last week being invited from the MEC office. There I met with a Professor from WSU Mthatha who noticed the agroecology farmer in me as discussions and questions took place. She asked to briefly speak with me so they can partner with us as the University on their research in natural herbs and medicinal plants stating they work with communities and their economy. I gave her my details, she wrote me an email endorsing what she spoke to me about. I replied to her telling her about IBLN as it is the only community I know and have been working with 😅. Their team would therefore wish to meet the IBLN and they shall send me the dates. I just hope and pray the dates will suit all or most of us and would like to ask Fort Cox to be our venue as usual. Trusting you are excited as I am because Prof from WSU is excited to meet us'.*

A separate WhatsApp group was established for this activity marking the emergence of a sub-network from the IBLN centered on cannabis farming.

Network members sharing farming practice and farm produce

Members shared their farming practices and produce on the WhatsApp group with the injection of much permaculture knowledge following the addition of Ludwe Majiza, another permaculture practitioner in the network, who has been proactively sharing knowledge since he joined.

Following the much-needed rains in early 2020, the discussions became more positive, and focused on farming practices and best approaches to crop production.

Below is an extract with Nolitha Nyikana sharing her farming practice with other farmers and permaculture practitioners, Mrs Peter and Ludwe Majiza and an NGO training facilitator Mr Eddie Parichi commenting with rainwater harvesting, permaculture and scientific agricultural knowledge.

[12:36 PM, 1/9/2020] Nolitha Nyikana: Planted this plot on the 29/12 with rabbit manure, eleven (11) days later, check how it looks. Everything growing so vigorously, weeds and spinach konke nje [etc.]. I'm not sure whether mulching would have helped in suppressing the weed growth???

[12:37 PM, 1/9/2020] Ludwe Majiza: Beautifully done, please mulch...always mulch and when in doubt just mulch. 🥕🌻🌶️
[12:41 PM, 1/9/2020] Nolitha Nyikana: Thank you.
[12:42 PM, 1/9/2020] Mrs Peter Moringa And Youth Co-op: You are right Ludwe most members here are not active participants at all though they are valuable members of the team and I think if ever there was a pressing issue that could only be solved by them, they would never keep quiet. In a way we appreciate everyone in the group even if some are behind the scenes😂*.*
[12:44 PM, 1/9/2020] Mrs Peter Moringa And Youth Co-op: Beautiful sisi have you intercropped. I heard rabbit urine is the best. Do you have rabbits?
[12:44 PM, 1/9/2020] Ludwe Majiza: Great ke mama👍

[12:49 PM, 1/9/2020] Nolitha Nyikana: I need to be educated on compatible crops, I use chicken manure on my spinach plots, and the carrot grew so vigorously I could literally not walk in this plot without stepping on those poor carrots.
[12:59 PM, 1/9/2020] Mr Eddy Parichi: I guess it's because chicken manure is very rich in nitrogen, which promotes vegetative growth. It's not much needed by carrots as the food there are the roots which need phosphorus. I wonder if I'm making sense😃

Figure 4.34. Extract from WhatsApp discussions (1)

Below is one of many images and messages shared by Ludwe Majiza (who has a sophisticated technology background, and therefore emerged quickly as a key actor in the

network, also driving the development of a logo for the IBLN to strengthen their identity as a community of practice / learning network):

[10:08 PM, 1/1/2020] Ludwe Majiza: Aba bakhe baya e Hope Farm eMonti [Those who have been to Hope Farm in East London] might have witnessed a grey and black water system. Here are some infographics kwaba funa uzenzela [for those who want to do greywater harvesting], I hope you will be inspired

Figure 4.35. Image and Message from Ludwe Majiza

IBLN members sharing knowledge on other learning interests

The Imvotho Bubomi Learning Network WhatsApp group has been a rich space for sharing knowledge and activism activity around GMO's, seed saving, climate change, agricultural platforms, learning opportunities, business opportunities and agroecology. These are linked to rainwater harvesting, conservation and use and are popular topics for learning network members.

Below is a WhatsApp discussion from the group illustrating a strong interest in the network that combines the popular knowledge topics of seed saving, climate change, learning opportunities and business opportunities for network members.

[2:07 PM, 1/20/2019] Mr Peter: Greetings. I am concerned. There is a talk on Facebook from one scientist of DRDAR who is questioning/querying the cropping programne of the Department, putting clearly that from the point of view of business, dry land farmers are not breaking even on it. Analysing it on yield per hectare and the sale of maize that also fluctuates. My concern is, it's been years since we had been talking about this on the network. Knowing there is an alternative that could work even in terms of people's health and an impact on the environment from heavy use of chemicals. We were to submit proof with help if Professional amongst our midst but it's going to be a missed opportunity.

[2:13 PM, 1/20/2019] Tichaona Pesanayi: Good afternoon comrades. That was indeed the plan mom Peter. The question now is do we still have champions in our midst who are willing to actively take this forward beyond internal talk?

[2:16 PM, 1/20/2019] Mr Peter: Ticha I think champions are there but they need to commit to the task. As farmers we are ready to take it up to the Department as long as we have facts as to the technical aspects, mechanisation process, inputs, yields and market using our tested drought resistant variety coupled with Rain Water Harvesting and Conservation.

[4:48 PM, 8/19/2019] Mrs Peter Moringa And Youth Co-op: We are facing a big problem that can turn into an advantage for us. Grain industry is a huge industry for both humans, animals, fish and birds. It was in 2015 when UFH gave a report on OPV seed production with success and challenges highlighted, till now no inroads were made by all of us, farmers, academics, govt and consumers. By now you should know this is very close to my heart but 1st things to be done are beyond my capacity, technically.

[5:00 PM, 8/19/2019] Mrs Peter Moringa And Youth Co-op: If we could have a plan for sorghum, millet, yellow, red, purple and white maize. Soya beans, sunflower production from soil preparation to harvest and storage. This wouldn't be unique to us, it has been done in Africa in our neighbouring countries.
[5:19 PM, 8/19/2019] Xolisa Dwane: That's a great idea mem, how do we go about doing it, what would be the first step
[5:26 PM, 8/19/2019] Mrs Peter Moringa And Youth Co-op: 1st step is technical Xolisa by academics, extension. Then farmers take it to DRDAR Regional office or if persuasive to Political heads of DRDAR.

Figure 4.36. Extract from WhatsApp discussions (2)

Learning network members sharing knowledge on agricultural opportunities and platforms

As previously mentioned, an array of agricultural opportunities and platforms are shared in the group, below are a few examples:

Figure 4.37. Image shared on the 3rd of March 2019

[12:04 PM, 12/3/2018] Lawrence: Molweni Bonke another web link which I meant to send on Thursday which might be of interest to some of you: www.etcgroup.org/content/United-nations-hits-brakes-gene-drives
[10:34 AM, 6/18/2019] Luke Metelerkamp: For any who are interested, there is a free livestream from the International Conference on Agroecology In Africa being held in Kenya for the rest of the week.
[10:34 AM, 6/18/2019] Luke Metelerkamp: The link to the livestream is here: https://www.agroecologyconference.eoai-africa.org/livestreaming.html
[10:10 AM, 6/21/2019] Kgalaletso Moerane: Good day there. So my friends and I are dropping our second issue of PEEPLE of the Soil. The digital magazine is aimed at encouraging young people to look at the world around them differently. Our first issue was about investigating whether African nations' Fourth industrial revolution, particularly our agriculture. Our second issue is just a range of stories contributed from people outside our house. We hope that we will create a network where young people and anyone for that matter can share information about farming techniques, business strategies and any information worth sharing.
[10:11 AM, 6/21/2019] Kgalaletso Moerane: Can follow us on Instagram and twitter at @ofpeeple.
I'll post a link to the issue once it's up later today
[12:18 PM, 6/21/2019] Kgalaletso Moerane:
https://issuu.com/peepleofthesoil19/docs/winter_issue_updated_latest_1_/a/197536
Here we go. It's officially online. Would really appreciate some feedback

Figure 4.38. Extract from WhatsApp discussions (3)

The IBLN is the most active WhatsApp group in the Amanzi for Food project. It is no wonder as knowledge on RWH&C as well as interconnected knowledge is shared frequently in this platform; it has also been in existence for a much longer period (since 2014) and a stronger culture of interaction and knowledge sharing has developed over this time compared to the other learning network WhatsApp groups (see below).

4.8.2 The Sinakekela Sibusiso Semanti Learning Network (SSSLN), Mpumalanga

Membership and Activities

The SSSLN WhatsApp has 15 main members who were on the ToTo programme, and are mostly in fairly senior positions in their organisations, and have full capacity to maintain the network and the WhatsApp group. WhatsApp activities tend to focus more on learning networks events, knowledge or knowledge platforms, youth and employment opportunities, social media engagement opportunity, and knowledge shared on media platforms from within the group. Many of the posts concerned continental and international events.

The SSSLN members are also part of a Climate Smart Agro-Ecology WhatsApp group that shares similar information due to cross posting but has a slightly more active WhatsApp community thus sharing more event notifications and agroecology related information.

SSSLN members hosting events and sharing event and useful information and website notifications

- The Association of Water and Rural Development (AWARD) Hosting events and sharing knowledge

AWARD hosted two events in this year and shared that information on the WhatsApp group. The AWARD facilitator (Bigboy) completed the Amanzi for Food ToT course in Mpumalanga, and continues to support agro-ecological and rainwater harvesting practices amongst smallholder farmers.

- Agro ecology event

[8:13 PM, 3/2/2019] Bigboy AWARD: Dear all this is a kind reminder that AWARD's AgriSI project is going to hold a Farmers in Agroecology Open Day on the 14th of March 2019. Venue at Motetema Skhukhune District (+_30km from Groblersdal). This is a shared learning event to which we are inviting all of you to come and learn more on what the farmers are doing. We would also want to give you this opportunity to market your organisation and the services that you provide to support sustainable agriculture practices. Please confirm your attendance farmers are awaiting for your visit.

- Livelihood diversification event

[9:37 AM, 7/19/2019] Bigboy AWARD: Dear Colleagues. It is with great excitement that we send you this invitation to invite you all to our shared Learning Event taking place at Sedawe community hall on the 16th August 2019. The event is hosted by Smallholder farmers from Lower Olifants (Mopani District in Maruleng Municipality area) and Middle Olifant (Sekhukhune and Capricorn District under the theme "Livelihood Diversification". Please confirm your participation as early as possible, and also indicate if you would like to be given an opportunity to share experiences or present on livelihoods diversification options. We will also like to encourage you to share this invitation to people and organisations beyond this network so that we strengthen the network and increase the impact.

- Hoedspruit Hub a host partner in a soil fertility knowledge sharing event

Below is an extract from an invitation from Hoedspruit Hub and partners on a soil fertility knowledge sharing event.

[3:30 PM, 10/17/2019] Live: Are you ready to understand soil health in a whole new way? Is soil fertility an issue for your farm or garden? Zingela Ulwazi, Kruger2Canyons Biosphere, and Hoedspruit Hub are bringing you a very special and rare opportunity to spend a day with Alan Rosenberg, focusing on soil health and fertility. Alan has been involved with Agroecology for more than 4 decades in 4 countries. His core focus has been on the development of soil health and fertility. He has written and published 4 books and is the chairperson of South African Organic Sectors Organisation (SAOSO) and a founding member of NECOFASA (Network of Eco Farms in Africa South Africa).
[7:03 PM, 3/17/2019] Bigboy AWARD: https://agroecologia.espora.org/general-introduction/?fbclid=IwAR29PK-JT9TeiC3IIkekag1XGOYeRXgR9ItrUxlkbfx3rXPk2LSFFLZUQAw
[7:03 PM, 3/17/2019] Bigboy AWARD: Hi everyone this looks like an interesting resource. La Via Campesina just launched a website about agroecological practices, an online course on the farmer-to-farmer methodology (Cuba) as well as a resource library

Activism engagements

- Seed activism knowledge

Below is an extract shared by AWARD from the seed activist work by the African Centre for Biodiversity.

The ACB has engaged with regulators over several years, submitting evidence that these GM maize varieties present biosafety and healthy and safety risks to farmers, farm workers, consumers and the environment. The risky GM maize varieties are owned by Corteva (new name given to the Dow-Dupont merged entity), one of a handful of multinational agrochemical giants that monopolises S…
[8:08 AM, 9/9/2019] Bigboy AWARD: 2-4-d: Active ingredient in infamous war chemical, Agent Orange. More poisoning of SA's staple food. 2-4-D GM maize set for approval

The African Centre for Biodiversity (ACB) is extremely concerned about impending approvals by the South African government in regard to three new genetically modified (GM) maize varieties designed to withstand the extremely toxic herbicide, 2,4-D.

- AWARD engaging in and promoting a tweet storm on sustainable and organic farmers success stories as they work towards achieving zero hunger.

AWARD members posted on Tweeting events for raising awareness on farmer success stories. The purpose of the event was raining awareness on the role played and celebrating the role played by organic sustainable farmers in achieving zero hunger. Below is an extract of a WhatsApp message advertising the event from the SSSLN WhatsApp group.

[10:09 AM, 4/8/2019] Bigboy AWARD: Dear Friends, I am writing to ask you to join an online activity we have planned for 17 April highlighting the work sustainable, organic farmers do to achieve Zero Hunger. In short we are asking organizations to join a tweet storm on 17 April, 11am CEST, tweeting farmer stories, e.g. videos, memes, article links. You can share your own content, retweet ours or both! We will also be sharing content on Facebook.
Attached you will find more details and a sample video we will use on the day.
https://drive.google.com/file/d/1P_HO75RvOa9rNtmTtSspdc5C2VYxIpsI/view. It would be great to have as many organizations as possible on board for this. We are currently working on content suggestions that people can use on 17 April and I can share them with you when done.
Let me know if you need more information.

Amanzi for Food sharing platforms for biodiversity and farming knowledge

Members of the Amanzi for Food project team shared knowledge acquisition platforms in the group, below are some examples.

[10:40 AM, 8/2/2019] Lawrence: Molweni check out this short film on Seed is Life: https://www.youtube.com/watch?v=ZC5WXcaJ6Lg&feature=youtu.be
[5:08 AM, 5/30/2019] Lawrence: You may like to try Farmerama Radio for some great programmes on biodiversity and small-scale farming. There is a great one recently by Vandana Shiva on www.farmerama.co
[7:11 AM, 10/24/2019] Lawrence: Molweni zonke! There is an online agricultural publication called Nufarmer. Some of you may know about this? It's very conventional in approach but does have some

articles which may be of interest. It may be worth checking out on: https://issuu.com/nufarmerafrica/docs/nufsept.oct19
[8:53 AM, 11/1/2019] Lawrence: Good morning everyone I am sure many of you know about this but a really interesting website is Food for Mzansi https://www.foodformzansi.co.za definitely worth a visit and we should look at posting some of our own wonderful stories on this site 😃
[8:18 AM, 1/31/2020] Lawrence: Molweni here is a new blog which may interest many of you. It includes a video "how do young people engage with the rural economy in Southern Africa?" Find the blog at https:www.ids.ac.uk/opinions/to-farm-or-not-to-farm-thats-not-the-question/ Enjoy!

NewsHorn sharing weekly newspaper when relevant to network

Tumelo Dibakwane of NewsHorn shared two articles that were related to the network as they were on water shortage.

[6:07 PM, 5/31/2019] Live: Molweni hectic news on pg 6 are any of the municipalities represented here affected? I didn't notice any of the ones I know are represented by the network!
[11:45 AM, 8/22/2019] Tumelo Dibakwane: https://newshorn.co.za/sa-has-sufficient-water-in-storage/
[11:54 AM, 8/22/2019] CC Mashego: Thanks so much Tumelo keep us posted and keep up the good work

University of Mpumalanga sharing rainwater harvesting content on Lowvelder local newspaper

Gerhard Viljoen established a continuous article sharing platform for RWHC&U sharing in the Lowveld newspaper and posted links to two articles in the group. Below are extracts from WhatsApp, directions to access one of the articles and a link for the other.

[2:31 PM, 7/12/2019] Gerhard Viljoen: Type in on Google agri pulse lowveld July 2019, article is on page 6, hope it works https://lowvelder.co.za/epapers/agripulse-july-2019/#book/5

Sharing Agricultural opportunities for employment and youths

A few opportunities were shared on the group for employment or youth entrepreneurship or youth learning opportunities. Interestingly and still needing attention is the fact that there are few youths in the Mpumalanga group as well as few farmers in the Mpumalanga group although members work with farmers. Below is an example of a youth opportunity shared on the group.

[6:24 AM, 6/1/2019] Lawrence: A link to the Global Youth Video Competition on Climate Change: http://biomovies.tve.org/competition/global-youth-video-competition-2019/

4.8.3 The #PulaWise Learning Network (Taung Agricultural College), North West

The #PulaWise learning network Whatsapp group has been extremely quiet over the past 12 months after an initial flurry of activity in association with the development of the productive demonstration sites on campus in March 2019. It is perhaps unwise to speculate too deeply on the reasons for this, but clearly the small membership, limited almost entirely to people at the college itself, provides limited opportunity for diverse contributions. Added to this is the considerable work pressure on the existing membership within the college, and the formal institutional culture which requires express permission from senior management for engagement with external organisations, including with the media.

Membership

The membership which started 2019 at 19 had, by the end reduced to 15 with several members leaving. Of the remaining 15 members, seven are in fact members of the Amanzi for Food core team at the ELRC and one is a member of the Fort Cox AFTI staff. In effect,

therefore the membership within the TAC has shrunk to just only seven members. While these are all still committed to sharing ideas on RWH&C, it would seem an insufficient number to maintain real momentum.

WhatsApp activity

Over the past 12 months there have really been only 2 activities which have been shared through this WhatsApp group. The first was in March 2019, when the network worked together to implement some RWH&C practices as productive demonstration sites on the TAC campus. These included the building of, and the establishment of some deep trench beds.

Figure 4.39. Tower garden and trench bed construction at TAC

The second item to be shared was the awarding of certificates to successful ToT course participants on 15 January 2020.

Figure 4.40. Five of the 10 successful ToT course participants at TAC display their certificates

Other posts have originated from the Amanzi for Food team, and included notification of the Food for Mzansi website (www.foodformzansa.co.za) with which it is intended to form a link with the Amanzi for Food website, the online publication Nufarmer (https://issuu.com/nufarmerafrica), and Farmerama radio (https://farmerama.co/). It is hoped that these posts stimulated network members to engage with these sites.

4.8.4 Analysis of Networked Learning Process: The case of IBLN WhatsApp group in detail

Digital technologies are becoming increasingly important to the ways in which we live, work and learn. The smartphone-based messaging app WhatsApp is now the most widely used app in Africa, and its users are growing daily. WhatsApp has become a central pillar in Amanzi for Food learning networks, especially the IBLN for about 6 years now. An analysis of a detailed WhatsApp data of the IBLN was done[24] to provide a substantial contribution to understanding the use of WhatsApp in rural learning contexts in South Africa. The Imvotho Bubomi Learning Network has adopted WhatsApp as the main platform for communication and exchange. This group, which operates within the framework of a wider rural learning network, provides a valuable opportunity to gain insight into the ways that WhatsApp can serve as a learning support tool in the context of a low-tech and low-income rural area.

The intention of the analysis was to view the IBLN through its digital platform in order to provide greater clarity on the network itself and to explore the unique opportunities afforded by WhatsApp as an enabling digital technology in rural co-learning processes. A research question was posed: *What did the introduction of WhatsApp enable and what could be understood about the broader nature and learning processes of the Imvotho Bubomi Learning Network through it?* We were interested to understand the role of WhatsApp as a social media platform in the development of the overall social learning network model being developed for this WRC project on Knowledge Use and Uptake, which as indicated in Chapter 1, was conceptualised within a situated, systemic and pluralistic orientation.

The empirical research on this aspect was based on a combination of reflective action research and textual analysis. The action research was based on the role of the Amanzi for Food team as active participants in the IBLN over the past five years. This was supported by an empirical textual analysis of 196178 words of data spanning 1320 days of WhatsApp conversation between the 9th of September 2016 and the 30th of July 2020.

The following software packages were used to support the analysis: Microsoft Word, Nvivo, Excel, Antconc and ChatVisualiser. These were used to:

- Conduct a basic textual analysis to establish the frequently used terms and key concepts
- Track user exchanges of specific terminology over time
- Collate and categorize the resources that were shared through the WhatsApp platform
- Review members' engagement with these resources
- Review the extent to which IBLN members shared their practices and the group engagement around these
- Track shifts in the themes of the discussions
- Quantify the volume and frequency of posts by each member

[24] This analysis was done by Dr Luke Metelerkamp, Sarah Durr and Lawrence Sisitka, all contributors to the Amanzi for Food research programme and this project report. The analysis is also the subject of a draft paper (Metelerkamp et al, in process).

- Consider the changes in the use of language and medium of posts by members over time
- Categorise the questions being asked by members of the group
- Assess the way in which the group was moderated

While some quantitative data is brought to bear, the majority of the findings are qualitative in nature.

➢ *Findings*

Volume of participation

The increasing sense of ownership of the network by the farmers it was initially developed to support, has been accompanied by a steady increase in the volume of messages over time.

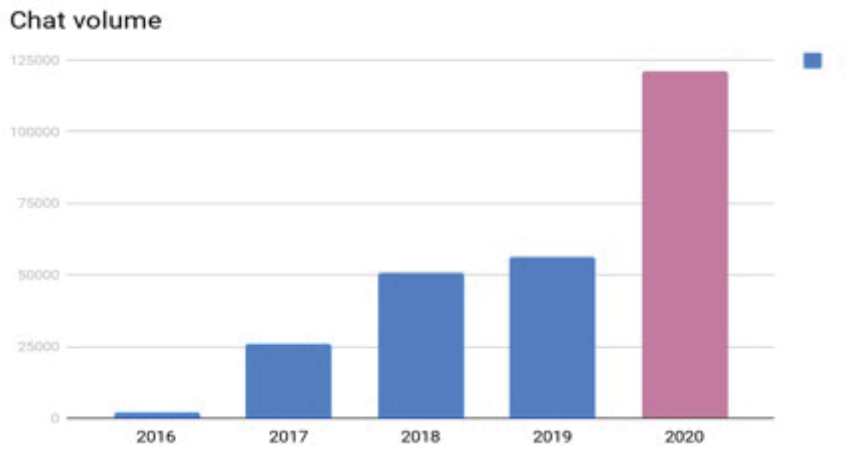


Figure 4.41. Chat volume in words sent per year (2020 = projected total based on Jan-June data)

While we have not empirically investigated the cause of this increase, we hypothesise that it has arisen from combination of the following factors:

- Increasing smart-phone penetration
- Declining data costs (and the availability of specific WhatsApp bundles at low costs)
- The expanding adoption of WhatsApp as the social media and messaging platform of choice in South Africa (cf. Chapter 2)
- Growing membership in the IBLN, including new, often fairly young members, with both high levels of digital literacy, and positive, energetic dispositions
- Clear relevance of content to the IBLN members
- Value in the sense of community and camaraderie within the network
- The lockdown measures put in place in March 2020, as a result of COVID19, resulting in more time spent on social media

In June 2020 there were 90 members on the IBLN WhatsApp group. While there is some attrition through individual members leaving, there are almost constant additions to the group as members invite friends and colleagues, and this figure probably provides a reasonably accurate estimate of the number of members at any given time. Members' participation does, however, vary a great deal, as evidenced by the following exchange between members.

[2020/01/09, 10:13:37]
"Molweni,... I see 86 group members here but have noticed only about 10 are consistently active. Are others shy, have changed their numbers or...?
An indication with a response by saying "I'm active" might be fruitful and assist the admins with planning, for all we know all this valuable information we share might not have as big an impact as it seems... 🤔*"*

[2020/01/09, 12:43:00]
"You are right Ludwe most members here are not active participants at all though they are valuable members of the team and I think if ever there was a pressing issue that could only be solved by them, they would never keep quiet. In a way we appreciate everyone in the group even if some are behind the scenes 😅*"*

As the member's initial comment above indicates, a small number of people account for the vast majority of dialogue on the WhatsApp platform. Over the last four years, just five members accounted for 60% of all WhatsApp posts.

These five, in order of contribution, are:

- Farmer 1 – 1844 posts
- ELRC convener 1 – 986 posts
- ELRC convener 2 – 854 posts
- Farmer 2 – 844 posts
- Farmer 3 – 353 posts

The remaining members accounted for the remaining 40% of content.

Membership of the WhatsApp group can be broken into the five categories under which the Net-Mapping was done previously, namely: Farmers, Government Services, Agricultural Training Institutions, Academia and NGOs. Figure 4.42 shows an interesting balance between the numbers of farmers and of the other categories.

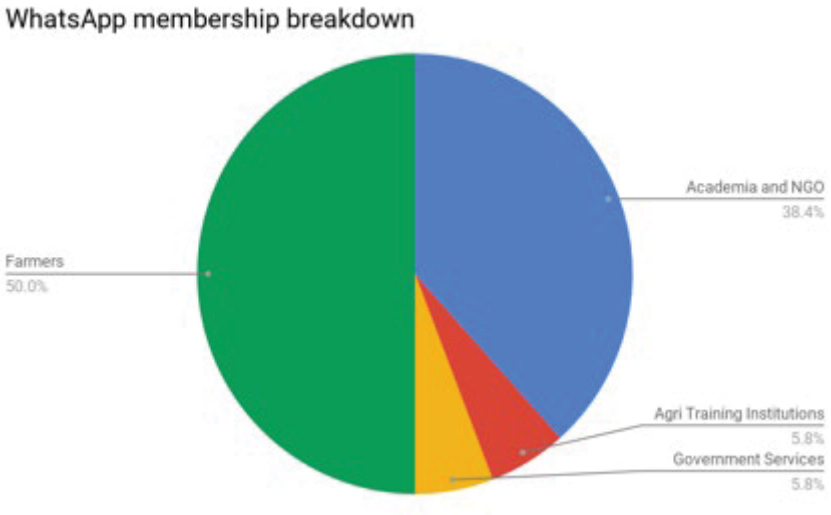


Figure 4.42. IBLN WhatsApp group membership breakdown

Participation dynamics

The IBLN means different things to different members, and accordingly members participate in the network in very different ways and for different reasons.

What the analysis of the WhatsApp data indicates is that participation patterns are far from uniform. Some members contributed consistently while others would contribute actively for brief periods and then recede into relative silence. Other members consistently say almost nothing, but apparently draw value from reading the posts, documents and notifications.

A closer reading of the data suggests that the members who participate consistently help to keep the group alive and contribute a sense of consistency, community and energy. These could be considered the keepers of the digital culture. In addition to setting the tone and keeping the group active, they spend a considerable amount of time providing recognition to the efforts of others and offering regular and abundant praise and support.

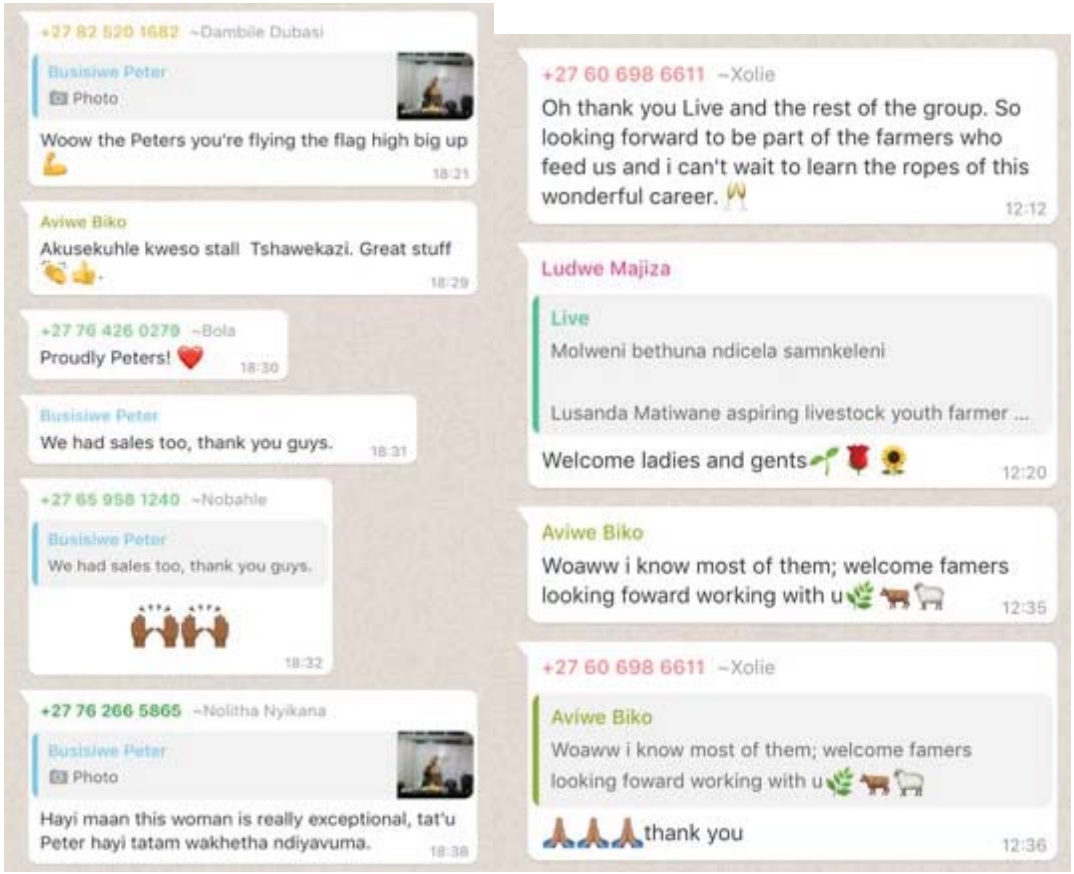


Figure 4.43. Examples of praise and the welcoming of new members

These keepers of culture also play a vital moderating role; ensuring the online community stays on topic and remains a safe and inclusive space. While the instances of posts being removed from the chat thread by these moderators are few and far between, this is a vital part of keeping the digital learning space alive. Figure 4.44 (below) is illustrative of this kind of rapid mobilization around group moderation from three of the keepers of culture.

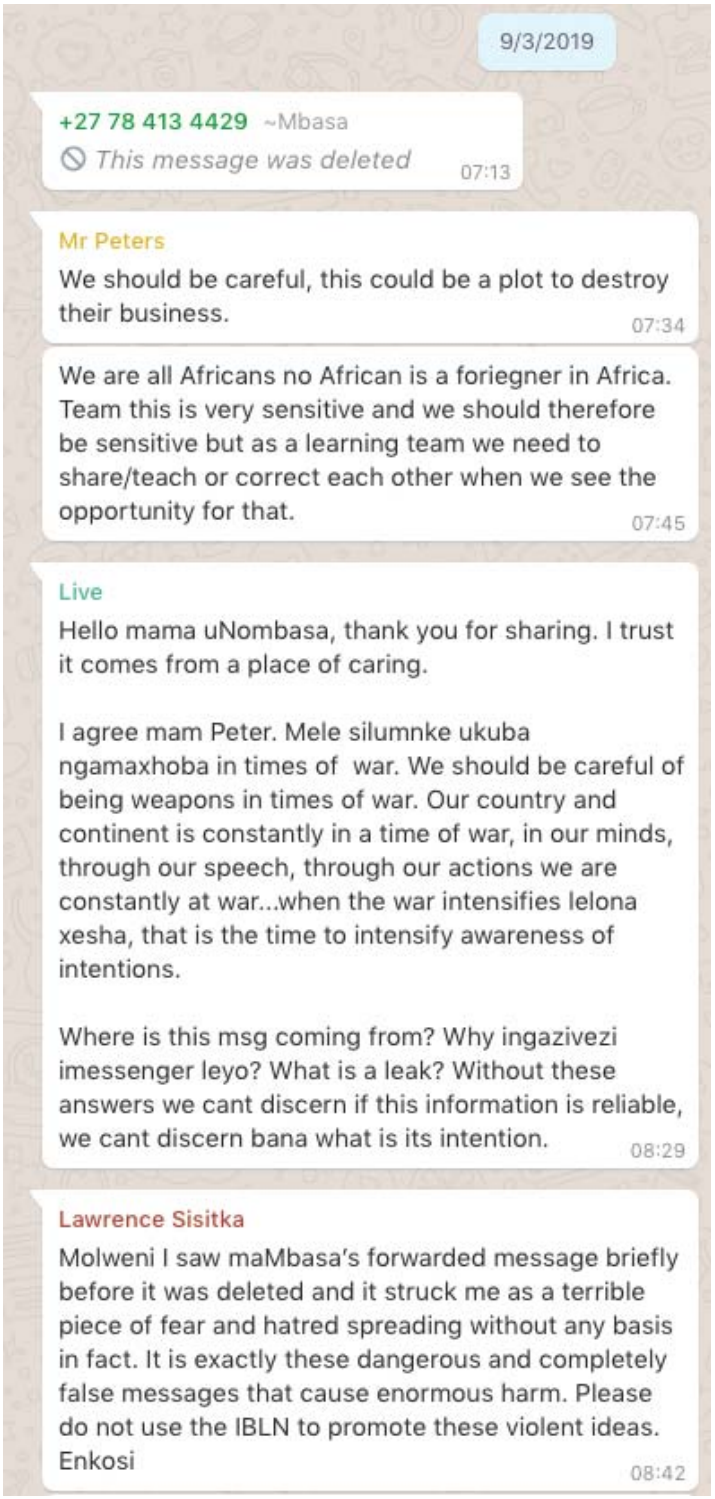


Figure 4.44. Critical moderation of group culture, to ensure focus on generative learning is maintained

Many members use the network as a tool as they navigate living, working and learning in this underserved region. These are largely the farmers, home gardeners and rural youth. They will come to the network for support when they need it, or when something is on offer (such as training) and then retire into the background. As the track record of the WhatsApp group now extends over 6 years, the evidence of the learning value of these long-term relationships is increasing. Very often these engagements focus on a specific problem a network member has

come across. Figure 4.45 is exemplary of the kinds of questions that get posed on the platform, as well as the collective contributions to solving them. In this case the farmer received a response to their query in under an hour. In this example, no-one in the network had any idea of what was causing the maize deformity, but those who were experienced with online searching were able to source an answer from the extension faculty of a reputable North American university and then share this with the network.

We note that in almost all cases questions are accompanied by an image or video. These visual resources greatly improved the accuracy and value of answers farmers received and also helped the rest of the network to learn from the farmer in question's particular problem. This simple integration of smartphone technology into the group learning process is indicative of the power of technology in agricultural learning systems.

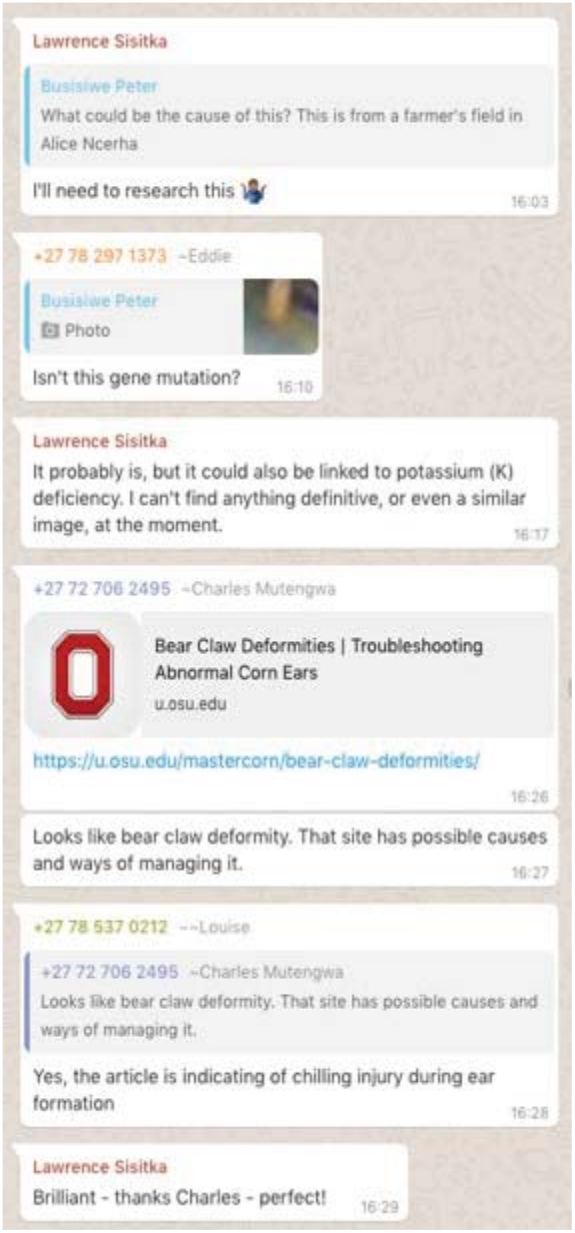


Figure 4.45. Collective effort to answer farmers' questions

There is an increasing tendency for direct farmer to farmer communication and sharing of practices and ideas (see Figure 4.46).

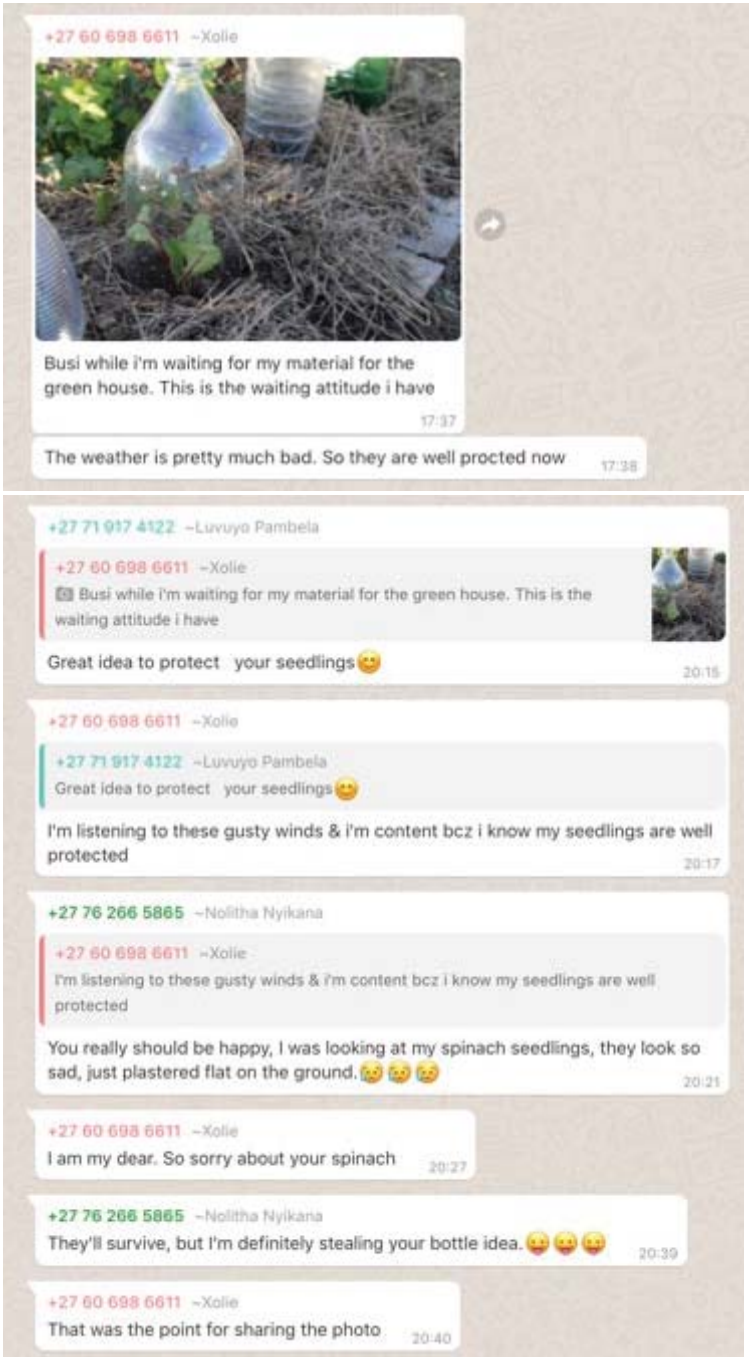


Figure 4.46. Farmer to farmer practice sharing

Network communication increasingly takes place in isiXhosa, without too much apparent concern for the exclusion of the (relatively few) non-Xhosa speaking members of the network (see Figure 4.47). Where translation is required this is readily provided.

Figure 4.47. Shifting towards dialogue in isiXhosa vernacular

We suggest that these linguistic changes are indicative of an increasing sense of ownership of the network by the farmers. This represents a positive shift from an academic-led network for farmers, to a farmer-led network with a diverse range of trusted non-farming specialists who are available on demand.

The intermittent contributors also included those who were active organising members of the IBLN, who drew on the WhatsApp group as a logistical support tool to arrange meetings, workshops and other physical gatherings. There are more references to the terms “transport” (50) and “lift” (20) in the chat text than there are references to “drought” (25), “mulch” (29) or “tower garden” (14). This is important, as it reminds us of the value the IBLN still places on face-to-face gatherings. The online community augments the broader network community, it does not replace it.

The following 3 graphs representing three different usage typologies: Figure 4.48 epitomising the consistent communication of a 'keeper of culture', Figure 4.49 showing the intermittent high volume communication of a farmer-activist using the digital network as a support tool, and Figure 4.50 the intermittent, but significant communication of the network chairperson using WhatsApp primarily for convening physical meetings.

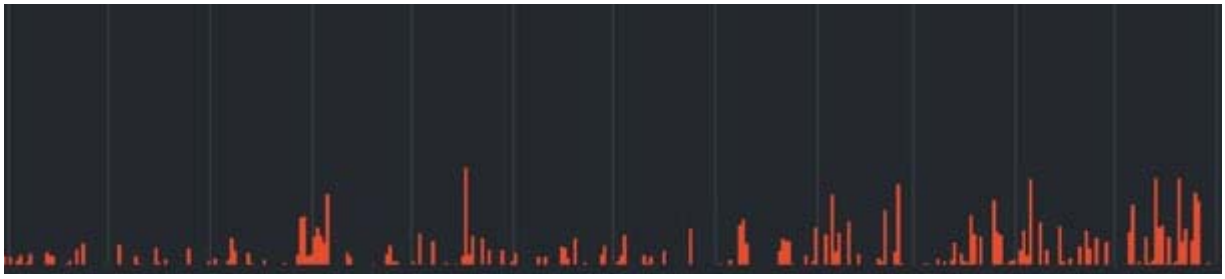


Figure 4.48. Consistent communication of a 'keeper of culture'

Figure 4.49. Intermittent high volume communication of farmer-activist using the digital network as a support tool

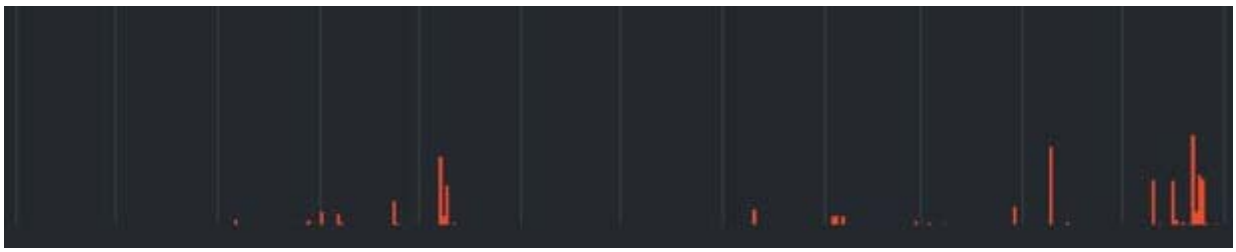


Figure 4.50. Intermittent, but significant communication of the network chairperson using WhatsApp primarily for convening physical meetings

- ***Resources and attachments shared***

In addition to the text posts, 1125 attachments and 229 web-links were shared via the WhatsApp platform. These attachments of various forms were vitally important learning artefacts and resources.

i. Overview of resources shared

The majority of attachments shared were images (996), followed by PDFs (89), then movies (65) and word documents (12). Of the 229 web-links that were shared, most were to websites and relatively few were to other social media platforms. Of the social media links that were shared, 30 were to Facebook, 27 YouTube videos, and 12 Tweets.

Table 4.1 provides a summary of some of the key documents and web-links that were shared. This table provides an overview of the types of documents being shared across the network, the sources of these documents and network members sharing the documents.

Table 4.1 Key documents and weblinks shared through the IBLN WhatsApp platform

Type of document shared	Source of Document	Who shared the document
Water Research Commission material 1)Production Guideline for African Leafy Vegetable 2) Grey Water Use in Small-scale Agriculture and gardens in South Africa 3)Manual for Rural Freshwater Aquaculture 4)Greywater Harvesting	Water Research Commission	ELRC team members
Private Farming material 1) Material 2) Bringing farming back to Nature 3) Precision and Conservation Agriculture 4) Climate Smart Agriculture material 5) Aquaponia 6) Eco-Village Design Education 7) Beginners Guide to Bee-keeping (Kenya)	Various private agro-ecological sources	IBLN agro-ecological member. RMDA members ELRC team members
Government Farming material 1) Basic Bee-Keeping 2) Solar drying of fruit and vegetables 3) Using Kraal manure as fertiliser 4) Acid soil and lime 5) Ten things you should know about African swine fever	Department of agriculture, forestry and fisheries	IBLN farmers ELRC team members Extension Officers
Amanzi for Food TOT material and examples of work 1) Tower garden information card	Amanzi for Food TOT	ELRC team members
Government employment Opportunities	South African various government departments: Department of Education & Department of Agriculture, forestry and fisheries	Farmers
Land Audit Report	Department of Rural Development and Land Reform	
Government Bills	Plant Improvement Bill –Department of Agriculture, forestry and fisheries	Eastern Cape Farmers Association
IBLN Radio Scripts and Recordings	IBLN Radio Committee	IBLN Radio Committee
IBLN Agenda & Meeting Minutes	IBLN Secretary	IBLN Secretary

Invitations and Programmes for Local events	Associated organisation (Mxumbu Youth, CSA, RAYMAF, Food for Us, etc., Amanzi TOT graduation, Fort Cox Graduation … etc.) Department of Technological Innovation	IBLN Members directly connected to the local organisation or shared by those who continue to share information.
Local Organisation Reports	Associated Organisation	Directly Associated IBLN Members
Government Bursary awards	Department of Agriculture, forestry and fisheries	Farmers, govt. officials
Expo/conference and marketing flyers	Agri-business	IBLN Farmers
Academic reports and papers	Environmental Learning Research Centre	ELRC team members
Funding Calls	National Arts Council – an agency of the Department of Arts and Culture Department of Agriculture, Forestry & Fisheries Department of rural development & reform	IBLN members
COVID19 material	Department of Education, Western Cape Government South African Government	Various IBLN members
Online articles	Various Farming online sources (Farmers weekly, etc.)	ELRC team members IBLN Members

The diverse range of topics illustrated in Table 4.1 is indicative of the wide scope of the information exchanged within the IBLN network. Bearing in mind the network's original focus on water related issues, the diverse range of topics which the members are now engaging in is indicative of significant growth and development within the network. Furthermore, the fact that stakeholders from all corners of the network were actively contributing information to the learning community is indicative of the horizontal nature of the learning community and suggests that the network has become a space in which all stakeholders feel like they have valuable knowledge to contribute.

ii. A picture says a thousand words

From the total number of images shared via the WhatsApp group, it is clear that the sharing of photographs plays a very important role within the digital community. Smartphone photographs are by far the simplest way to document and share technical queries across the

network without confusion or the need for a thousand words. Almost all practical requests for information and advice about a particular problem are accompanied by an image. Examples of these images are shown in Figure 4.51 below.

Figure 4.51. Examples of images accompanying farmers' questions

However, it was not just problems and questions that network members shared through images. New ideas (Figure 4.52) and causes for celebration (Figure 4.53) are also frequently shared by photo and video.

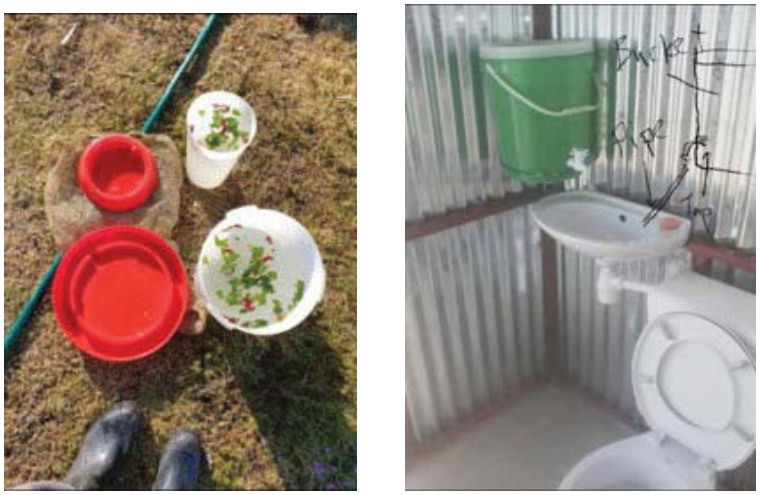


Figure 4.52. Sharing new ideas and solutions

Figure 4.53. Celebrating the good moments with others makes the hard work all the more worthwhile

- ***Theme/concept tracking***

This section provides an overview on the themes and terms which are prevalent within the IBLN WhatsApp group. This provides insight into the broader issues and practices that feature within the IBLN as a whole, as well as insights into the particular things the WhatsApp group is used for.

Following this, we pick up on three of these practices, tracking their occurrence in more detail through the history of the online community. Two (out of many) rainwater harvesting and conservation practices are considered: Trench beds and mulching. Sifting through the 600+ pages of WhatsApp data opens up a window onto the way in which the online community shares, engages, experiments and learns. Looking back over the four years of conversation also illustrates the introduction and evolution of these practices within the IBLN.

Finally, we share some examples of questions and answers within the IBLN WhatsApp group in order to reflect on the ways that the platform serves as a space for ongoing problem solving and knowledge exchange. Considering the kinds of questions asked by the group also provides an additional layer of data to support an understanding of the kinds of knowledge barriers the smallholder farming sector faces.

- ***Term frequency***

Figure 4.54 provides an approximate illustration of the frequency of 30 commonly used terms.

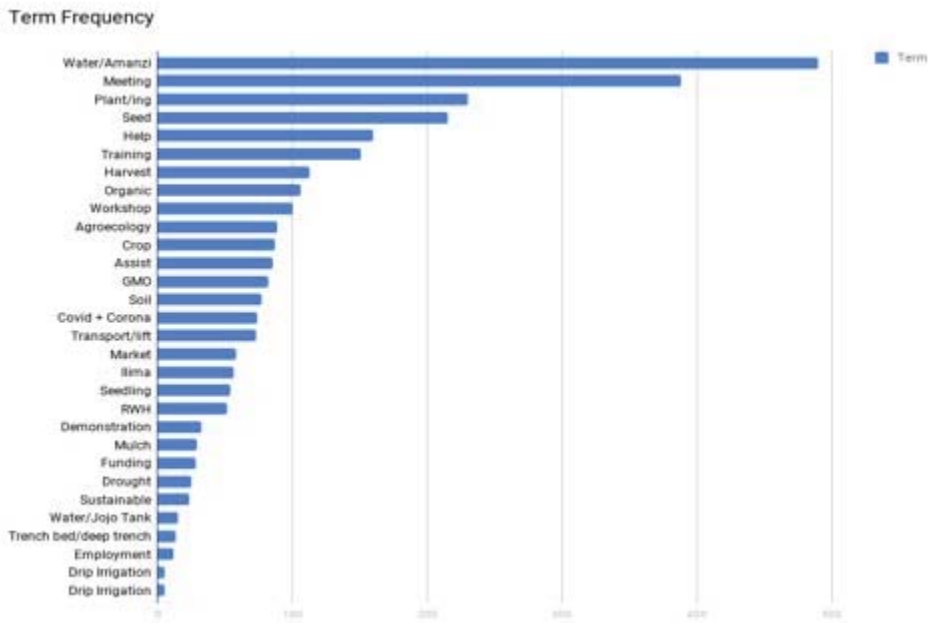


Figure 4.54. Indication of the frequency of selected terms within the IBLN WhatsApp conversations

Analysing the frequency of these and other key terms within the data set suggests that while water and water-related discussions are very frequently discussed and are a major item of deliberation, the IBLN has become about much more than just water-related issues.

Unsurprisingly, the WhatsApp platform plays an important role in IBLN logistics, with the terms 'meeting' featuring 388 times and 'transport' 73 times. This reiterates that physically coming together as a group has been central to the evolution of the group and remains important to the group as a learning network. Seed, help and training are the next highest words used, which indicates the foundation of the farming practices, and the role of the network which is a learning network.

Also interesting are the ideas and concepts such as the resistance to genetically modified organisms (GMOs), and the focus on organic and agroecological practices which appear to have become the ideological touchstone of the group. These are manifestations of an activist strand permeating many of the discussions. It is important to highlight that the WhatsApp data suggests that these are not passing interests, but rather the underlying values which guide decisions and motivate practice. The fact that the term 'sustainable' (23) comes up 130% more than the term 'profit' (10) gives some insight into the ethos of the group. It could be argued that these concepts have now become central to the identity and work of the IBLN, and combine with the RWH&C practices around which it was formed to offer a wider concept of engaging in sustainable agricultural practices (cf. also Pesanayi's 2019 research which shows a similar finding).

However, closer inspection is important to understand by whom and how these issues are being driven. While discussions about agroecology and organic farming were relatively widespread among members of the group, 90% of all 27 references to 'GMO-free maize' were attributable to one, particularly vocal and passionate member. This member set the agenda around GMO maize and has continually used the IBLN WhatsApp group as a platform for lobbying this issue and encouraging other farmers to retain their traditional open-pollinated maize varieties. Even so, while certain members of the group clearly led these issues, there was strong evidence that they were being carried forwards by others.

This comment from one of the younger members of the group indicates strong commitment to this ethos in the face of pressure from a government extension officer:

> *"This will be a missed opportunity for us because our officer want you to dance to her tune. I tried to engage with her several times she refused. Instead she wanted us to join the GMO maize production and I refused…"*

Interactions with extension workers were generally positive, although there was a recognition of not such a good historical relation, and in the 53 references to extension officers in over the four years, a clear interest in the need for effective collaboration is evident, as is increased participation in the network from the extension officers themselves. As one member put it 'Spilt milk was spilt, let us leave it there and go and milk again taking care not to spill it again'. The farmers in the group are aware of the need to build and maintain good relations with extension workers for two reasons. The first is that extension workers are seen as a key mechanism through which farmers access state support. The second, is that the group recognises the need for extension workers to be better trained and equipped and that farmers have something to teach local extension workers just as much as extension workers have something to teach farmers.

*'We should take steps to claim the space. It is there put in front of us. It had come at the right time, maybe the **extension officers** like us did not know where to source the organic inputs, now we know. Let us be proactive.'*

*'Yes Mam Peter its true this campaign will need all of us. I believe this is another strategy to fight against GMOs in this country...That is why it is important to involve our **extension officers** so that they know our language as agroecology farmers…'*

The IBLN is a network centred around farming, but ultimately it is a learning network for all, and the fact that extension officers are very much seen as equal co-learners within the network speaks is indicative of the success of the IBLN process in supporting a culture of equal co-inquiry that enhances farmers sense of agency within a system which has historically elevated others such as the extension advisors to the status of external 'experts'. The role of the network in enabling better interactions between farmers and the extension services was confirmed also in the study on the role of extension services in the IBLN (Sithole (2018), and by the PhD study of Pesanayi (2019) which focussed on the way in which a social learning network could expand the learning of all who were participating in the learning network towards a shared object), thus reducing the divide between extension, education and farming which was identified by ASSAf (2017) as a major issue affecting the agricultural industry and its education, training and learning systems.

- ***Two vignettes on RWH/C practices***

Mulching

Figure 4.55. IBLN members develop a productive demonstration site for mulching

The term mulch/mulching came up 29 times between 2017 and 2020 in the WhatsApp discussions. Importantly mulching also featured frequently in the images and videos that were shared across the group, suggesting that this RWH&C concept and practice (first introduced via the navigation tool and WRC material in the ToT course, and enhanced by the local Zingisa NGO's practices that focus on permaculture farming) has been widely adopted by the group in practice.

Table 4.2 IBLN Discussions relating to mulching

Date	Person	Comment
2017/07/09	Busisiwe Peter	Molweni, farmer Peter Ugereshile today preparing for this year's cropping season and mama Peter is watching her seedlings grow though we still have frost. Some seeds that fell on the soil are starting to germinate. Vetch planted on plots is growing and my experiment of using it as **mulch** is being observed. I can't wait to see the results. **Mulch** using Pearl millet residue
	Tich	Molweni. It's great to see good preparation including conservation of moisture and soil.
2018/11/20	Busisiwe Peter	We need a lot of **mulch**, grass is so scarce here, remember we are from winter and this heat is not doing any justice to the growing grass. Old tree leaves are not ideal too as they get blown by the wind and end up where they are not needed. Eish. Wood chips are plenty in Melani Alice but problem is transporting them😋. I wish we had a municipality with a tipper truck that would assist in that regard as part of drought relief. What a pity.
	Aviwe Biko	Ooww askies Thsawekazi I know what u mean; u can have a lot of it but kukude sherm
2019/06/09	Mr Peter	Thanks sisi maXoli. It took us 3 yrs according to the calendar. On the 1st year in June we would prune the trees to the ground, something we fought with Passmore for because we thought it would take long for the trees to grow. Passmore stressed that we do if we want them to grow then we did comply. We covered the tree with thick **mulch** thinking we were protecting from frost. Many trees did not recover from there. The next June we pruned the remaining trees to 1 m (not following the rules deciding to experiment). This time we surrounded the trees with 3 tyres but put **mulch** in the bottom, with this we discovered that frost sat on the **mulch** and melted straight to the stem and roots which caused more trees to not survive the winter but only 5 survived. Last June we put plastic and cardboard on top of tyres so to prevent melted frost from getting to the stem and roots. 2nd week if December when its warm enough we remove tyres and in Feb we saw this tree giving off pods and I screamed with joy because I expected to get seed and Walla we did. Bottom line is Moringa fears cold but with protection it survives. Where we are winter us long with very shortened warm months making it difficult to thrive. We used our tunnel to grow seedlings from where we harvest leaves that we dry and pound into powder and sell some. These do not grow into tall trees but are dwarf which give more leaves as you harvest. I have one short one that grew 1 pod which I am watching to what extent it will grow. On the day we harvested the pods you see in the picture we pruned all the trees, covered them with tyres and we put zincs on top but we have **mulch** at the bottom and we shall keep on watering giving 2litres per week for each.
	Busisiwe Peter	Team I am sooo excited. We have taken occupation in our farm in Cambridge East London! As I was starting to worry about compost, manure and mulch, remember these were easily available kwa Matole. We then visited our closest neighbour to introduce ourselves and guess what!!! We are neighbours to ProGro, the manufacturers of organic compost!! Isn't God wonderful?
2019/12/02	Ludwe	With the drought challenges, i don't see much conversation about building food forests, planting a whole lot of trees and mulching plots 1 ha and below.

Date	Person	Comment
		We really can reverse climate change by doing our bit...now that we have scientific evidence of this I hope we can all do our bit
	Busisiwe Peter	Buti this is a permaculture way of having abundance. Cover story is your big tree , e.g. Avocado, understory, apples or peaches, shrub could be your vegetable or herb, legume as nitrogen fixer, comfrey for instance as ground cover or still your legume and climber, e.g. grapes. This is nothing else but companion planting using guilds, principles are the same
2020/01/09	Nolitha Nyikana	Shares two images <attached: 00001801-PHOTO-2020-01-09-12-36-24.jpg> <attached: 00001802-PHOTO-2020-01-09-12-36-25.jpg>
		Ludwe: Beautifully done, please **mulch**...always **mulch** and when in doubt just **mulch**.
	Nolitha Nyikana	Thank you.
2020/01/2	Busisiwe Peter	I would also love to hear what Ludwe had in mind. I started seed beds hoping by 4th the seedlings would be ready for planting, just a small plot that won't take much time.
	Ludwe	Using what medium to plant in? Straw Bales or in compost...I'm assuming the no dig plot method you are referring to is where you sheet **mulch** the ground and build up soil that is a minimum of 15 cm and plant on it using compost and or straw bales?
	Busisiwe Peter	Mine is loosening the area using a fork, pour in liquid fertiliser made from Comfrey leaves and manure tea, then pack with compost and **mulch** with cardboard box and make openings for planting seedlings
	Ludwe	That's as good as it gets!

Trench beds / deep trenching

Figure 4.56. A demonstration of preparing a trench bed at Fort Cox AFTI

Trenching was one of the least commonly referred to practices within the group (10 mentions). The general feeling is that this is because although trench beds are very productive, they are very hard work to prepare.

Table 4.3 IBLN Discussions relating to trench beds

Date	Person	Comment
2018/02/13	Live	Shares images IMG-20180213-WA0008.jpg (file attached) IMG-20180213-WA0009.jpg (file attached) IMG-20180213-WA0010.jpg (file attached) **Fertility trench** of the ELRC prepared this weekend basil, spinach, tomato and red cabbage!! #puttingourlearningtoaction #productivedemonstrationsite
	Busisiwe Peter	Wow good work Live.
	Louise Madikiza	Looking forward to bumper harvest for the hard work put in. Great work indeed!
	Chamu Matambo	Great stuff there. Yet another demo-site for IBLN. Siyaquba
2018/02/23	Xolisa Dwane	We have just finished clearing the weeds on this field, to the TOT, please advise which RWH practices would you advise us to do here, the field is 25 m by 50 m, we were thinking of **deep trenches** but it seems too big for that
	Ngele	Is it for the productive demonstration plot? Good afternoon?
	Xolisa Dwane	No its our own plot, will be starting that one on Tuesday Please advise
	Lawrence	A bit difficult Xolisa without knowing about the soil type, the slope if any, what's happening around the field to see if there is any chance of bringing water onto the field, etc. So some of this information would be useful and you know about your resources skills, etc. maybe look at the Navigation Tool to start with and select a few possibilities then let me know. Ok?
	Xolisa Dwane	Shares image <attached: 00000930-PHOTO-2018-02-23-15-44-19.jpg> We have started to make a **trench** on the edges of the field, not very deep. Is that right?
	Lawrence	As I said I need to know more about the land
2018/05/22	Louise Madikiza	Shares images <attached: 00001374-PHOTO-2018-05-22-15-58-09.jpg> <attached: 00001376-PHOTO-2018-05-22-16-00-38.jpg> The **trench bed** that constructed during Amanzi for Food ToT
	27 83 375 0482:	Halala
	Busisiwe Peter	Food security at play.
	Eddie Parichi:	This is good news. My mouth is even watering
2018/06/22	Aviwe Biko:	Shares 8 images <attached: 00001739-PHOTO-2018-06-22-14-02-05.jpg> Dimbaza Demonstration site
	Tich	Wow nice mulching and **water harvesting trenches.**
	Aviwe Biko	Thank u Teach Xolisa can't compete with us with raised beds.
	+27 82 840 4129	Beautiful mamuBiko
	+27 78 363 2838:	Kwaza kwakuhle mam iko...

Date	Person	Comment
2019/02/26	Ticha:	Wow, that's very good rice. I look forward to the harvest already. Are you planting in a wet area?
	Aviwe Biko	Tich I planted my rice late November in a **trench bed**
	Ticha	Okay all the best with the rice Sisi. It needs lots of moisture so you've probably planted it in a good place.
2019/03/12	Live Matiwane	Yes and its our radio slot as a network so its up to us to volunteer to be panellists. … This could be the script radio host greets, introduces the book and the panellists introduce themselves 1) So Ms Ntombekhaya (for example) you want to implement **trench beds** in your garden, tell us what you are planting and why you want to implement trench beds. 2) Will you be mixing **trench beds** with any other RWH&C practice? Why have you chosen that combination? 3) Mr Hogana you implemented mulching but instead of using straw you intercropped mealies with beans and you are using beans as a cover crop which is a different way of mulching? …
2020/04/23	Xolisa Dwane:	Shares photo <attached: 00003733-PHOTO-2020-04-23-13-41-29.jpg>
	Lawrence Sisitka	A brilliant way to spend the lockdown!
	Nolitha Nyikana	Ndine picture yakho, digging those **trenches** with zeal and determination.
	Xolisa Dwane	I love doing it with all my heart. We had a bit of rain a couple of nights ago and I was so happy to see that I have a lot of wiggle worms under those boxes.
	Lindah Nuzangwa	It's good indicator of a healthy soil.
2020/05/05	Lawrence Sisitka	Thanks Busie, I have taken note of Nolithas comments and think that this is more geared for smaller scale homestead gardeners although anyone can probably apply. Can we share this through the EC CAN network? It could help a lot of people struggling to get food. The main issue is that it will be at least 6 weeks before they can harvest something, maybe spinach, and winter is not the best time for growing. Maybe we will need to share some advice on water harvesting, grey water, **trench bed**s, tower gardens, etc.? What do you think? Enkosi kakhulu
	Xolisa Dwane	This will be a missed opportunity for us because our officer want you to dance to her tune. I tried to engage with her several times she refused. Instead she wanted us to join the GMO maize production and I refused….
	Busisiwe Peter	Yes Lawrence lets share, information is power its for a good cause.

- ***What matters to the IBLN***

Based on the various lenses through which we analysed the WhatsApp data, the following considerations seem to stand out as being of particular importance to the IBLN community:

Water challenges and responses

As the harvesting, storage and use of rainwater for food production (under the title of Rainwater Harvesting and Conservation – RWH&C) was the foundational focus of the group, it is not surprising that this continues to feature strongly in the conversations. The area of the Eastern Cape Province in which the farmers operate has long been subject to an ongoing drought of varying intensity, and availability or lack of availability of water is a constant concern. Much of the information shared by the group is therefore concerned with how to make the best use of this limited resource.

Seed: Access to seed, seed sovereignty, securing access to GMO free seed (maize in particular) and challenging the state discourse around GMO seed.

These related themes were brought into the group following the second running of the training of trainers course. This involved a number of farmers and NGO personnel involved in agricultural activism associated with food sovereignty and related issues. With their activist background these IBLN members are at the forefront of debates around the agency of farmers in determining their own paths and defying the imposition of what they consider unsustainable practices driven by commercial interests. They are among the most vocal group members, and have shaped the agenda and orientation of the group quite considerably over the past 2 years.

Agroecological practices: including organics and climate smart agriculture

The emergence of a strong interest in agroecological approaches came fairly early in the life of the network, and was strongly reinforced with the membership of the farmer activists. This saw something of a shift from the more specific 'organic' approach to a broader agroecological understanding, but even within the first two years of the network the question was asked as to whether it could include only organic farmers. While this question was never fully or formally resolved, there has been a continuing bias in favour of organic and related approaches, although there is no absolute rejection of opportunities offered by more conventional approaches. The introduction of climate smart (or more recently 'resilient') agriculture came about through a connection made with a WRC project based in Pietermaritzburg in KwaZulu-Natal. Several of the IBLN farmers became involved as the Eastern Cape cluster in this project, since when CSA (or CRA) has been a continuing theme within the network discussions. This is also connected with ongoing discussions related to effective and efficient use of limited water resources as many CSA practices are also concerned with this.

Access to land and other forms of support: mostly from the state, but also elsewhere

It would be surprising if access to land, one of the most vital and politicised issues affecting emerging farmers, did not feature in the network discussions. Access to land itself is also a prerequisite for access to other forms of support, particularly funding for agricultural activities, and there is considerable sharing of information on opportunities for accessing such support. Most opportunities are in the form of grants from the provincial Department of Rural Development and Agrarian Reform (DRDAR), or the national Department of Agriculture Forestry and Fisheries, although funding from national and international NGOs also feature. Interestingly, within the network, although each member could be viewed as a potential competitor for such support there appears to be little or no reluctance to share information on these opportunities. This reinforces the very strong emphasis on the well-being of the collective rather than only on individual farmers.

Learning and teaching others: information as power

While the network was established and indeed named as a 'learning network' it could never have been assumed or predicted that the focus on teaching and learning would have been maintained to the extent that it has. There appears to be a real joy in the sharing of information, ideas and experiences that transcends any ideological or theoretical notion of social learning, which has *de facto* become almost the life-blood of the network. This sharing and learning is driven far more by the farmers than the academic members of the group, although the advice of the latter is often sought in areas where other members are less confident. Any conventional hierarchy of learning or differentiation between teachers and learners has long disappeared, with everyone at one time or another adopting both these roles. The recognition of information as power, a fairly often used phrase, is a strong indication of how the IBLN members feel that their agency, both individually and collectively, is enhanced through the sharing of information.

Securing the welfare of smallholder farmers and food producers: their own and others

There is a powerful current of concern for welfare and wellbeing of all small-scale food producers, and every effort is made to seize on opportunities which can enhance this. This extends to and informs much of the activism in which some members are involved, and lends depth to the sense of collective. There is strong recognition of the need for a united voice from emerging farmers to promote their role and contribution to food security, particularly within the rural and more marginalised communities.

In person meetings and gatherings

The IBLN is as much a social as a professional network, and as such face-to-face contact is considered extremely important as it reinforces the relationships between members, strengthening their connections and reaffirming their commitment to each other. Such commitment is expressed in particular through the *ilima* days where members help others implement new practices and farming systems. The WhatsApp link is therefore used as a vital tool in making the necessary logistical arrangements for such direct interactions.

In conclusion, the IBLN WhatsApp community has become increasingly central to the network on three fronts:

1. The maintenance and evolution of network culture
2. The maintenance and expansion of network membership
3. The ways that learning takes place within the network

The WhatsApp digital platforms can play a valuable brokering role between knowledge, learning and practice. New knowledge gained via the group animated farmers' practice, and this practice in turn animates the digital community. Through the digitally-enabled ability to share one's actions with a supportive group of friends, colleagues and specialists, small actions take on a greater purpose, experimentation is supported and applied learning is carried forward incrementally on a daily basis in the IBLN.

4.9 Conclusion

This chapter has provided insight into the media components of the Amanzi for Food programme. As can be seen, the programme continues to use a diversity of social mediation tools, with the WhatsApp and Facebook being important means of social media communication, along with community radio, community newspapers and the website.

Interesting dynamics have been observed which can be synthesised in order to inform a more comprehensive communication strategy and guidelines for Learning Networks and the Knowledge Uptake Strategy.

The findings above show that social media activity definitely plays a very important role in informal learning settings, and is a key mechanism for supporting smallholder farmers to learn from each other and to stay up to date with new knowledge and practices; and that it is important to work with those platforms that are most widely used (e.g. WhatsApp) and accessible. Based on these insights gained, the Amanzi for Food team have produced guidelines for learning networks that also guide transformative social learning principles in agricultural learning systems (see Appendix 3.3 as a Technology Transfer Tool to support the Knowledge Uptake Strategy). Overall, in the time available, the Amanzi for Food project was able to establish an effective media-based foundation for extending the learning interactions. The scope and impact of the media-based foundation is beginning to show and more time is needed for this interactive media approach to reach its full potential. The introduction of the Mobile Journalism (MoJo) activity shortly before the advent of Covid-19, showed great promise in increasing the interactivity of network members with the various media, and this is an area that will need further effort.

One area in which the project did not achieve its aims was the intention to link with other web-based organisations, such as Mzansi for Food. Although some initial contacts were made, the opportunity to take this further in the form of an informal agreement for information-sharing did not present itself. A similar scenario played out in relation to other online media. This does not signify that such collaborations are not possible, but rather that more time and focus will be needed to pursue them. During the COVID-19 pandemic a number of the IBLN members participated in national dialogues and webinars focussing on food systems and smallholder farmers, and these networks have been drawn on to make connections between the IBLN and its work and these wider networks. For example, the online course has been shared with large networks such as the AFSA network and the Mzansi for Food network amongst others.

From the data presented in this chapter, any Knowledge Uptake Strategy must clearly take into account the potency of internet-based social media to enhance knowledge sharing and collaborative learning. However it should also recognise the preferences displayed by people in the agricultural sector, in particular by the smallholder farmers and household food producers who have been the main focus of this project. While the broad-based public platforms such as websites and Facebook pages are used to some degree, the more direct, personal connections afforded by WhatsApp (and presumably Signal, Telegram, Viber and a host of similar platforms which were not explored in this project) appear to be more appealing to most people. There seems to be a strong preference for engaging with ‘real people’ over the essential anonymity of the blogs and posts on the wider media. Indeed all three learning networks established during the project (and the sub-networks in Mpumalanga) were based on groups of people who knew each other personally from the ToT course or from previous professional contacts, hence the concept of the ‘Course Activated Learning Network’ is important in building the foundations for ongoing social media-based learning network development. New members who were added subsequently were also known personally to the existing members who introduced them to the networks, and while most members did not have any personal connection with the newly introduced people, they were readily assimilated into the social fabric of the group. In promoting the use of internet-based social media,

therefore, the Knowledge Uptake Strategy should differentiate between the functions of websites, as repositories of information, such as the WRC material, and hosts of training programmes and courses, and platforms such as WhatsApp which thrive on direct farmer to farmer interaction. The Strategy should also be candid about the challenges in establishing effective collaborations with online journals and other web-based organisations.

Conventional media, including newspapers and radio stations certainly have value as means of sharing information, and in social learning in a learning network approach as shown by Lupele (2017's) study. However engaging with such media requires considerable time and effort. This is required to establish initial contact with the right people within the organisations, to negotiate the process through which information can be shared, and to navigate the constraints on this, and then to produce the information in the required form, or induce a journalist to become interested enough in what you wish to share to work with you in developing and article of radio programme. Even the simple act of arranging transport for people to take part in a radio broadcast is often challenging. This indicates perhaps a need to engage more directly with journalist and media practitioner training, and to ensure that in each learning network and ToT programme there is a strong cohort of media practitioners who have the interests of smallholder farmers and household food producers at heard. For successful engagement with conventional media it is essential, in any group or network, to have a few people with the necessary skills and commitment to make it work. The Knowledge Uptake Strategy should certainly raise the possibilities offered by conventional media, but should also be clear on the challenges inherent in working in these spaces.

CHAPTER 5
TOWARDS A KNOWLEDGE UPTAKE STRATEGY PART 4: Training of Trainers Programmes

5.1 Introduction: Design and Development of the Training of Trainers Programme and Material

In the first iteration of this programme we developed a Training of Trainers programme as a Rhodes University Certificate Course that facilitated the uptake and use of the WRC material and the collaborative development of productive demonstration sites. This course was structured into 5 modules (cf. Lotz-Sisitka et al., 2016) for detail on the initial development of the course. In this period of the project (2017-2021), the course was reviewed and redeveloped and was run in the three learning network sites, and was developed into an open source, online course that interfaces with the Amanzi for Food website as indicated in Chapter 4. As reported on in Chapter 3 and 4, the course plays an important role in activating the learning networks (cf. also Weaver, 2016; Pesanayi, 2019).

The current version of the ToT programme has three modules (Appendices 5.1, 5.2 and 5.3) which were modified from the original five as follows:

5.1.1 Module 1

Module 1 is based on the original Module1 which focused almost entirely on RWH&C practices. This has been modified to introduce learning processes associated with such practices. The expansive learning processes originally covered in the original module 5 have been brought forward into this module. The purpose of this change was to strengthen the model of collaborative learning around RWH&C practices right from the beginning as this was shown to be one of the strengths from the previous programme (cf. Lotz-Sisitka et al., 2016). Module 1 begins by providing the purpose of the Amanzi for Food programme as a response to the national food security and water scarcity challenges. It then immediately introduces RWH&C Practices in Farming Processes and Systems and their potential in improving production in Homestead food production and Small-scale crop production. This discussion is done on the context of Farming Scales, Farmers' Aspirations and the contexts of their farming systems. The navigation tool is introduced to mediate the identification, location and selection of appropriate RWH&C practices from the eight RWH&C material. The module connects the theory with practice through a soil and water demonstration/activity and field visit to an existing or potential RWH&C demonstration site to facilitate hands-on learning of RWH&C practices. This approach was taken to underpin the 'practices' focus of the course. The module concludes with a reflection on learning emerging from the course process thus far and the modelling of possible solutions that participants have gone through. The assignments were based on this content modification, emphasizing collaborative learning in a learning network context and RWH&C practices.

5.1.2 Module 2

The focus of Module 2 is very much on learning, and it picks up from Module 1 with a discussion of the different ways in which people can learn, especially in relation to the RWH&C context and the farming context in general. The revised Module 2 incorporates much of the content of the original Module 3. This module examines the approaches to learning taken by the WRC material and discusses aspects such as 'Participatory' and 'Social' Learning. These concepts are then taken into a review of the existing education and training processes with which the course participants are involved. This includes college lecturers undertaking a review of their curricula; agricultural extension officers and NGO personnel reviewing their training programmes; and household food producers and small-scale crop producers examining how they share information with their peers.

The link to practices is re-established through a discussion of the great value of practical examples and activities in learning, leading to a session on the importance of productive demonstration sites as sites of learning. A practical field activity, building on the Module 1 laboratory experiment, is included. The final session of the Module involves groups of course participants coming together to plan for the development of productive demonstration sites for their and others' use in the future. This, with other activities, helps prepare participants for Assignment 2.

5.1.3. Module 3

Module 3 focuses on consolidation of the learning network on the one hand and the consolidation of productive demonstration sites and curriculum innovations on the other. Based on the original module 5 and using some of the material from the original Module 4, it starts off with a reflection on what participants have learnt through engagements with each other through knowledge processes presented in Modules 1 and 2 and then particularly focuses on reflections on the learning from the access and use of WRC Material, from co-engagements in the learning network and from selecting and using RWH&C practices in designing and implementing demonstration sites and curriculum innovations.

5.2 Participation in the Training of Trainers Programme in the Three Learning Network Sites

Participation here is discussed in terms of the range of people and institutions participating in the Training of Trainers' courses, and in the learning networks. In all cases, the Learning Networks were catalysed through the ToT course which has a work together, work away structure to allow for applied assignments (Change Projects) and building of local connections and partners. The ToT course follows the following structure (outlined above) and associated assignment path that helps to facilitate applied learning and practice.

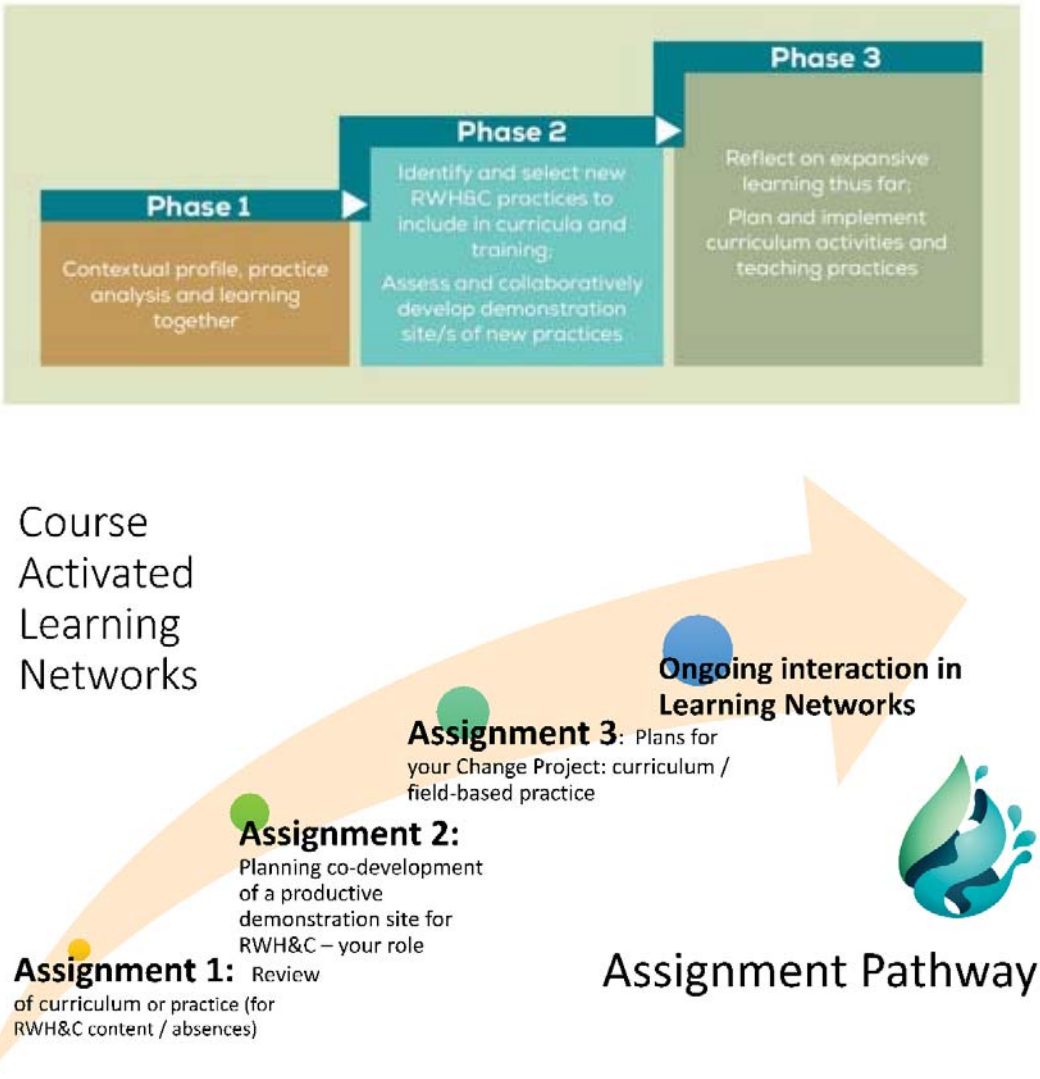


Figure 5.1. Applied Learning Pathway in the ToT course, in which participants use WRC material for planning and implementing Change Projects and Productive Demonstration Sites

Learning networks were successfully established in all three sites, and the Training of Trainers Course was also successfully delivered in each of the sites, although in slightly different forms in each place. Course participants established change projects in the form of productive demonstration sites, which were reported in the final course certificate sessions. Rhodes University / WRC Course certificates were issued in all three sites to participants who completed the ToT course assignments, and posters capturing the productive demonstration site development and engagement with these were developed by ToT course participants. Links to the WRC material used to guide these change projects were indicated in the posters. Letters acknowledging participation were issued to all those who participated in the ToT sessions, but did not complete the written assignments. It should be noted here that one of the intentions of the ToT course was to expose participants to the eight WRC material, but also to *catalyse local social learning interactions, which will be discussed in more detail below.*

Figure 5.2. ToT Certificate Ceremony for the IBLN network, Eastern Cape, July 2018

5.2.1 Eastern Cape Province (Learning Network 1)

Participation, in all its many forms, has long been a central feature of the ToT courses and a key principle of the Imvotho Bubomi Learning Network (IBLN) in the Eastern Cape. This Learning Network has grown from strength to strength over the years, supported by the Fort Cox AFTI and WRC Amanzi for Food team, and strengthened by the introduction of instant group communication processes such as offered by the WhatsApp internet-based application. The IBLN's success can be attributed to many factors, including the access to the necessary technology enjoyed by more farmers and others in the area than had been expected. The second running of the ToT course in the Eastern Cape introduced a new range of people to the IBLN, who in turn brought in new and interesting participatory dynamics. There was strong representation from active (and activist) farmers, and NGO and CBO representatives, which shifted the balance of the network more towards the farmers and their various activist foci. Together with members of the WRC Amanzi for Food team, membership of the IBLN has grown to almost 90 as also reported on in the previous chapter. The new members also brought in their connections to already established networks and partnerships which further shifted the balance in their direction.

This is not to deny the continuing central roles in the network played by Fort Cox AFTI, the agricultural extension services, and the ELRC Amanzi for Food team. Recent research into this network conducted through a process of developing 'Net-Maps' with a range of IBLN members indicates that for most these remain the key players, while for others it is their long-standing associations with national and regional NGOs (such as Zingisa Education Trust and the Rural Women's Assembly) and local CBOs (such as Ilizwi Lama Fama) which predominate, who have become strong members of the IBLN and who have participated in the ToT programmes (Metelerkamp et al., in press). Through these connections there are also continental links to organisations such as the African Food Sovereignty Alliance (AFSA). The net-maps developed to capture the range of interactions and organisations (see Chapter 3) show both diversity and influence that was catalysed by the course.

The Training of Trainers course in the Eastern Cape had an overwhelming response with over 60 people applying for the course. About 55 participants turned up for Module 1 but the number stabilized to about 30 in Module 2. The group had mostly women farmers, members of an NGO, about 10 youth (including 5 Fort Cox AFTI students and 5 youths from the farming community), 2 Fort Cox Rural Development Centre trainers, 2 lecturers (from Fort Cox AFTI

Department of Agribusiness and Forestry), 1 technician and 3 University of Fort Hare lecturers also participated in the course. The Raymond Mhlaba Development Agency (RMDA) had two officers participating, whilst the Alice Extension Office had 3 officers participating, among others. Figure 5.3 shows a field demonstration activity during Module 1 ToT training in which a farmer poured water onto the soil surface in a container with bare soil cover and then on a mulched surface to compare water percolation and soil moisture retention. The levels of participation brought into the course and then into the network have been extraordinarily high, with collaboration and mutual support being the key features of the interactions.

Figure 5.3. Left – Field demonstration activity during module 1 ToT in the Eastern Cape

The participation within the IBLN has long been focused on practices, especially the productive demonstration site practices catalysed by the course assignments (cf. Lotz-Sisitka et al., 2016) and this continues through the organization of *iilima*, or working days (which is one of the outcomes of the second round of the ToT programme in the IBLN), where network members come together to help each other develop demonstration sites and implement new practices, in preference to holding more conventional *iintlanganiso* or *iimbizo* (meetings), which are considered by many to be just 'talk-shops'.

Members of the IBLN were also involved in a further activity when the team from the WRC Climate Change Project (WRC Project K5/2719/) from Pietermaritzburg visited the Eastern Cape in 2017. Discussions were held between the two WRC projects (WRC Amanzi for Food and WRC Climate Change) at ELRC Rhodes University, concerning possible synergies. It was clear that there were strong synergies between the two projects, and with the IBLN members' background in Amanzi for Food, they had a good understanding of climate change, its impacts, and some of the practices appropriate to address the impacts. The IBLN was proposed to become a hub for the CSA activities, as the CSA team were very impressed with the knowledge and enthusiasm of the farmers in the Eastern Cape. Many IBLN course participants and members participated by implementing experimental plots and hosting workshops (Figure 5.4), extending the practical aspects of the course further.

Figure 5.4. IBLN Members work with the CSA team to erect a shade-cloth tunnel at Xhukwane, Eastern Cape

Extending from the course, three Imvotho Bubomi Learning Network meetings were held. IBLN meetings took one of two forms, either a practical form or an administrative form. Productive demonstration sites were established through *Ilima* or RWH&C knowledge sharing plans and related interests in the network are discussed and planned. Such interests in the network include but are not limited to seed saving, seed activism and agro-ecology.

Figure 5.5. A trench bed and a tower garden at Quzini, stimulating discussions during a meeting on 1 November 2018

This meeting was primarily an administrative meeting to conclude the 2018 year and plan training events for the year 2019, which also shows the influence of the ToT, especially its continuity after the official course assignments are completed; and its important role in cementing a culture of ToT and peer learning in the learning network (Appendix 5.4). Here were also discussions and practical activities associated with RWH&C practices, indicating the ongoing influence of the course on the culture and practices of the learning network.

Figure 5.6. IBLN members after a meeting at Fort Cox Agricultural Training Institute on 7 March 2019

Figure 5.7. IBLN meeting held at Pondweni location

- *Taking the Training further*

The Mxumbu Youth Agriculture Co-operative, members of which participated in the ToT course, have been particularly active in sharing their learning from the course with youth in neighbouring communities. They conducted semi-formal training involving some theoretical components, but mostly practical elements involving both the RWH&C practices and CSA practices they have learned from the respective WRC projects. They actively drew on the

WRC material in this process. The value of their training was recognised more widely to the extent that the cooperative was contracted to train different groups by NGOs and government departments. However, they required considerable support in the form of support material and equipment from their network partners, but sometimes it was difficult to obtain this timeously. The Mxumbu Youth Agriculture Co-operative also planned for the training to become self-sustaining, which was successful as they have managed to establish a Training Division of the Co-operative and are working closely with the ELRC on developing a business plan and a training programme with a full set of support material derived mostly from the WRC projects. The idea was that they could take these training and business plans to prospective funders, or to prospective clients, such as NGOs or government departments, who could then commission them professionally to provide training to youth groups throughout the area. It was expected that both plans were to be complete and operational in 2020 but this was slowed down due to the impacts of COVID-19 pandemic which led to hard lockdowns in South Africa. (Appendix 5.5). However, virtual engagement with this group has continued and the ELRC are now working with them to set up a 'mobile resource centre' with computers and learning resources that can assist them to become a small 'local training hub'.

Figure 5.8. The Mxumbu Youth Training Division conducting training in Ngcamngeni village

Figure 5.9. Community peer-to-peer training taking place lead by the Mxumbu Youth, showing use of the WRC and other material that farmers are finding useful

5.2.2 Mpumalanga Province (Learning Network 2)

The Mpumalanga Learning Network shared a similar genesis but was different to the Eastern Cape Learning Network in several fundamental ways. The main similarity is that it evolved out of the Training of Trainers course, implemented via three modules between September 2017 and January 2018, with participants in the course forming the nucleus of the network. The main implementing partner for the ToT course was the University of Mpumalanga (UMP), and was implemented with the support of Mr Gerhard Viljoen, who heads up the Short Course Unit at the UMP. A key difference between the two learning networks was the initial absence of farmers in the ToT course in Mpumalanga, as none registered for the course. Farmers were involved in the third training session, as course participants brought farmers from their demonstration sites to the course session. Participants on the initial ToT course were:

- University of Mpumalanga lecturing staff and students;
- Agricultural advisors from the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA);
- Personnel from the Mobile Agricultural Skills Development and Training (MASDT) a not-for-profit company (NPC);
- A staff member from the NGO AWARD (Association for Water and Rural Development); and
- A journalist from the Mbombela Newshorn newspaper.

Figure 5.10. Mpumalanga Learning Network during second course session and field visit

The course involved participants from across the province mainly from three Districts: Ehlanzeni, Gert Sibande and Nkangala. While this offered a wider coverage of the province, it also made it more difficult for participants to meet and work together in one active learning network. Smaller networks which were linked together via a province-wide WhatsApp group were established to address the situation. In this case, everyone could belong in the network, and a total of 6 sub-groups were set up to operate as smaller learning networks through which they could work together more locally and develop productive demonstration sites. These sub-groups were:

- **Nkangala** – centred on the University of Mpumalanga (UMP) Siyabuswa and Teaching School campus, developing a productive demonstration site at Masoganeng and also on the UMP campus,
- **Gert Sibande** – centred on Ermelo and was led by MASDT personnel in establishing a productive demonstration site at Amersfoort,

- **Ehlanzeni South** – centred on Nkomazi, led by the DARDLEA agricultural trainers and MASDT personnel, with an initial productive demonstration site at Buffelsfontein, to which others were added, including to the north near Hoedspruit (in Limpopo province),
- **Ehlanzeni North** – centred near Bushbuckridge, led by MASDT personnel and DARDLEA agricultural advisors, and with productive demonstration sites there and at Zoeknog,
- **University of Mpumalanga education and learning group** – calling themselves the "Sinakekele Sibusiso Semanti (we are thankful for the gift of water) learning network" (SSSLN), centred on the UMP Mbombela campus and led by lecturing staff, with productive demonstration sites in the campus grounds and on surrounding farms. As this network is based at the centre of the Mpumalanga RWH&C involvement, the learning network name applies also to the province-wide network.
- **University of Mpumalanga Enactus group** – a student group on the UMP Mbombela campus working with community gardeners with whom they were establishing productive demonstration sites.

Although these six subgroups were linked through the province-wide WhatsApp group, they operated mostly as independent units, each with their own WhatsApp groups. As they were all working with farmers, it became integral to the sub-networks. However, between these subgroups it was noted through field visits by the Amanzi for Food team that some groups were more active than others, and that the groups tended to operate in their independent spaces as they were working with their groups of farmers. There was little ongoing interaction between the groups due to the distances in the province, although they maintained some contact through the province-wide WhatsApp group, and attended province-wide learning network events together. The Amanzi for Food team encouraged the sub-groups and members of the sub-networks to engage more proactively with each other across sub-networks, as well as sharing their experiences.

Figure 5.11. Members of the Mpumalanga Learning Network at the end of course Water Seminar Day 1: Amanzi for Food Presentations

The most vibrant learning network in Mpumalanga province was the province-wide Samkelekile Sibusiso Semanti Learning Network (SSSLN). Although there were a few sub-networks operating at a district level, the details of their activities were not immediately available to the Amanzi for Food team, as they were not members of these networks. However, these smaller networks operated primarily as fora for arranging meetings, and sharing information on local events.

The SSSLN has, over the past years taken on a more activist focus, with posts concerning the need to promote organic agriculture and agroecological approaches in the face of efforts being intensified by global corporations to promote more intensive industrial agriculture approaches, including the use of Genetically Modified Organisms (GMOs) which are designed, amongst other features, to be resistant to specific chemical pesticides. The network was and is still used for sharing information concerning engagements with other networks, in particular those, such as the Inkomati-Usuthu Catchment Management Agency (IUCMA), which is involved in water management programmes. The RWH&C practices were also shared through the network's WhatsApp group, indicating their continued interest in developing and sharing such practices. Many members of this network are also involved in the Climate Smart Agroecology WhatsApp group, founded by members of activist NGOs.

5.2.3 North West Province (Learning Network 3)

The Training of Trainers course in the North West Province was adapted into a single 3-day session, implemented from the 2nd to the 4th of October 2018 at the Taung Agricultural College (TAC). This was due to difficulties in securing staff time for the training programme and this adaptation was informed mainly by the availability of key people within the TAC. All key aspects from the three course modules were covered. All course participants were from within the college itself, including lecturing staff, students and farm personnel and technicians. Despite this limitation, it was apparent that the different groups had little experience of working and learning together, and the course provided a much-welcomed opportunity for them to do this. The course was very well received with a universally positive evaluation from all participants. (Appendix 5.6)

The Learning Network was initially established via the ToT course and therefore it involved only participants on the course, all from the college. However, there was agreement in discussion, reinforced through suggestions in the assignments that a wide range of other partners, including farmers, agricultural advisors from the provincial Department of Agriculture and Rural Development (DARD), municipal officials and traditional leadership should be engaged and involved. A key session in the course involved the participants forming mixed groups which were guided in discussing initial ideas for productive demonstration sites on the campus itself. It was during this session particularly that the participants expressed their appreciation of being able to interact and work together. During final discussions, it was agreed that the learning network and associated WhatsApp group should be called #PulaWise ("pula" meaning rain in seTswana and seSotho). Although the focus was inevitably on the TAC campus itself, participants were encouraged to take the ideas out into the farming communities with which some were already working. The assignments that were submitted towards the end of November 2018, indicate that while most plans were for on-campus productive demonstration sites, there were also some plans for sites developed with local small-scale farmers and household food producers and others.

The Amanzi for Food team maintained its collaboration and communication with participants to evaluate the success of the productive demonstration sites and the curriculum innovation ideas in North West province. However, the #PulaWise Learning Network set up at Taung Agricultural College flourished for a relatively short period of time from the end of the Training of Trainers course held in October 2018, to the establishment of some productive

demonstration sites in February 2019. The initial enthusiasm for the network, driven mainly by two of the lecturing staff, with the support of some of their students, was sufficient to take them through this initial process, but it appeared as there was insufficient motivation to continue beyond this. The lecturers' time was fully occupied by their teaching and supervision roles, and some of the most enthusiastic students had completed their studies and moved on. It was also proving difficult for the technicians from the farm staff to justify time spent on activities not specifically connected with their main functions. Another factor could be that the network, although very ably led by an enthusiastic and committed member of the lecturing staff, did not include anyone of sufficient status or authority within the TAC, to overcome a certain degree of institutional hierarchy that does not appear to be easy to traverse for those in the network. For example, permission was required for the network to engage with the local community radio and other media, and this has not been forthcoming, thereby limiting the opportunities for the network to reach out beyond the college walls. It was also not possible, as a result of some municipal political activities and student unrest at the college to arrange a visit from the ELRC Amanzi for Food team to support the network in conducting a 'roadshow' to take the RWH&C message into the community, and hold a formal graduation ceremony for those who had successfully completed the course. However, it is intended to involve the TAC in the online ToT course, proposed for early 2021, and the Amanzi for food team hope that the engagement of lecturers and students with the online course may reinvigorate the network.

5.3 Change Projects Advancing Rainwater Harvesting and Conservation Practices

There are several ongoing change projects in the Eastern Cape and Mpumalanga Provinces, and new change projects in both provinces mainly as a direct result of the revised Training of Trainers course programme. There were also plans for important change projects in the North West province as highlighted in the post-ToT course assignments, although these do not appear to have come to fruition. In both the Eastern Cape and Mpumalanga the change projects involved, in addition to productive demonstration sites, changes to the curricula to incorporate elements of RWH&C.

5.3.1 Eastern Cape Province

In the Eastern Cape group some of the change projects are still ongoing, with new change projects being established. Most of the change projects have taken the form of productive demonstration sites, which are covered in detail in Section 5.4, below and in Chapter 6 of this report. Three of these practical change projects are introduced here:

- The productive demonstration plots established at Keiskammahoek in 2015 continue to be productive through selling surplus produce and hosting many teaching sessions for Fort Cox AFTI students. The relationship established between Fort Cox AFTI lecturers and the local farmers and extension officers in Keiskammahoek has demonstrated the potential and power of co-engaged networking and expansive learning. The excerpt below from a WhatsApp chat indicates that there were multiple levels of development that have and continue to take place at this site.

"I took my students there in late October early Nov this year. She (Mrs Maso, the farmer) did the teaching. I've just sent u [you] the video. It is still uploading. … Wait till u [you] listen to the video. The way the garden looked and how the technique is working. Also the money she is making on that piece of land. She was excellent in her teaching" Fort Cox AFTI lecturer.

- Fort Cox AFTI has expanded on its farm pond demonstration plot by developing controlled production trials with mulched and drip-irrigated plots of tomatoes versus un-mulched plots with drip irrigation. Results showed higher productivity on mulched plots. There was also a focus on the production of indigenous leafy vegetables using agro-ecological techniques of saving water and establishing fertility trench beds.

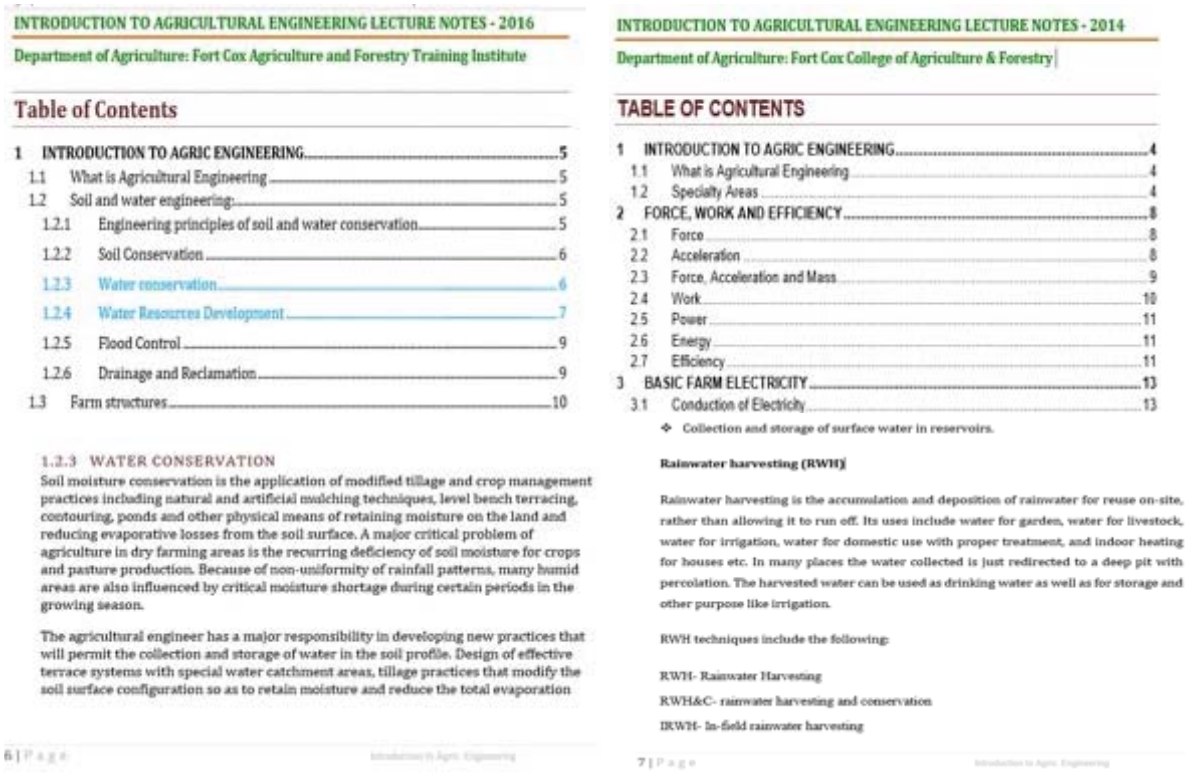
- The Amatole Basin change project began at the close of the first iteration of the project and has picked up momentum in this period of reporting due to local farmer agency and the proactive support of the learning network in generating more change projects where innovative and willing farmers in this area were showing interest.

  The main change project sites in the Amathole Basin are:
  - ***Site 1 homestead garden***: The homestead garden has a permaculture design, and has integrated rooftop harvesting with farm pond designs adopted from Lloyd Village after a look and learn tour, and change laboratory workshop involvement in 2016.
  - ***Site 2 Youth cooperative garden***: This garden was started in late 2016 and involves four youths and an adult mentor (former state registered nurse educator). They have developed heavily mulched circular beds that harvest water and produce vegetables. The members also produce OPV maize at their croplands and gardens.
  - ***Site 3 Cropland in Amatole Basin/Fort Cox AFTI Rural Development Centre (see site 4 under Fort Cox AFTI)***: This is a productive OPV maize production plot divided into 3 planting plots over a gently sloping land. The site also produces *Moringa oleifera* and is targeted to also produce some sorghum and millet. The host farmers (Mr and Mrs Peter) planned to develop deep contours to capture and store water using the example in the WRC WHC material, as part of their ToT change project. The master plan is to involve all interested farmers in Mqayise and neighbouring villages through an ilima process that will see generative scaling of RWH&C practices in the wider Amatole Basin area.

Figure 5.12. Mr and Mrs Peter with the Fort Cox/Amathole Group Change Project Poster

In addition to these, and many more productive demonstration sites, considerable change was effected in the Fort Cox AFTI curriculum as a result of the first Change Projects implemented there during the initial course (showing the continuity of the Change Projects over time), while additional curriculum change projects were introduced by new lecturers (these are communicated in more detail in Chapter 6). The key curriculum changes at the Fort Cox AFTI were introduced early in 2016 are shown in Figure 5.13.

The changes are illustrated through a comparison of *course content of the Introduction to Agricultural Engineering course* between the years 2014 and 2016. Figure 5.13 shows that among other modifications, course content on water conservation, and water resources development were added to the course content which previously did not exist in the course notes. A diversity of RWH&C practices now features in the course notes (see Figure 5.14 below).



INTRODUCTION TO AGRICULTURAL ENGINEERING LECTURE NOTES - 2016

Department of Agriculture: Fort Cox Agriculture and Forestry Training Institute

Table of Contents

1.2.3 WATER CONSERVATION

Soil moisture conservation is the application of modified tillage and crop management practices including natural and artificial mulching techniques, level bench terracing, contouring, ponds and other physical means of retaining moisture on the land and reducing evaporative losses from the soil surface. A major critical problem of agriculture in dry farming areas is the recurring deficiency of soil moisture for crops and pasture production. Because of non-uniformity of rainfall patterns, many humid areas are also influenced by critical moisture shortage during certain periods in the growing season.

The agricultural engineer has a major responsibility in developing new practices that will permit the collection and storage of water in the soil profile. Design of effective terrace systems with special water catchment areas, tillage practices that modify the soil surface configuration so as to retain moisture and reduce the total evaporation

6 | Page

INTRODUCTION TO AGRICULTURAL ENGINEERING LECTURE NOTES - 2014

Department of Agriculture: Fort Cox College of Agriculture & Forestry

TABLE OF CONTENTS

- Collection and storage of surface water in reservoirs.

Rainwater harvesting (RWH)

Rainwater harvesting is the accumulation and deposition of rainwater for reuse on-site, rather than allowing it to run off. Its uses include water for garden, water for livestock, water for irrigation, water for domestic use with proper treatment, and indoor heating for houses etc. In many places the water collected is just redirected to a deep pit with percolation. The harvested water can be used as drinking water as well as for storage and other purpose like irrigation.

RWH techniques include the following:

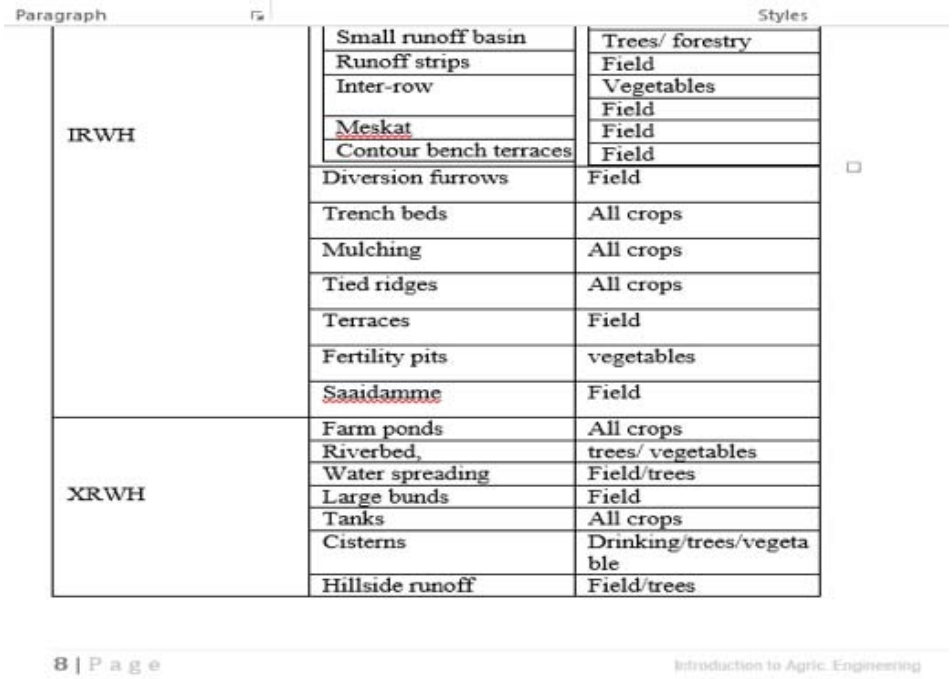
RWH- Rainwater Harvesting

RWH&C- rainwater harvesting and conservation

IRWH- In-field rainwater harvesting

7 | Page

Figure 5.13. Changes in agricultural water content in the Introduction to Agricultural Engineering course from exclusive irrigation in 2014 (top left) to incorporation of rainwater harvesting and conservation in 2016 (top right and bottom left and right)



Paragraph Styles

IRWH	Small runoff basin	Trees/ forestry
	Runoff strips	Field
	Inter-row	Vegetables
		Field
	Meskat	Field
	Contour bench terraces	Field
	Diversion furrows	Field
	Trench beds	All crops
	Mulching	All crops
	Tied ridges	All crops
	Terraces	Field
	Fertility pits	vegetables
	Saaidamme	Field
XRWH	Farm ponds	All crops
	Riverbed,	trees/ vegetables
	Water spreading	Field/trees
	Large bunds	Field
	Tanks	All crops
	Cisterns	Drinking/trees/vegetable
	Hillside runoff	Field/trees

8 | Page Introduction to Agric. Engineering

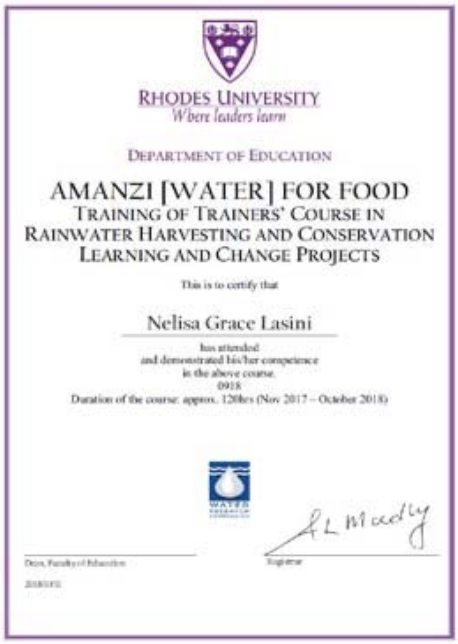
Figure 5.14. Extract from Introduction to Agricultural Engineering notes used in 2017 at Fort Cox AFTI showing diversity of RWH&C practices incorporated in curriculum after first ToT course

The continuities of the initial curriculum change projects have led to further curriculum review processes at Fort Cox AFTI, and a number of other innovations are being introduced that

support smallholder farmers. Professor Lotz-Sisitka attended a curriculum review committee meeting in mid-2019, and was appointed as Chair of the Crop Sciences Curriculum Innovation committee. Of importance to the WRC project is to note that approximately 50% of this curriculum innovation committee actively engaged with the IBLN as members and contributors, all have attended the ToT courses, and are supporting smallholder farmers in the local area. This is a significant shift in curriculum development approach in the FCAFTI, as local farmers are now included in curriculum development, and the curriculum is now much more oriented towards the smallholder farmer, including more sustainable practices such as RWH&C in the curriculum. Members of the IBLN and RU have been asked to comment on the curriculum modules as these have been developed, and we have made suggestions on material to include, as well as suggestions to support the re-orientation of the curriculum towards a more balanced focus on smallholder and larger commercial farmers' interests. This process will support further integration of RWH&C components into other curriculum elements, including crop production. This shows the influence of the ToT course, the Change project model and the approach taken to social learning, agency and change in the Amanzi for Food programme, and its impact over time. A simple change project started in a ToT course in 2016 by three lecturers who became leaders in the IBLN, has now led to whole institution change and a strong re-orientation of the ATI curriculum and orientation to inclusion of smallholder farmers in the curriculum, and community engagement mission and vision of the ATI.

5.3.2 Mpumalanga Province

The change projects in Mpumalanga were showcased at the Graduation Ceremony which formed part of a Water Seminar hosted by UMP in July 2018. The groups presented posters which they had developed describing their activities, and Rhodes University / WRC partnership accredited certificates were awarded to successful course participants.


RHODES UNIVERSITY
Where leaders learn

DEPARTMENT OF EDUCATION

AMANZI [WATER] FOR FOOD
TRAINING OF TRAINERS' COURSE IN
RAINWATER HARVESTING AND CONSERVATION
LEARNING AND CHANGE PROJECTS

This is to certify that

Nelisa Grace Lasini

has attended
and demonstrated his/her competence
in the above course.
0918
Duration of the course: approx. 120hrs (Nov 2017 – October 2018)

Figure 5.15. Specimen Graduation certificate
(permission was granted by the Registrar after she was approached to include the WRC logo on the Certificate)

Figure 5.16. Course participant being awarded a ToT Course Certificate

Figure 5.17. Ms Melody Chiume presents the Ehlanzeni South group Change Project

This was followed on the second day by a series of presentations on innovative irrigation and water management practices both in the commercial sector and by the Association for Water and Rural Development *(*AWARD*)* programme, operating in Limpopo and Mpumalanga provinces. The Amanzi for Food course participant posters were also shared into this wider network of agricultural actors in the province, thereby raising support for the activities of the smallholder farmers from other stakeholders.

Figure 5.18. Change Project posters made by Amanzi for Food ToT participants being shared at the UMP Water in Agriculture Seminar

ChangeProjects in Mpumalanga Province's learning network have been organized around the six sub-learning networks. The Change Projects were supported by stimulating field visits during the course sessions where RWH&C practices were examined, and the WRC material and their potential use was discussed.

Figure 5.19. Course session field trips to examine different RWH&C structures and practices.

The development of these learning groups, their activities, and the ways in which they interacted with each other have been followed and documented, with the main processes reported on below.

- ***The University of Mpumalanga education and learning group*** – the "Sinakekele Sibusiso Semanti" learning network. The SSSLN implemented practices at their productive demonstration sites that were associated with climate smart agriculture, water management, soil erosion, soil health, crop management, indigenous knowledge, conservation practices and rainwater harvesting systems. Specific practices included homemade water storage systems, diversion furrows diverted into underground storage tanks, and tower gardens, along with other conservation practices. Detailed guidance on these practices were drawn from the WRC material. The aim of these productive demonstration sites was to educate the household food producers and agricultural trainers. The sites played important roles in implementation of the proposed BSc Honours and MSc courses in Extension, and the material from the WRC were used in these training courses. Funding was sought to develop these sites with the intention to continue with the developments in 2019 moving forward.
- ***The University of Mpumalanga Enactus student outreach group*** – The Enactus group comprised of students who were studying at UMP. Their aim was to share their knowledge with local small-scale farmers and household food producers on how to improve food production. Their plan in relation to RWH&C was to introduce mulching, contours, trench beds and compost making to the community food gardens where they were involved. The

initial demonstration site activities that were developed involved making furrows which were used to collect water for irrigation of trench beds.

During the Amanzi for Food team visit in November 2018, it transpired that there had been considerable disruption to activities at UMP during the year, and little further progress had been made, although the students were still very keen to follow through on their plans. The students had worked with the WRC material, and reported that they found them useful for their planning.

- ***The Nkangala group*** planned to develop a school vegetable garden that has a rooftop collection system and tanks. They calculated their catchment area using the guidelines in WRC material. Their action plan includes procurement and installation of the necessary infrastructure and material, training of staff responsible for project, operation, and maintenance and establishing links with the curriculum programme and planting calendar. In addition, the group intends to increase organic matter (through use of compost, mulching, trench beds, and tower garden), again drawing on the WRC material for guidance. The group involved the School Governing Body (SGB), the school management team (SMT); an engineer, extension personnel and local farmers. Among the roles ascribed to the network members, the SGB and SMT brought education experience and the small-scale farmers' and household food producers' practical skills and knowledge. The rainwater harvesting techniques planned included ponds and a storage tank, whilst the water conservation practices included mulching. Demonstrations and active participation were among the learning methods that were used. The Amanzi for Food team continued advising on the learning methods to ensure full involvement of the school in the problem identification and planning processes, so that there is genuine school-centred participation. There has been some progress with the plans, and the WRC material were shared with farmers and educators. The school vegetable garden was developed in 2019, supported by the UMP lecturers and other partners, drawing on the information in the WRC material.
- ***The Gert Sibande*** team started working with a cooperative that was resourceful but was not being productive due to internal conflicts, hence they left the group for purposes of their change project and moved to a homestead farmer, Mr Mafika's project. The project: "Real Deal Enterprise", is in Daggaskraal Village, in Gert Sibande District. The change project introduced new RWH&C practices learnt from the Amanzi for Food ToT and WRC RWH&C material that include sunken (trench) beds, composting and mulching that were not practiced before. The group also introduced nursery containers covered with shade cloth to conserve water for the growing seedlings. The garden's productivity improved significantly and they produced organic food including king onions, spinach, spring onions and cabbage for sale. The farmer was very keen to be introduced to a network of other organic and Agroecology farmers, and in particular the Climate Smart Agroecology network in Mpumalanga. The farmer, with the support of the group, also supports the nearby Thembalethu home for about 62 disabled children with a similar RWH&C productive demonstration site, and a tower garden. They have built a tower garden at the disability centre which is much easier for the children and staff to work with.

Figure 5.20. Sunken trench beds at Daggaskraal

The Gert Sibande group hold farmer days where they interact with farmers and find out what would have worked for them. The Amanzi for food training, and the WRC material have helped them to share what they have learnt with the small-scale farmers and household food producers. They tend to use rainwater harvesting techniques which are not costly for the farmers, as they cannot guarantee the selling price for the produce. Therefore, the aim was to introduce cost effective rainwater harvesting techniques. The group's demonstration sites are accessible to everyone involved.

- ***Ehlanzeni South*** has established a WhatsApp group and invited one of the Amanzi for Food project facilitators to participate in the group. This group has been very active in establishing productive demonstration sites in Buffelspruit village in Inkomazi District, but also beyond their designated area, spreading to Bushbuckridge near Hoedspruit through the work of MASDT. These change projects are outcomes directly linked to the Amanzi for Food training of trainers' course. Key players in the Buffelspruit change projects were Emmah Sibiya and Vamile Madide (both Agricultural trainers based in Buffelspruit and Nelspruit respectively), and Melody Chiume (MASDT trainer based in Nelspruit). The initial change projects were based at three sites, namely two homesteads (farmers Ngwenya and Mashinini) and at a cooperative garden near Buffelspruit River.

Figure 5.21. MASDT ToT course participant showing the poster of their practical demonstration site

The change project at farmer Ngwenya's homestead was an aquaculture project established through a training organized by the agricultural trainers and the MASDT officer and facilitated by an aquaculture expert based in Nelspruit. Twenty-five WRC aquaculture booklets (A Manual for Rural Freshwater Aquaculture – TT 463/P/10) were distributed to farmers and agricultural trainers by the aquaculture trainer. Being located next to a crop field, the aquaculture pond was protected by a Vetiver grass hedge (sourced from AWHGS Vol 2, Part 2 '*Resource Material for Facilitators and Food Gardeners*' p. 5-67), and 'Sustainable Techniques and Practices for Water Harvesting and Conservation and their Effective Application in Resource-Poor Agricultural Production: Vol. 2 of 2: Farmer and Extension Manual TT 542/12, p. 56').

Figure 5.22. Farmers preparing Vetiver grass for planting around an aquaculture pond

A trench-bed was established in a homestead garden next to Mr. Ngwenya's grocery shop. Participants used WRC book WHC vol. 2 part 1, pp. 14, 124, 134-136; and AWGHS Vol. 2 Part 1, pp. 29, 2-80, 4-13, 6-1, 6-17, 6-53, 6-62. The site was designed to serve as a training mediation tool for people visiting the grocery shop, and also to provide vegetables for sale in the shop.

Tied ridges at Buffelspruit river cooperative garden

The Ehlanzeni South team supported a cooperative to start a garden near the Buffelspruit River, where they integrated tied ridges. The team also improved soil cover with mulch and experimented with companion planting and other natural pest control measures.

Figure 5.23. A range of healthy crops grown on the tied ridges

The learning network has expanded to include small-scale farmers and household food producers – the landowners – and their neighbours; DARDLEA – Trainers and Extension Officers shared experiences/technical support/information; MASDT – for technical support and sharing of information; and a Tobacco mentor (from British American Tobacco, BAT) for technical support. The roles of network members were clearly defined as extension officers (agricultural advisors) to mobilise and support farmers; and neighbouring small-scale farmers and household food producers to share information with others.

The group members came up with a plan to integrate more neighbouring farmers in their plans, to rehabilitate existing farm dams with Vetiver grass that they were sourcing from elsewhere, and to demonstrate other rainwater harvesting practices appropriate for the farms they were working on and that also applied to other farmers' contexts in the same area.

The MASDT partners in this sub-group were also working with an established women farmers' co-operative, the "Thousand Herbs and Vegetables Garden", in the far north of the province (near Orpen). This project was initially supported by a local private game company, to whom most of the produce was sold. MASD planned to support the farmers in the installation of a large underground storage tank, fed by a large diversion furrow, which was also designed to reduce the flooding and erosion caused by runoff from the adjoining land. The rainfall in Mpumalanga is very erratic and tends to come in very heavy downpours, washing the soil away, with the water then flowing away quickly. All the WRC material were shared with the farmers here in electronic format, as they had computing facilities.

Figure 5.24. Lettuce and herb tunnel at the Thousand Herbs and Vegetables Garden, near Orpen; with trickle irrigation

MASDT also supported the Thorny Bush Community Project with a vegetable garden in the grounds of a primary school in the same area. This was a relatively new project but some RWH&C practices, such as composting and mulching, were implemented. It was also possible to share the WRC material electronically to stimulate and support the implementation of other appropriate practices in the area.

Figure 5.25. Composting bins at the Thorney Bush Community Project

- ***The Ehlanzeni North*** group worked with an active small to medium scale farming project. This is the Jubelly project near Zoeknog, not far from Bushbuckridge. The team supported the establishment of a RWH&C productive demonstration site at the project, through introducing the practice of tied ridges.

Figure 5.26. Preparing the tied ridges at the Jubelly project

They also planned to increase the size of one of their existing dams, as the farmer wanted to channel the overflow of one dam into another. During the Amanzi for Food team visit, it became clear that the farmers here, led by another very strong woman farmer, were very familiar with the concepts of rainwater harvesting and conservation and were implementing a range of practices, some learned from other farmers, and others from the WRC material as shared by the agricultural advisor. The farmer employed a team supplied and partially paid for by the Community Works Programme via a recommendation by the Department of Agriculture, showing the support from DARDLEA senior management for advisory staff on the ground. There are a large number of dams which, when full, gravity feed water to different cultivated areas, and the farmers are keen to try new practices that can enhance their productivity. The WRC material were also shared in electronic format with these farmers to support their RWH&C practices, as they, too, had access to computer facilities.

The project noted new developments in change projects in Mpumalanga, which included funds raised for on-site productive demonstration sites at the UMP campuses, and integration of RWH&C into the practical activities and assignments of the Agricultural Diploma programme for the work integrated learning component. Currently RWH&C features strongly in the curriculum for the Diploma in Agriculture, including a requirement for 3rd year students to complete an assignment on these practices as part of their work integrated learning during their farm placements. In addition, RWH&C forms part of the Diploma in Nature Conservation offered by UMP.

5.3.3 North West Province

The assignments from the Training of Trainers course indicate a strong commitment to instituting change, both in terms of curriculum and in promoting RWH&C through the development of productive demonstration sites. The majority of the sites in North West were intended to be located on campus itself, but almost all included the intention to support the initiation of change projects off-campus as well, within the farming community.

Figure 5.27. Planning a productive demonstration site on the TAC campus

The core of most change projects included making the move from conventional, commercial-level irrigation as taught and promoted in the current Irrigation Diploma curriculum, to include alternatives based on RWH&C. There was a strong recognition that the irrigation systems currently in use in the area, mainly the centre-pivot systems which require vast quantities of water from the Vaal river irrigation system via the Taung Dam and three other dams, were

unsustainable, and inaccessible to smaller-scale emerging farmers and household food producers. A further motivating factor for change to the use of rainwater or greywater, where possible, was the understanding that the current pollution levels in the Vaal water were unacceptable, with extremely high levels of contamination from both the upstream mining industries and agriculture, and from poorly treated, in some cases un-treated sewage from malfunctioning municipal sewage treatment works. In addition, there was recognition that there could be no guarantee that the Vaal river system would, in the future, be able to continue to provide the amount of water being taken from it for agricultural use currently. It was, however, recognized that no RWH&C practices could match the current systems in commercial areas in terms of the sheer volume of water available, and some level of compromise was needed to accept this situation. Indeed RWH&C was seen very much as a set of practices more appropriate to the smaller-scale farmers and household food producers.

5.4 The Importance of Shared Productive Demonstration Sites

The initial development and use of demonstration sites was at a much more advanced stage in the Eastern Cape than the other two provinces due to phase I of the project. Demonstration site development was linked to the ToT course and the expansive learning process.

5.4.1 Eastern Cape Province

IBLN members in the Eastern Cape continued to experiment with new practices, both those associated with the WRC Amanzi for Food RWH&C project and the WRC Climate Smart Agriculture project, with which many of the farmers were also connected. They developed sites for both production (primarily) and for sharing the practices with which they were experimenting. While most practices were small-scale, including trench beds, tower gardens, fertility pits and similar practices, one group in particular, the Mxumbu Youth Agriculture Co-operative, had started work on a larger, field scale. The effectiveness of some of these practices is shown in the following Figure 5.28.

Figure 5.28. Carrots growing on mulched raised beds at Xhukwane School; Maize growing on contour ridges at Fort Cox AFTI; Mixed cropping on mulched trench beds under shade at University of Fort Hare

Other demonstration sites included two sites developed in a village in the Eastern Cape namely Lloyd Village, which had a cooperative garden where they established farm ponds in 2015, which are still functional and intact. The farm pond was used for water harvesting in

site 1 where members have reported rescuing their vegetables from drought using water captured by the farm ponds. Two challenges were observed being destruction of some of the plastic pond lining by rodents and poor maintenance of diversion furrows. The group expressed their desire to develop a farm dam within their garden to capture and store more water over a longer period. However, labour was an issue among the mostly elderly members due to non-participation of local youths. Some of the elderly members hired local labour to maintain their gardens. Poor member involvement in the IBLN was a drawback for the group as they always missed the ilima (collective labour pooling) opportunity. However, the involvement of University of Fort Hare and Fort Cox College as supporting partners helped in addressing further developments. The group needed tighter extension support coupled with internal agency. Although the engagement of the extension office was initially low, it also improved with the involvement of a large number of extension officers from the Alice extension office in the ToT course.

The second site involved homestead gardens where one of the villagers (Mr Menthe Hiti) who participated in the cooperative garden's rainwater harvesting demonstration sites and who helped out with labour in the garden had established an innovative rainwater harvesting system at his homestead. He designed diversion furrows to channel water to a deep farm pond that he developed and lined with plastic that he was given by the Amanzi for Food project. He also dug deep contours to harvest and store runoff. (See 5.31)

Figure 5.29. Rainwater harvesting practices in a homestead garden at Lloyd Village, Eastern Cape (Left: plastic lined farm pond; Top right: deep contours, Bottom right: raised garden beds)

Productive demonstration sites have been developed in individual farmers' homestead gardens. These provide opportunities for the farmers to share their knowledge, expertise and passion with their immediate neighbours and with others in their communities.

- *Nomphindiwe Msesiwe, Quzini*

Phindiwe, as Mrs Msesiwe is known, is passionate about her gardening, and about sharing her knowledge with others, she has set up a whole range of different practices in her homestead garden.

She grows the following vegetables; tulip, banana, onion, garlic, oranges, avocados and cauliflowers. She says she learnt the tower garden practice from Zingisa and from the Amanzi for food training of trainers course, Imvotho Bubomi learning network and from CSA training. *"I eat the produce with my family and the rest I give to neighbours".*

One of the main challenges that she faces is water scarcity. *"I collect water from the roof and it flows through the furrows. Rainwater harvesting and conservation practices I am doing include fertility trench beds, raised beds, tower gardens and ridges. The ridge bed helps in preventing moles from eating the potatoes".* She also has a small pond, capturing runoff from the unused part of her yard. The WRC books she consulted are; water harvesting and conservation book (WH&C) and Resource Material for Facilitators and Food Gardeners (AWHGS).

Another practice that Phindiwe has recently introduced is small-scale drip irrigation, where she is using empty 1-litre soft drink plastic containers for drip irrigation. Her sources of information include; Zingisa, Rhodes University / WRC Training of Trainers course, books from the library, radio and from members of the Imvotho Bubomi learning network. The demonstration site is based in Quzini location. Phindiwe and her children are involved in the productive demonstration site project.

Figure 5.30. Mrs Msesiwe demonstrates her eco-circle garden at Quzini

- *Busisiwe Mganxela (Mrs Peter)*

Busi, as Mrs Peter is known, is based in Cambridge, just outside East London in the Buffalo City Metropolitan Municipality. She is part of the productive demonstration site in Amathole district and she has a productive demonstration site at her homestead as well. In the demonstration site in Mathole district, they are practising different methods of rainwater harvesting. The purpose of the demonstration site is to use and show practical ways of harvesting rainwater. Busi says that "*Climate change is here so we wanted to practice rainwater harvesting so that we would be able to conserve water and also advise community members as they are mostly exposed to theory and not practical."*

Rainwater harvesting and conservation practices being done include contours, swales, raised beds and mulching. There are 6 members in total involved in the demonstration site. They eat the produce and the surplus we sell.

Mrs Peter and her friends face a number of challenges, including the preparation of deep contours because they need machinery; it is not something that they can do manually. She says that "*We started with the easy practices such as raised beds (because they are permanent) and mulching because it decomposes in the soil. The tower garden stays for 3 to 4 years. We have food almost throughout the year. We do not buy vegetables, we take from the garden, eat as a family, and sell the surplus. We are also using grey water from the water that we use to wash clothes*."

The challenge that they are having is that it is difficult to collect water from the shower, *"…so if we can have a smart way of collecting water from the shower it would help."*

Mrs Peter and the others draw on various sources of information, including the Imvotho Bubomi Learning Network and the WRC material. Busi says that they also learned through the Rhodes University / WRC Training of Trainers course, the Amanzi for Food website, Google, and from the discussions in the IBLN WhatsApp group.

The rainwater harvesting and conservation material that they mostly use are those on Greywater, the Rainwater Harvesting and Conservation (WHC) booklet, and the modules and support material from the Training of Trainers course.

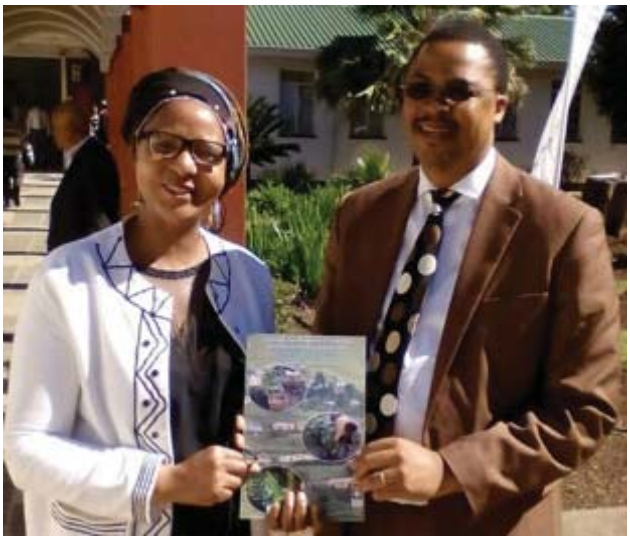


Figure 5.31. Busisiwe Peter showing the WRC material on Greywater harvesting to Eastern Cape Agriculture MEC Mr Qoboshiyane

5.4.2 Mpumalanga Province

The development and use of demonstration sites was quite advanced in Mpumalanga where the groups were very active for almost a year. However there has been limited activity at the two University of Mpumalanga campuses due to lack of funding to support the development of their sites. Most of the productive demonstration sites established by the members of the SSSLN in Mpumalanga were reported on above. A few other sites have been developed in

various parts of the province, with the support of network members. Most of the information regarding the productive demonstration sites in Mpumalanga has been provided in the Change Projects section – above). Indeed, the productive demonstration sites were the most obvious manifestation of all the change projects, with the exception of those concerned with curriculum innovation. However, in summary it appeared that some of the most functional productive demonstration sites were those in (i) Ehlanzeni South, where a wide range of practices, including aquaculture have been introduced, and a large number of small-scale farmers and household food producers are involved in replicating these practices on their own land; (ii) Ehlanzeni North, where the farmers involved in the Jubelly project were using a range of different practices, from farm dams, to contours and tied ridges. This site demonstrates a range of RWH&C practices, and has great potential as a learning centre for other farmers; and (iii) Gert Sibande, where the sub-network was working strongly with the farmer Mr Mafika in implementing a range of practices, both on his own farm, and at the Thembalethu centre for children with disabilities. They are using these sites to share these practices with other farmers in the area.

In summary the productive demonstration sites in Mpumalanga included an in-field rainwater harvesting site, a tomato enterprise irrigated using roof water, and commercially produced tower gardens in a communal garden. The last example is particularly interesting as these are low-cost, plastic tower (or pyramid) garden frameworks, which function very much as the more organic, home-built tower gardens, but, of course, require far less labour or material to build. They also represent small-scale examples of the move towards vertical gardening in space-constrained contexts such as urban areas.

Figure 5.32. Infield RWH&C Practices demonstrated in Mpumalanga

5.4.3 North West

This relatively small group, including lecturers, students and farm technicians, at Taung Agricultural College established a range of productive demonstration sites in February and March 2019. As all ToT course participants were based at the Taung campus, and the productive demonstration site activity took place in the campus grounds, the majority of sites were developed on campus. These included fertility pits, trench beds and tower gardens. They also introduced mulching and no-till as standard practices in the horticulture department. All these practices represented considerable divergence from the conventional practices which had traditionally been implemented at the college, and as such were truly ‘change projects’ in a quite hierarchical and formally structured context.

Figure 5.33. Trench bed at Taung Agricultural College

5.5 Making the Training of Trainers Course More Accessible: Design and Development of the Online Course

The demand for information on RWH&C practices for small-scale farmers and household food producers is far reaching across South Africa. With limited coverage of small-scale and alternative farming practices in conventional agricultural education curricula, there is a real need for widespread sharing of the Water Research Commission's material. With such a large potential target audience, the contact course approach on its own can never meet the demand.

The Training of Trainers course is specifically relevant to training institutions and extension services, and there could be potentially considerable demand for the course from agricultural colleges, agricultural high schools, agricultural extension/advisory offices, agricultural NGOs/CBOs, as well as farmers and farmer association's nationwide. It was the reality of such potential national demand from an extensive audience that motivated the development of the Amanzi for Food Training of Trainers open access online course.

5.5.1 Making WRC material accessible to all

The original purpose of the Amanzi for Food project was to make the WRC research outputs easily available for all to use. The Amanzi for Food team used the contact courses and the development of learning networks as a way of sharing the information in these resources. The aim of the Amanzi for Food project was to make the information easily accessible and encourage its effective use as widely as possible.

5.5.2 Encouragement of learning groups and networks around the country

One of the successful characteristics of the Amanzi for Food project has been the social learning that has developed out of the learning networks that are built around the Training of Trainers courses as reported above and in previous chapters. Learning Networks create spaces for individuals and groups within the agricultural sector to share information, engage in dialogue and form partnerships. The Amanzi for Food project team intends, through the online course, to enable the development and strengthening of learning networks all around the country.

The online open access ToT course offers people the opportunity to do the course either as individuals or in groups. Drawing on experience from work in the Eastern Cape, Mpumalanga and North West provinces, it has become clear that one of the fundamental factors that enables successful sharing of the information is through social learning processes as exemplified by learning networks. The online course has been designed to enable networks or groups to do the course together, encouraging them to develop a learning network of their own. Developing learning networks within a common geographical area allows participants to discuss the WRC resources within their shared context. The course also encourages individuals to do the course and seek out other individuals within their area within whom to discuss the course content and share information. This can extend to collaborative development of productive demonstration sites, a central feature of the ToT course.

Not only is the intention to develop locally orientated learning networks within communities engaging in the course, but also to develop national learning networks where participants from all around the country can share their experiences and knowledge.

With the move towards a more technology based society it was considered necessary to take the Training of Trainers course and adapt it to be used on an internet-based platform. Great care has been taken to ensure that the course maintains the critical social learning characteristics that encourages practice-based and collaborative learning.

5.5.3 Key aspects of the online course concept

Easy access

The course was designed as a free, open access online course that is compatible with many devices such as computers and Smartphones with a simple, straight to the point approach and user friendly approach. The easy accessibility to all aspects of the course without need for registration, makes it possible for users to benefit from the course and the WRC material without having to commit to a set timeframe or fixed expectations. The course can be followed at a participant's own pace and in their own time. Even for registered participants, who wish to achieve formal certification, there are no fixed contact sessions, however there is a line of communication between the registered participant and their tutor. The straightforward course structure and use of non-academic language makes it user-friendly for all. Relatively small amounts of data are needed to access all elements of the course and the material (except some videos and the full original WRC material). The screen size of the smaller smartphones might make it difficult to read the course text, but participants are encouraged to download the content and utilize it on another device if possible.

There is also no need to stay online for extensive periods of time with all elements downloadable in pdf format. Most of the study time can therefore be offline.

A very recent development in terms of access, has been securing a data-free link to the website and the course (http://amanziforfood.sbox.datafree.co/) which people can use from their cell phones. This is a real breakthrough and should make it possible for farmers and others who have real difficulty in affording the very expensive data charges in this country, to have access to all the WRC and other material at no cost.

One major limitation of the course in terms of access, however, is that it is currently only available in English.

5.5.4 Optional Registration

There is an option for registration for those wishing to try for Rhodes certification, but it is not compulsory. Certification requires successful completion of 3 assignments within 6 months of registration. Those not wishing to register can still access all elements of the course and the WRC material. They can even work on the assignments and if at any stage they feel confident and motivated towards certification they can register at any time for their assignments to be assessed.

5.5.5 Development of the course

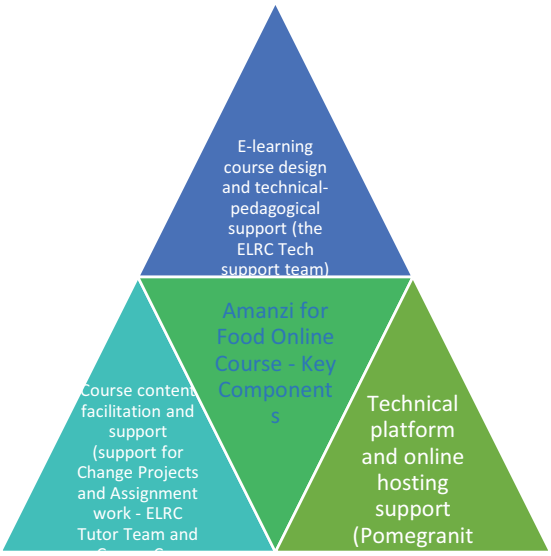
Building own capacity for online course development: learning how to work with the systems

The process of moving to an online learning landscape can be daunting, but with supportive tools mediated co-engaged learning can take place. For an educator to make the transition from face-to-face to online learning they must have the necessary knowledge of student learning, subject matter and technology, including both the pedagogical and content aspects of “technology knowledge”. During the transitioning to online platforms our role as educators has shifted to how to support our students in their learning process on the virtual platform and ensure that student learning outcomes are met. During the development of the Trainer of Trainers Online course the Amanzi for Food team experienced considerable professional development and personal growth through the process. WordPress, a web design programme, had first to be mastered before the real work of setting up the course could commence. It became evident that the course developers needed to be able to design the course, enter content and make changes on the site when needed. Otherwise they remain dependent on the web developer for technical support, maintenance and changes to be made to the site. The course developers also had to become confident with online learning strategies, online learning platforms and online course design programmes and tools such as WordPress and LearnDash. The figure below shows the combination of skills needed for online course design, development and delivery.

There were also some challenges in reconciling the pedagogic and the technical requirements of the online course. Applying the pedagogical and contextual framework of the contact course to the online context was challenging. For non-educators, such as web-designers, it is sometimes difficult to understand the teaching and learning practices required for active learning and even for educators it is a challenge to transpose those practices online. Good communication between the online course developer and web-designer is essential to ensure a good balance between the pedagogic and the technical requirements.

5.5.6 Adaptation of the course for the online platform

The process of understanding how people learn best through online courses led to course content and layout adaptations that enabled the development of the team's understanding of the knowledge sharing processes via a very different medium. The structure of the course had to be adjusted and some changes were made to adapt the course to function within an online learning platform. The main contextual difference between the contact and online version of the course is the approach to teaching and learning. The Trainer of Trainers contact course consisted of three sessions at the agricultural colleges. The online course has no contact sessions, but has a Course Forum where for each module where registered participants can communicate and discuss topics with fellow participants and tutors, and the tutors assist registered participants during their learning process.



A detailed Course Orientation is provided to describe and explain the various components of the course. Below is a screenshot of the "Orientation" page, showing the menu bar at the top with the three different modules.

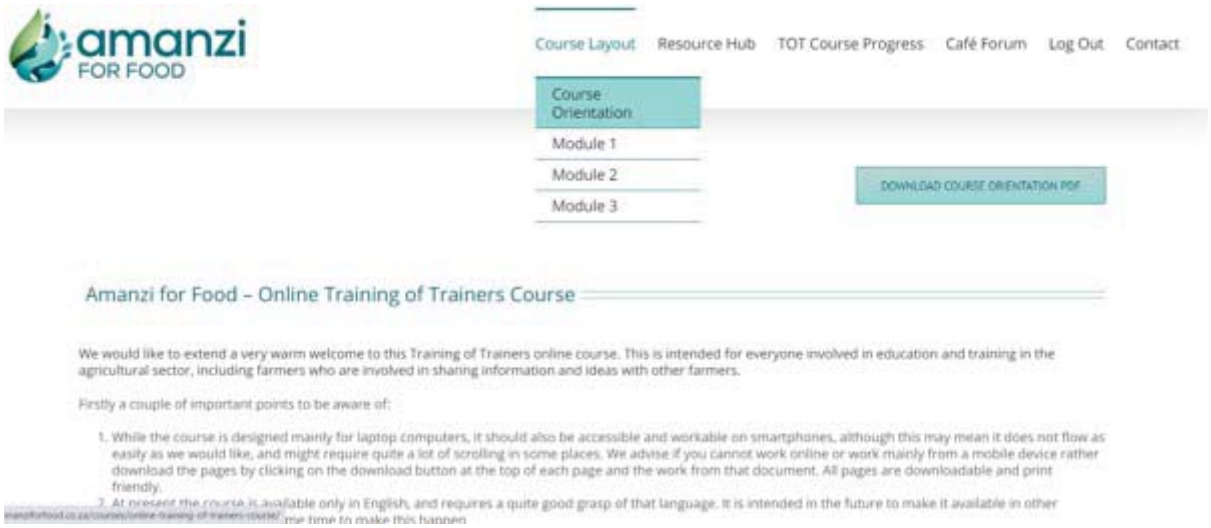


Figure 5.34. Screenshot of the Course Orientation page

5.5.7 Structure of the course

The Course consist of 3 modules, each comprising an overview, core text and assignment. All the course material are downloadable in easy to use, mobile friendly .pdf documents. The course is set out in a simple format to reduce data usage and confusion. What makes the

course different form other courses is that anyone can access the whole course and all the information and documentation.

- ***Module 1 –*** Introduction to the RWH&C Practices; Understanding different farming contexts; Using the Navigation Tool; Activity Systems and Learning Networks
- ***Module 2 –*** Teaching and learning interactions: Sharing information on RWH&C practices to include in curriculum and training; the power of the practical; developing a productive demonstration site
- ***Module 3 –*** Plan and implement RWH&C related curriculum activities and teaching practices; reflect on the learning in the course; develop ideas for a learning network

There are two separate streams for the assignments. They are very similar to the contact course assignments.

- ***Stream 1*** (formal education sector): *'Amanzi for Food' Training of Trainers Certificate of Competence in Curriculum Innovation and Changing Practice* – **10 Credits at NQF Level 6**
- ***Stream 2*** (informal training sector and for farmers sharing with others): *'Amanzi for Food' Training of Trainers Certificate of Competence in Environmental Learning and Changing Practice* – **10 Credits at NQF Level 5**

Within each module core text the participants can view and download short informative presentations in pdf format, and there are hyperlinks to all the resources required for the course, including the WRC material. All of these are also downloadable, as is the core text and all other course elements. Below is a screenshot of a page listing all the RWH&C practices described in the WRC's key material divided into 4 categories, namely:

- General activities (skills) applicable to and underpinning many of the key practices;
- Collecting, reducing loss and holding rainwater (in the ground);
- Storing rainwater; and
- Using water: simple irrigation practices.

The underlined texts are hyperlinked to the website and take participants to the specific material associated with that practice.

For example below is the page for "Drip irrigation", the info card is downloadable, and the relevant material in the 'Resources Library' are also in downloadable format. The WRC Amanzi for Food ToT course is ideal for anyone who would like to get simple, practical guidance on how to successfully manage small-scale and sustenance farming with little water. These skills are essential and all the information is accessible to everyone with internet access.

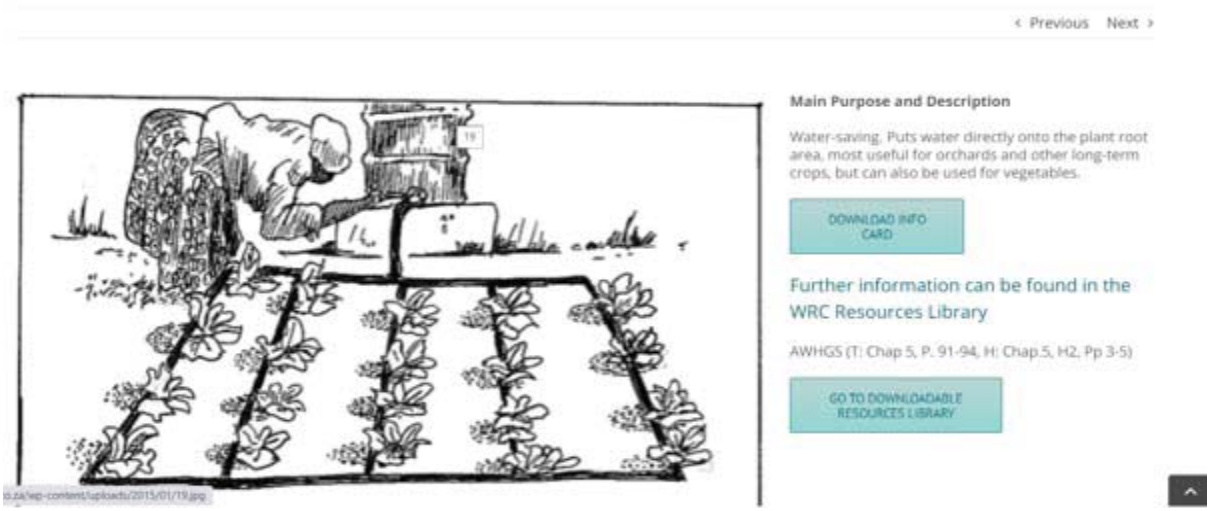


Figure 5.35. Webpage with downloadable information on drip irrigation

The easy navigation of the site makes it possible for users to switch between course elements through simple links between pages and hyperlinks. Every page has a “download” button where the content of that page can be downloaded for future offline reading. The online course includes suggested activities and the assignments bring in the practical aspect of the course. The participants received a NQF Level 5 or Level 6 Certificate from Rhodes University on successful completion of all 3 assignments.

5.5.8 Setting up the systems for the management of the course

In order to achieve certification, participants need to register. Once they click on “Register” they have to complete an online form that provides a lot of useful information for the research project, the users also agree that the information can be used for research purposes and the user’s technical skills and bandwidth is tested. If any participant experiences any kind of issue during registration they can contact the support team. The registration process works as follows:

- Users clicks on ‘Register’ and completes the online registration form.
- The support team receives a notification that a new participant has registered.
- The Wordpress and the Online Registration form is opened.
- The participant's account is then activated on the registration form page.
- Then on the participant page, the participant is enrolled and allocated a mentor
- The participant receives an email that they are now registered for the course.

5.5.9 Initial (pre)launch of the course

WRC webinar

Amanzi for Food in partnership with the Water Research Commission (WRC) announced the Amanzi for Food Training of Trainers (ToT) course on the 13th of October 2020 during a webinar hosted by the Water Research Commission. The webinar boasted a number of excellent speakers with the main message being the importance of sharing information and resources, such as through the Amanzi for Food ToT course, in protecting and conserving water resources while developing communities.

This highly informative webinar showcased the best of the WRC Amanzi for Food project's work, and culminated with the pre-launch of the Amanzi for Food Training of Trainers (ToT) open access online course. It was explained that the online course is still in its pilot phase and will be fully launched in January 2021. Accompanying the full launch of the online course will be the inauguration of the Amanzi for Food #Student challenge which invites all students to explore the online course and then use the practices that they have learned to develop productive demonstration sites.

5.6 Engaging Students in the Online Course via a #Student Challenge

The full launch of the online course in 2021 will be enhanced by the launch of the #Student Challenge. The idea is to stimulate interest in the course and encourage young people to take a strong interest in farming and, in particular, in the RWH&C practices promoted by the WRC through the Amanzi for Food project. Information on the challenge is located on the Amanzi for Food website, as follows:

> *All South African Agricultural Students in Agricultural High Schools, Agricultural Colleges, Agricultural Training Institutes and or Universities, or youth that are learning farming practice with support from NGOs or other support organisations – between the ages of 15-30 are invited to participate in the Amanzi for Food #Student Challenge. This can be done as a formal group class activity, or an after-hours student leadership or student engagement activity, or as a youth peer-to-peer learning activity.*
>
> *The student challenge is for any student or youth organisations who would like to develop a rainwater harvesting and conservation practice of their choice (selected from the 26 rainwater harvesting and conservation practices on the www.amanziforfood.co.za website) and who want to make a short 5 minute video (cell phone video) of* ***a productive demonstration site*** *that they have developed with others focusing on a rainwater harvesting and conservation practice.*

5.7 Conclusion

The development and facilitation of the Training of Trainers Course has been a central activity of both the earlier piloted iteration of the project (cf. Lotz-Sisitka et al., 2016) and the current project, and one from which many of the critical understandings and outputs, including the learning networks, change projects and productive demonstration sites, have evolved. In this way the course must be seen as absolutely crucial to the Knowledge Uptake Strategy pursued through the 2 phases and being developed further for future sharing of the WRC material and the information they contain.

The primary motivations for the development of the course were: firstly, to encourage, facilitate and mediate access to the information in the WRC material (the prime mandate of the project); and secondly, to promote the use of the RWH&C practices described in the material. In the event, the courses went considerably beyond this in forging long-lasting collaborative partnerships between farmers, extension advisors, ATI and university lecturers and researchers, and others in the agricultural sector. A further unexpected outcome has been the fervour and energy with which course participants have not only taken up the practices in their

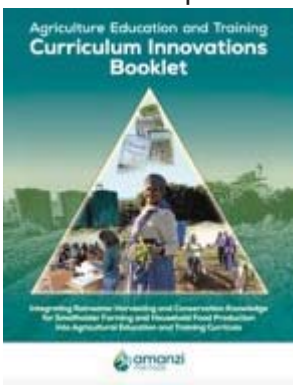
own farming activities, but also become almost active in their sharing and promotion of the practices. Knowledge of the practices, the seeds of which were sown during the courses, has spread within families, within communities, within organisations and institutions and across quite wide geographical areas (in Mpumalanga, across much of the province). This was achieved through face-to-face engagement with, in total, only some 150 people who participated in the four courses facilitated by the Amanzi for Food team, and augmented by promotion through online and conventional media within the social learning model developed in and through the Amanzi for Food project. Knowledge uptake through this conventional training approach was in fact far wider than could have been envisaged, which illustrates the importance of boundary crossing between formal and informal learning settings for social learning network development as also shown in the study by Pesanayi (2019).

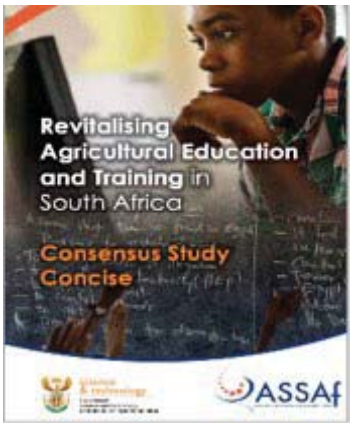
However the essential limitations of the personal contact versions of the course, in terms of how many people could be reached, became evident early in Phase 2 of the project, and a determination was reached to adapt the course into an online format. This involved a long, often challenging, but ultimately rewarding process, and the course is now securely housed on the Amanzi for Food website with data-free access arranged for those wishing to follow the course processes on their cell phones. Access to the course provides immediate and free access to all the WRC material and the information they contain, thus responding to the primary mandate of the project, and providing a further boost for the Knowledge Uptake Strategy, both immediately and in the future. In particular the decision to offer the course as an entirely open-access course for both people who wish to register formally in order to work towards a Rhodes University Certificate, and for those who simply wish to work their own way through the course in their own time, should open the information to a very large number of people in different areas within the agricultural sector. So far 140 participants have registered formally for the online course, and as reported in the previous chapter many more people are visiting the Amanzi for Food website to consider the course. The next phase of the work will be to mediate and facilitate the building of a wider social learning network via the online course and #StudentChallenge and the Rhodes University team will continue to track the impact and insights from this next iteration of the programme. There is no doubt that the continued facilitation of the online Training of Trainers Course, should be a central and foundational element of the Knowledge Uptake Strategy.

CHAPTER 6
TOWARDS A KNOWLEDGE UPTAKE STRATEGY PART 5: Curriculum innovation in the agricultural learning system

6.1 Curriculum Innovation in Agricultural Education and Training

Curriculum development in the Agricultural Education and Training system has traditionally been top-down and driven by the frameworks that are provided by Agricultural Education and Training qualifications. These remain very important for guiding curriculum development, but they can constrain lecturers and Agricultural Training Institutes from introducing new innovations into the curriculum. This is a quite critical constraint, as Universities, Agricultural Training Institutes, Technical and Vocational Education and Training Institutions, and Agricultural High Schools, need to contextualise the qualifications to suit the farmers, their agricultural settings, their agricultural value chains, and local conditions. In this chapter we consider an approach to curriculum innovation that has been pioneered and developed in the Amanzi for Food programme. The approach has also been written up in a Technology Transfer Tool entitled 'Agricultural Education and Training Curriculum Innovation Booklet' (Appendix 6.2) that accompanies the Knowledge Uptake Strategy[25]. The booklet is meant to support lecturers to consider *how* they can approach curriculum innovation around critical areas such as rainwater harvesting and conservation practice. It does not provide technical information for qualifications development as this would need to be a separate study.





As reported on in Chapter 2, the recent study by the Academy of Sciences of South Africa (ASSAf, 2017) outlines a pressing need to revitalize agricultural education and training in South Africa. It indicates that there is an urgent need for agricultural extension services to be appropriately located at provincial level and in local contexts, and given this, that there is an urgent need for **improved relevance in the curricula**. ASSAf makes the point that, "Though there are exceptions, students are primarily educated for commercial agriculture, with little focus on smallholder farmers or on the social and human dimensions of agriculture. Linked to the need for relevance, is the need for multi and transdisciplinary approaches to curricula that address modern-day topics, find solutions to grand challenges, such as climate change, and drive economic development" (ASSAf, 2017, pg. 11).

[25] The research for, and content of this chapter has shaped the content of the Amanzi for Food Curriculum Innovation Booklet.

As pointed to in Chapter 2, and given the challenges associated with food security for South Africa's poorest households, and the situation reported on above by ASSAf (2017), one of the big challenges in the Agricultural Education and Training system is therefore to shift the balance of emphasis from a focus on commercial agriculture only, to **be more inclusive of smallholder farmers and household food production value chains and production systems**. This has historically been neglected in the Agricultural Education and Training System in South Africa, and is therefore an important area for **curriculum innovation**.

Research conducted by the project team in the Amanzi for Food project revealed a clear demand for knowledge of rainwater harvesting and conservation amongst smallholder farmers and household food producers as also shown in the previous chapters of this report. It was also found that farmers who have had their land restored, had little or no access to water, making the promises of land reform turn into failure for many. Youth co-operatives are being supported by the Department of Agriculture, but as they are not being trained to make use of appropriate rainwater harvesting and conservation approaches they struggle with access to water for developing their enterprises. A further finding was that educational institutions specializing in agriculture generally have a history of favouring mono-cultural production involving large-scale irrigation; and that lecturers themselves have not been exposed to up-to-date information on rainwater harvesting and conservation. This results in:

> … a virtual absence of curriculum and learning focusing on smallholder farmers and household food producers, and an absence of curriculum and learning focusing on rainwater harvesting and conservation. The irony is that there is lots of high quality knowledge available on how to harvest rainwater for food production amongst smallholder farmers and household food producers; this knowledge has been disseminated, but still few are using it for curriculum innovation purposes.

It is therefore critical to pay more attention to the 'water for food' needs of smallholder farmers and household food producers in Agricultural Education and Training as this will strengthen the relevance of what is being taught. It will also impact on poverty reduction through offering expanded opportunities for food production. Such an approach will also better equip future extension advisors with the competence to engage with a wider range of farmers, and to share knowledge more relevant to the social context.

6.1.1 Top-down or more balanced approaches to curriculum innovation?

As indicated in Chapter 2, curriculum can be seen in many different ways. As outlined above, the traditional curriculum development approach in the Agricultural Education and Training system has generally taken a top-down approach where curricula are developed centrally by the national government and 'sent down' to the Agricultural Education and Training sector (Institutes, Colleges, TVET colleges, Schools) to implement. However, there is a need to shift from conventional approaches to achieve a better balance between bottom-up or localized curriculum development and nationally directed top-down curriculum development. To move towards such a balance, we need to give attention to curriculum innovation.

Curriculum innovation involves a process of 1) considering the farming context and the farmers; 2) meeting the requirements of the national qualifications; and then 3) adapting the content and processes (knowledge, activities and approaches) to be more appropriate to local

farming practices, value chains, agro-ecological conditions and needs (e.g. available water). To begin to think about this, we can consider this challenge that may face Agricultural Educators and Trainers as they need respond to the 'double challenge' of serving commercial crop producers AND smallholder farmers growing vegetables for local markets, if the national curriculum emphasises commercial crop production only.

To address this challenge, the Agricultural Education and Training Institute, TVET College or Agricultural High School have two main choices:

1. To continue with 'business as usual' curricula focused mainly on the needs of large scale commercial farming, OR
2. To consider some curriculum innovations to provide for the commercial farming needs, while *also* supporting knowledge and practice learning that can better support the smallholder farmers, including household food producers, in their area.

The second choice would enable the Agricultural Education and Training Institution or College programme to be more *transformation oriented and more inclusive in their curriculum approach,* and it would also allow the learners in the College or University to gain wider knowledge and experience to support both commercial and smallholder farmers. This second choice recognizes and responds to the need to move to an approach that is more farmer-centred, and contextualized and that also supports smallholder farmers and their needs. The ASSAf (2017) study on Agricultural Education and Training in South Africa recommended adopting a farmer-centred approach to curriculum innovation.

This approach asks the following questions of agricultural educators and trainers:

- ***'Water for food' knowledge content*:** how are rural smallholder farmers' and homestead food producers' water contexts and knowledge needs represented in the current curriculum?
- ***'Water for food' practical teaching & learning*:** how are students learning to harvest water in preparation for their future as farmers or agricultural advisors in the area of water for food? What is missing?

6.1.2 Adopting a farmer-centred approach to curriculum innovation

One of the new developments in Agricultural Education and Training is a move towards greater contextualization in the Agricultural Education and Training curriculum. This can be seen to be emerging from four different influences, all of which place a stronger focus on **a farmer-centred approach**. It is this approach that we develop in this chapter out of the experiences of supporting and encouraging curriculum innovation in the Colleges, Universities and ATIs in the Amanzi for Food project.

Figure 6.1. Alignment between research, education and extension (from ASSAf, 2017) as visualised in the Amanzi for Food Curriculum Innovations Booklet

As indicated in Chapter 2, the farmer-centred approach to curriculum innovation proposed by ASSAf (ASSAf, 2017) suggests greater alignment between research, education and extension. Figure 6.1 illustrates this alignment as a 'Knowledge Triangle for Innovation in the Agro-Food Value Chain'. This also helps Agricultural Educators and Trainers refocus the national qualifications that they work with towards the needs of the farmers at a regional level.

To support college lecturers in adapting their curricula to include components on RWH&C the document 'Possible Options for Integration into College Curricula' (Appendix 6.1) was developed in the early phases of the project (see Table 2.5), which has also been included in the Curriculum Innovations Booklet.

In the Amanzi for Food Curriculum Innovation booklet, the smallholder farmers and household food producers and their 'water for food' needs are placed at the centre of the 'knowledge triangle'. With this focus on curriculum innovation, the question becomes how Agricultural Education and Training institutions, colleges, schools and faculties can become more responsive to farmers' needs so that future extension advisors can also be more attuned and able to respond appropriately. The research outputs from the Water Research Commission (in the form of the material mentioned above and shared via the www.amanziforfood.co.za website) are brought to the fore.

6.2 Exploring and Understanding the Agriculture Water Knowledge Base

The Department of Agriculture, Forestry and Fisheries proposed in 2008 that: "All Universities can pay more attention to the comprehensive incorporation of modules on *food security*, *water harvesting* and rural wealth creation within Agricultural and Social Science qualifications" (DAFF, 2008, p. 114). DAFF also noted that "Water harvesting for food security is in widespread use in North Africa but is not a method that is yet entrenched in agricultural thinking in South Africa" (Minister of Agriculture cited in DAFF, 2008, p. 42).

The project research studies also found almost no coverage of rainwater harvesting and conservation in Agricultural Curricula – in Agricultural High Schools, in Agricultural Training

Institutes, in TVET College curricula and in University curricula. This shows that it is a neglected area of knowledge in the South African Agricultural Education and Training System.

This is paradoxical because as indicated in Chapter 1 and 2, South Africa is a dryland country and we are facing imminent challenges from droughts and other effects of climate change. There is a clear need to support smallholder farmers and household food producers and the extension officers who support them with accurate and up-to-date information on rainwater harvesting and conservation.

This issue brings the research dimension of the 'Knowledge Triangle' to the fore. In seeking the information needed to support the farmers (as discussed above), Agricultural Educators and Trainers can turn to the research institutions to see what knowledge they are producing on rainwater harvesting and conservation practices and approaches.

6.2.1 A valuable (navigation) tool to help find new knowledge

As already discussed in the report, a key strategy developed more widely in the Amanzi for Food programme to make knowledge easily accessible to Agricultural Educators and Trainers, a booklet introducing the WRC material with a 'navigation tool' (Appendix 4.1) has been developed which gives an overview of the material that can be used to support teaching and learning about rainwater harvesting and conservation. This booklet is a useful resource for considering what RWH&C knowledge is already in curricula, and what the gaps are for curriculum innovation around this knowledge.

Having a navigation tool like this for expanding the inclusion of available knowledge in curriculum innovation processes it is important because initial research revealed that even Agricultural College Lecturers only knew about 3-5 of the 26 possible rainwater harvesting and conservation techniques. This is because it was not included in their own learning when they were studying agriculture. Therefore it is important that Agricultural lecturers update and expand their knowledge of these practices in order that they can share them with the next generation of farmers and extension officers through their curriculum innovation efforts. The navigation tool has been designed to make this knowledge accessible to lecturers, to farmers, to extension officers and to students.

From the above it is clear that the WRC material provide easy access to a wide range of information on rainwater harvesting and conservation practice that can be integrated into the curriculum. Importantly, the booklet and the navigation tool can also help lecturers to identify what they already know, and what they can learn more about, as well as what their students already know, and what they can learn more about.

6.3 Curriculum Innovation Options and Preparing for Curriculum Innovation Cycles

As already briefly discussed in Chapter 2, training provided by the Education and Training Institutions at all levels is framed by formal, approved qualifications and curricula, and it is within these qualification frameworks and curricula that any learning processes focussing on rainwater harvesting and conservation (such as the approaches shared above) must be located.

As described by ASSAf (2017), the Agricultural Education and Training system and the associated qualifications structures in South Africa are complex, with some colleges working with three different quality councils for qualifications approval and accreditation. Under a set of new Norms and Standards, Agricultural Colleges are also in transition into Agricultural Training Institutes (ATIs) and some are being integrated into Universities. There is also a movement towards adopting a competence-based approach to curriculum design in the new ATIs and some of the Colleges are currently in the process of this re-orientation.

For longer term systemic impact, it would be important to align new knowledge on rainwater harvesting and conservation for smallholder farmers and household food producers with the qualifications and competence-based models being developed within the ATIs. The sections in this Curriculum Innovation booklet outline a practical approach on how to go about competence-based curriculum development in practice, where new knowledge (research) is integrated with practice (engagement) via an interactive teaching and learning process (education), as it is through knowing and doing, that competence is developed.

In this section we discuss the more formal aspects of curriculum development. It is important to start engaging with curriculum development innovations practically through integrating them into existing courses where possible as this also helps to prepare for more formal curriculum development.

6.3.1 Some useful options

At the level of the Colleges / ATIs, there are a number of options available to lecturers in integrating new information and practices, such as that from the Water Research Commission on rainwater harvesting and conservation into their curricula. These options are described in Table 2.5 (in Chapter 2): *'Possible Options for Integration into College Curricula'* (Appendix 6.1)

These options were raised during discussions with representatives from various Agricultural Colleges during our research. They are useful to guide discussion within Agricultural Education and Training Institutions on different ways to integrate rainwater harvesting knowledge and practice (outlined above) into the formal curriculum documents and plans. Each institution can work out which might be the most appropriate and manageable option(s) in their own context. Examples are included below of how some lecturers have used the Options document to guide more formal integration of rainwater harvesting and conservation into existing curricula, thereby enriching these curricula and/or re-orienting them to be more relevant in the local context. It is important to know that all educators are expected to innovate with their curricula to make learning relevant and meaningful to learners.

A curriculum is not a blueprint to be slavishly followed, rather it is a guideline that can be enriched. If curriculum innovations work, then it is good to put them forward in the next cycle of curriculum review for more formal inclusion in curriculum and even qualifications re-design. A curriculum should not be 'static', it should be dynamic, and it is the lecturers and educators who work in particular contexts, who are responsible to make sure that curriculum is not treated as a 'top down' blueprint only, but that it is also treated as a contextualised social process where teachers, learners and communities can work together to make the curriculum more relevant to the context.

6.3.2 Preparing for curriculum innovation cycles

The curricula offered by agricultural colleges or Agricultural Training Institutions, in particular, are quite flexible, enabling them to meet the needs of their local farmers and farming contexts. In fact, they are increasingly being **required to be regionally relevant,** as discussed above. As rainwater harvesting and conservation practices have relevance in all farming contexts and for all farmers, it is appropriate to consider inclusion of information on this in all college curricula. The main difference is likely to be the focus on different practices for different farming scales and activities. Similarly, university agricultural faculties tend to be well embedded in the farming context in which they are located and which they serve. They are also in a prime position to provide support to their farming communities through the introduction of rainwater harvesting and conservation practices appropriate to their context.

The secondary schools, including the dedicated Agricultural High Schools, work with more restricted curricula, with a focus on agricultural science. However, even within these curricula, there is ample opportunity for the introduction of the foundational concepts underpinning rainwater harvesting and conservation.

Curriculum review processes take place in the main only once every 3 or 5 years, and these provide the key opportunities for making fundamental changes to curricula. If the new knowledge produced by research institutions such as the Water Research Commission (described above, and outlined in Appendix A in the Navigation Tool) is to be integrated in such a way that entire new curriculum components need to be developed, these can only be introduced within the formal curriculum review processes. However, some options only require the use of the information to supplement existing curriculum content, and such supplementation can be introduced at any time, and could either substitute for curriculum change or act as a precursor to this.

A particular opportunity is presented by the process of transformation of the Agricultural Colleges into Agricultural Training Institutes, with an increased focus on competence-based learning and regional relevance. The learning associated with rainwater harvesting and conservation practices, supported by the Water Research Commission material, is essentially competence-based and therefore fits extremely well with the new training and education model proposed for the colleges.

Other opportunities may arise as the move from offering Diploma courses to Bachelor degree courses is being effected by all agricultural colleges. This will inevitably require some adjustments to curricula and may create some space for the inclusion of aspects of rainwater harvesting and conservation concepts and practices. This will be entirely in line with the consensus, supported by recent agricultural policies and strategies, of the need to move more towards conservation farming practices and ‘climate smart (or ‘climate resilient / sustainable’) agriculture’ as also identified by Van Staden (2018) as a possible wider platform for curriculum innovations around water harvesting and conservation. This is reinforced by a growing awareness of the need to support emerging small and medium-scale farmers, in particular women farmers as discussed in the introduction of this booklet.

6.4 Influencing the Formal Curriculum Transformation Process

Using the approach of 'putting farmers at the centre' of the Knowledge Triangle of the agro-food value chain proposed by the Amanzi for Food curriculum innovation booklet we can see that curriculum innovation by lecturers using this approach is possible. This model shows that lecturers, by using this approach are engaging the following **dimensions of curriculum innovation praxis in Agricultural Education and Training**:

- Drawing on and using high quality research-based learning material that carry new knowledge;
- Enhancing their own knowledge of rainwater harvesting and conservation practices so that they are more able to share this;
- Linking with other knowledge partners in universities, research centres and the community;
- Integrating this knowledge into the development and design of productive demonstration sites with others in a local learning context;
- Contributing pro-actively themselves to the development of new productive demonstration sites, along with their students, farmers and other actors in the local context;
- Making actual changes to the College or Training Programme curriculum through this approach;
- Expanding community interaction and civic engagement (see Figure 6.2)

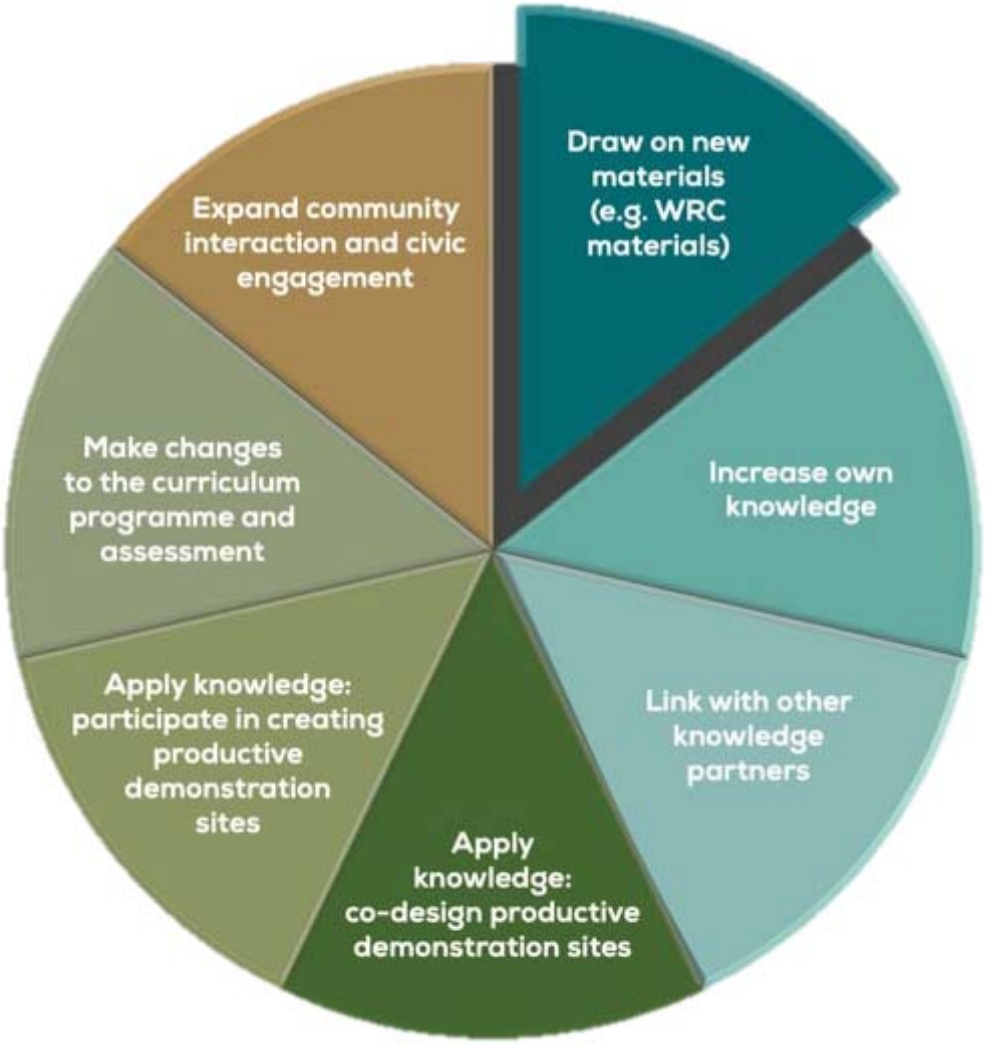


Figure 6.2. Curriculum innovation processes used by lecturers who are engaging in farmer-centred curriculum innovations.

Evidence from the Amanzi for Food curriculum innovation change projects and farmer-centred curriculum innovations indicate that once lecturers have worked through a farmer-centred curriculum innovation process involving the processes outlined above in Figure 6.2, they are more willing and also prepared to integrate new knowledge that is relevant to the local farming system into the formal curriculum review processes. This therefore represents a well-grounded approach to curriculum innovation that also produces responses that are aligned with local farming systems and needs.

6.5 Some Examples of Farmer-centred Curriculum Innovations Focusing on Rainwater Harvesting and Conservation Practice in Learning Networks

These curriculum innovations (see examples below in the tables), have all been developed in the context of smallholder farmers and household food producers and their knowledge requirements for innovating around rainwater harvesting and conservation practices using the above farmer-centred model. They reflect different engagements with the Curriculum Options in Table 2.1 above, but ALL reflect the range of dimensions of curriculum innovation praxis

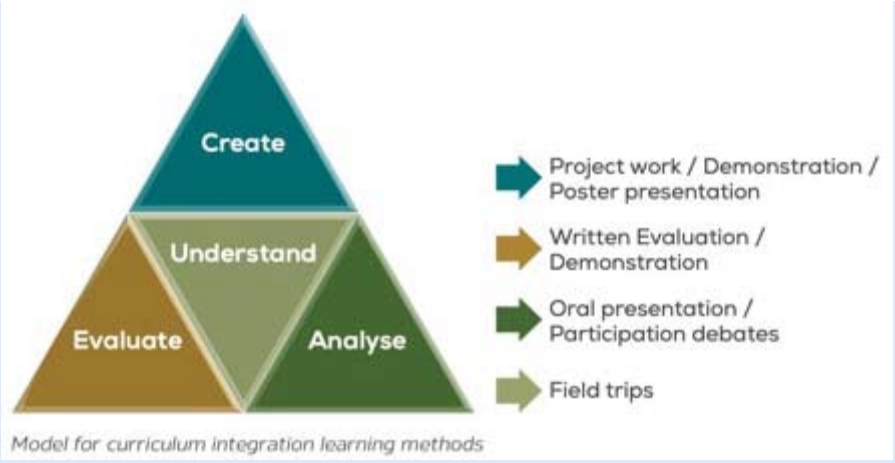
outlined above in the circular figure above, captured in the experiences captured in the Participant tables, below, from evidence of their curriculum innovation work (Table 6.1).

All of the Participants who developed the curriculum innovations reported on below participated in the Amanzi for Food 'Training of Trainers' Professional Development Course which supported lecturers, extension officers, farmers and others to develop curriculum and learning praxis innovations that integrate rainwater harvesting and conservation practice into the curriculum, and into extension programmes and actual farming practices in a learning network context.

Table 6.1. Participants' reflections on different engagements with the Curriculum Options and range of dimensions of curriculum innovation praxis

Participant A: Simthandile Bobotyana: Eastern Cape – University of Fort Hare **Curriculum Innovation Option 1 (from Table 2.1):** Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources	
Curriculum Innovation Dimensions	**Details of curriculum innovation dimensions observed**
Enhanced knowledge of RWH&C	Simthandile's knowledge and appreciation of the significance of RWH&C was enhanced. There was evidence of **clarity and depth of understanding** of the content and task, with evidence of engagement and involvement in the development of RWH&C productive demonstration site with team members in Fort Hare/Alice.
Integration of knowledge into development of productive demonstration sites	There is evidence of integration of Simthandile's strengthened knowledge of RWH&C into the development of productive demonstration sites (Fort Hare/Alice) as shown by his engagement with other team members. The use of WRC material (Denison *et al*., 2011 and Botha *et al*., 2012) to inform the sustainable techniques and practices for water harvesting and conservation, their effective application in resource-poor agricultural production informed to development of the demonstration site (Khanya nursery at University of Fort Hare). *"The TOT course programme provided us with lots of information and material that made us arrive at the decision that we have taken to choose these practices. WRC material on RWH&C contain a lot of techniques and how these can be implemented and used to mitigate the issues around water problems faced by farmers within our community. The material … by Botha et al. (2012) and Denison et al. (2011) provide very precise details about RWH&C techniques and therefore the information from the WRC material will be a vital tool in establishment of the demonstration site and also starting the projects."*
Actual contribution to development of productive demonstration sites for teaching and learning	Simthandile was involved as a researcher in the development of Fort Hare orchard & nursery productive demonstration site meant for collaborative learning by farmers in Alice. He was involved in monitoring this demonstration site which was used for conservation and growing seedlings through the implementation of rainwater harvesting techniques using practices such as fertility trench beds, mulching and in-field. He was successful as a team player in planning together and sharing responsibilities among team members to promote sustainability of the demonstration site which included research, extension support, daily site visits and monitoring as well as active participation and communication with other members through emails, WhatsApp & phone.

	"*One of my major roles in the development of the process is to ensure that firstly the site identification is done though well-suited testing and evaluation of the environment that can be suitable for these practices. Secondly, that the site chosen by the group is feasible meaning it is practically applicable for the practices we have chosen, and also it is workable and ideal to implement the identified RWH&C techniques. Lastly, ensuring soil testing and land preparation are done correctly and on time-frame and the husbandry of the demonstration site is within the vision and objectives of the group process plan.*" Simthandile kept all track of the agricultural process taking place whilst also keeping the members of the group well informed about all the scientific processes and new technologies that are in line with RWH&C techniques.
Changes made to College Curriculum	"*One of the major challenges facing agricultural training institutes and communities is that the curricula they are using are rigid and not flexible enough to accommodate all personnel and integration of new technology. The structure and the content of the curricula in which it is developed is not dynamic in terms of instruments that can reflect the educational objectives that can be attained with the content of the programmes".* *"The curriculum development should be fundamental in terms of or aspect of a rural development programme, therefore is a much-needed reflection in changing the expectation and perspectives in the nature of development and sustainable agricultural programme. This means that there is a need to include relevant local content that will have more direct application in terms of context.*" "*Participatory curriculum development can be a huge key aspect and may help to achieve a great balance in both institutional and local context, because most farmers and communal growers working in rural development are much familiar with the concepts of participation and participatory approach. Therefore, curriculum development is an important element of another programme that will involve a key rural development in our community.*" The option for integration that has been chosen in the curriculum development allowed the audience (farmers, communal growers, students and researchers) to improve their learning in a holistic way, without restrictions or limitations. These integration options focused on making connections for farmers, allowing them to engage in relevant information content and meaningful practical activities that could allow them to grasp the information and knowledge. The integration options involving the RWH&C which were implemented in the demonstration site included fertility trench beds, mulching and diversion furrows. These provide a great opportunity for improving the curricula and support the needs of the audience especially improving farmers' knowledge platform in building and developing proper and sustainable curriculum for all which covers aspects of site water holding capacity, soil fertility and RWH&C techniques. Several learning methods can be integrated into the curriculum including (i) discussion method, (ii) team teaching, (iii) field trips, (iv) presentations (oral and poster), (v) demonstrations and (vi) research project with report writing.

	 *Model for curriculum integration learning methods* "*The curriculum as it has been identified that it will be adopted from the WRC material therefore the programme will pretty much use readily available material from the resource that are well suited for our programme. The use of Amanzi for Food website, Imvotho Bubomi Learning Network, Imvotho Bubomi WhatsApp Group and Learning material from WRC will be a crucial part of the curriculum development process of the programme… By doing this through our training programme, we seek to improve farm production that can be cost effective to the farmers through these RWH&C practices.*"
Expanded community interaction and civic engagement	Community interactions were achieved through the Imvotho Bubomi Learning Network, Imvotho Bubomi WhatsApp Group and the use of the local radio station Forte FM. These platforms were used for teaching and as a way of mitigating some challenges regarding the programme.
Links with universities and other knowledge partners	Simthandile has links with researchers at institutions including Rhodes University, Fort Hare University and Fort Cox College.
How WRC RWH&C material were used	Simthandile used the WRC RWH&C material (Denison *et al*., (2011) and Botha *et al*., (2012) Volume 2 of 2) farmers and extension manuals for information on different methods and practices to be used to mitigate challenges faced by farmers regarding water problems in resource-poor agricultural production setup.

Participant B: Thembakazi Qambi – University of Fort Hare-Alice

Curriculum Innovation Option 1 (from Table 2.1): Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources

Curriculum innovation dimensions	**Details of changes observed**
Enhanced knowledge of RWH&C	Thembakazi's knowledge enhancement on the significance of RWH&C was evident in increased **depth of understanding** of the content as the participant provided sufficient details about integrating RWH&C practices in the curriculum. There is also evidence of engagement and involvement in the development of RWH&C productive demonstration site with team members in Fort Hare/Alice.
Integration of knowledge into development of productive demonstration sites	There is evidence of integration of knowledge of RWH&C into the development of productive RWH&C demonstration sites which is evidenced by Thembakazi's engagement with other team members and the use of WRC RWH&C material (Denison *et al*., 2011 and

	Botha *et al*., 2012) to inform the use of sustainable techniques such as fertility trench bed, mulching and diversion furrows for rain water harvesting and conservation, their effective application in resource-poor agricultural production informed to development of the demonstration site (Khanya nursery at University of Fort Hare). *"This demonstration site has a very good water holding capacity but the soil moisture in this site easily leach through heat thereby evaporation is a massive problem in this site and, low soil fertility. Therefore, mulching and fertility trenches can solve and addressed these challenges through these two RWH&C techniques. Mulching will cover the soil between the plants with the layer of material, in which this can be achieved by implementing plants and organic material such as compost, straw, manure dry leaves and dry grass clippings and pine buck into the surface of the soil (Botha et al., 2012: Vol 2 of 2). According to Denison et al., (2011: Vol 2 part 1), the trench beds create highly fertile soils, which are soft and loamy soils and have a very high moisture holding capacity, trench beds enable run-off from hard surface such as paths and roods to run into the trenches in the soils of the site similar to these conditions."*
Actual contribution to development of productive demonstration sites for teaching and learning	As a communication officer, Thembakazi worked frequently with high ambition of fulfilling her goals. She facilitated all communication processes and kept the team together for the sustainability of the demonstration site. She also engaged other stakeholders into their collaboration so that after the end of the program, they could keep practicing the techniques they could have learnt. *"My role is facilitating the communication process through the use of email services, WhatsApp and phone calls between group members. We need to be committed and willing to work together as a team to sustain the site for future and also involve the Khanya nursery workers into our collaboration so that after the practices of these techniques, they will keep on practising and understand the methods for sustainability purposes."*
Changes made to Curriculum	Thembakazi has shown the importance of a curriculum that is inclusive of all stakeholders sharing a common goal and includes information that is also relevant to the development of farmers, communal food growers and youths. *"Since RWH is included in the **WQC course**, it is possible for the RDC trainers to include more considerable information in the teaching and learning program and farmers and youth activities that can cover several RWH practices under infield and outfield, and link to various contexts."* *"The most targeted audience for this programme will be farmers, communal growers, unemployed youth and agricultural institutions. The programme will be designed in such a manner to accommodate everyone who share common goals. The programme will be specifically designed in a setting that is based on the targeted audience. The teaching and learning model will involve and encourage full participation of the targeted audience in meaning sharing and full involvement in this setting."* *"The programme thus will consider the involvement of targeted groups which will surely help and assist in making sure that the curriculum and or the teaching programme meets their expectations*

	and needs. The training will encourage and motivate for the involvement of the targeted audience so as to have a good understanding of their needs which will help in improving the curriculum. Therefore, the programme seeks to involve and engage its audience of all scales in teaching and practical training so as to improve its content and knowledge of our audience."
Expanded community interaction and civic engagement	Thembakazi collaborated with workers at the Khanya nursery so as to ensure continuity of the use of RWH&C practices and for them to fully understand these techniques and methods (mulching, fertility beds) for sustainability purposes. The participant also envisioned collaboration with farmers, students and other community members. *"This (demonstration site) will be a hub for emerging farmers, students and community members to come and learn more about the success of these practises so that they will be able to practise them in their respective communities and farming projects."* Community interactions were achieved through the Imvotho Bubomi Learning Network, Imvotho Bubomi WhatsApp Group, Amanzi for Food website, community radio and learning material from WRC. These learning platforms were used because they were easily accessible to the targeted audience and more. *"One of the reasons why we have chosen these learning methods is because these methods are easily available and also readily accessible to the targeted audience of our programme and we strongly believe we will be able to reach much more audience and this will be more effective and efficient in promoting these practices in our communities thus this will improve farming ways."* *"Radio will be the most useful tool in teaching and also as we are trying to solve or mitigate some of these challenges regarding this programme, some of these challenges can be used as suggested topics on the radio sessions."*
Links with universities and other knowledge partners	Thembakazi has links with researchers at institutions including Rhodes University, The University of Fort Hare and Fort Cox ATI.
How WRC RWH&C material were used	Although not highlighted in the individual assignments, the participant used the WRC RWH&C material (Denison *et al*., 2011) and Botha *et al*., (2012) Volume 2 of 2) as a group for information on different methods and practices to which they used at the productive demonstration sites which included making of fertility beds, mulching and diversion trenches.

Participant C: Papadi Nakalebe – Fort Cox Agriculture and Forestry Training Institute – Keiskammahoek **Curriculum Innovation Option 1 (from Table 2.1):** Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources	
Curriculum Innovation dimensions	**Details of curriculum innovation dimensions observed**
Enhanced knowledge of RWH&C	Papadi's knowledge enhancement on the significance of RWH&C was evident in **critical engagement** with the content and substance of some tasks as well as evidence of **clarity and depth of understanding** of the content as the participant provided sufficient details about integrating RWH&C practices in the curriculum in the assignments. There is also evidence of engagement and

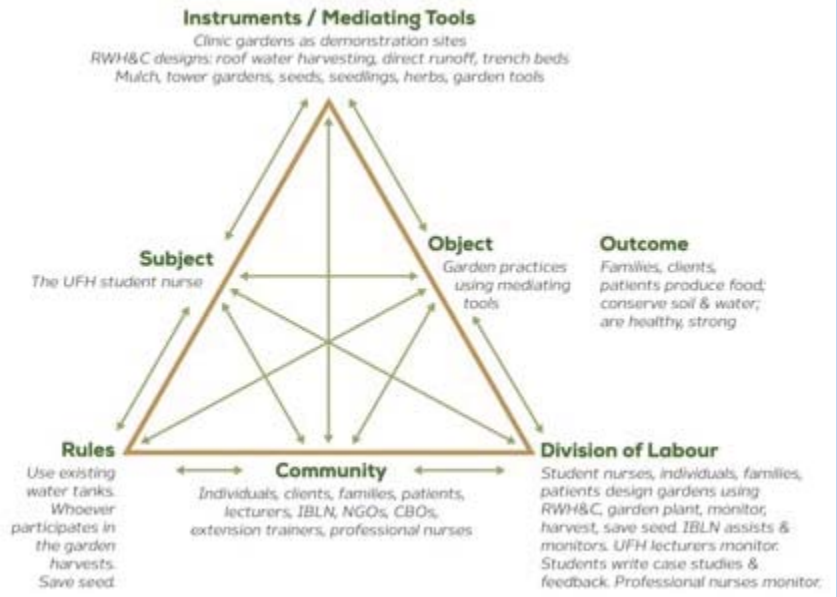
	involvement in the development of RWH&C productive demonstration site with team members in Keiskammahoek.
Integration of knowledge into development of productive demonstration sites	There is evidence of integration of knowledge of RWH&C into the development of productive RWH&C demonstration sites which is shown by Papadi's engagement with other team members and use of several WRC RWH&C material including sustainable techniques and practices for water harvesting and conservation (Botha *et al*., 2012;); production of African Leafy Vegetables (Jansen van Rensburg *et al*., 2012), sustainable use of greywater in small-scale Agriculture and gardens (Rodda *et al*., 2010); Improving rural livelihoods through biogas generation using livestock manure and rainwater harvesting (Smith & Everson, 2016) and Agricultural Water Use for Homestead Gardening Systems Resource Material for Facilitators and Food Gardeners (Stimie *et al*., 2010). The WRC material were used to inform the use of sustainable techniques such as roof water collection for the piggery farm, grey water for irrigation, diversion furrows, trench beds and mulching for crop sites. *"Since it's a piggery farm, clean water is needed and the best way is to collect water through the roof surface and the water can be stored in tanks. Then the water used within the piggery house will be used to irrigate maize which will be planted."*
Actual contribution to development of productive demonstration sites for teaching and learning	Papadi, who is a Lecturer at FCAFTI, contributed as an advisor and mentor for the pig production demonstration site. Papadi visited the demonstration site once a month ensuring that the pigs were well fed and maintained properly. He did the measurements and weighing of the animals, taking notes on any challenges and gave feedback to the team within three days, depending on the degree of the problem. He also assisted with developing Pig Management records such as feeds and feeding, health and disease management, breeds and breeding management, financial records, selection and replacement records. Overall, Papadi aimed at increasing pig production at the demonstration site. "*Sustainable rural development through conservation of land and water resources gives plausible solutions for alleviating rural poverty and improving the livelihoods of rural communities… Making sure that the number of animals increases so as to increase the production and returns, therefore bringing opportunities for employment*…" "*My responsibility is to ensure that at least once a month we meet as a team to discuss the progress and identify any challenges on pig management. Since the group consists of different people with different experiences and ideas, we must always share the information on new ideas and welcome those that will move the project forward. I believe that working and learning together in RWH&C will help in creating a strong supportive bond between us. And this will be essential for future sustainability of the site and its continued value as a place of teaching and learning*."
Changes made to College Curriculum	Papadi showed the importance of including RWH&C needs in the curriculum, to make it a practice that is taught and demonstrated to students which will increase their knowledge around RWH&C. He also recognised the need for a stand-alone course targeting students, farmers, educators and extension officers which will assist in bridging the gap in literature and knowledge, especially for farmers, educators and community.

	"As an additional resource material, water harvesting information is also needed in the college as another source of material that the lecturers and students, farmers can access anytime they discuss the concept related to it. The information can assist in different techniques that may be used in building structures at the farms."
Expanded community interaction and civic engagement	Papadi shared the skills and knowledge with other people, especially the farmers and anyone who was willing to learn more about RWH&C practices in piggery farms and shared information on how things or certain practices were done in order to attain the best results of improved livestock production. *"We share our information with other farmers and anyone willing to learn more about our practices and how we do things in order to attain the best results at the end of the day. This information is shared by farmer to farmer communication, government workshops and learning networks, e.g. Imvotho Bubomi Learning network which brings together people with different skills within the same department, which is agriculture to share information so that farmers can maximize yields through utilizing every drop of water."*
Links with universities and other knowledge partners	Papadi has links with researchers at institutions including Rhodes University, the University of Fort Hare, and Fort Cox ATI.
How WRC RWH&C material were used	Papadi drew on several of the WRC RWH&C material including sustainable techniques and practices for water harvesting and conservation (Botha *et al*., 2012); production of African Leafy Vegetables (Jansen van Rensburg *et al*., 2012), sustainable use of greywater in small-scale Agriculture and gardens (Rodda *et al*., 2010); Improving rural livelihoods through biogas generation using livestock manure and rainwater harvesting (Smith & Everson, 2016) and Agricultural Water Use for Homestead Gardening Systems Resource Material for Facilitators and Food Gardeners (Stimie *et al.*, 2010). The WRC material were used to inform the use of sustainable techniques such as roof water collection for the piggery farm, grey water for irrigation, diversion furrows, trench beds and mulching for crop sites.

Participant D: NAME: Nelisa Lasini – Fort Cox Agriculture and Forestry Training Institute – Dimbaza **Curriculum Innovation Option 1 (from Table 2.1):** Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources	
Curriculum Innovation Dimensions	**Details of curriculum innovation dimensions observed**
Enhanced knowledge of RWH&C	Nelisa's knowledge enhancement on the significance of RWH&C was evident through **critical engagement** with the content and substance of tasks as well as evidence of **clarity and depth of understanding** of the content. She provided details about integrating RWH&C practices in the curriculum in her assignments. Nelisa engaged well with team and was involved in the development of RWH&C productive demonstration site with team members in Dimbaza.
Integration of knowledge into development of productive demonstration sites	The productive demonstration sites focused on creating trench beds, raised beds, tower gardens and mulching. Information and knowledge gained from WRC RWH&C material was integrated into the development of productive RWH&C demonstration sites. The knowledge that was used for the development of the productive demonstration sites was mainly on use of organic material, water

	harvesting methods, constructing trench beds and mulching (Denison *et al*., 2011) as well as from Botha *et al*. (2012) with focus on weed control, organic fertilizers and mulching.
Actual contribution to development of productive demonstration sites for teaching and learning	Nelisa was the chair and coordinator of the Dimbaza team in the Training of Trainers course. She was responsible for planning and calling for meetings, creating a WhatsApp group and had the overall approval of the demonstration site chosen by team members. Nelisa was also responsible for the information gathered through practical sessions and observations which she used to enrich the component of WHR&C in team curriculum development. She was overseeing and ensuring the use of the productive demonstrative site (fertility trench bed) for practicals and demonstrations with students.
Changes made to College Curriculum	Nelisa demonstrated the importance of including RWH&C techniques in curricula and also making it a stand-alone course and or additional resource especially for farmers, educators and the community. *"As an institute it is important for the RWH&C to be included in the curriculum in order to make sure that it is a practice that is taught to the students and increase the knowledge around RWH&C… RWH&C can also find the option to be involved in Production Economics as the water is a resource that needs to be conserved. If there is not enough water in the farm, it increases the cost of production and may also affect the quality of the product, of which RWH will be used in various activities to reduce the amount of water coming from Municipality for agriculture."* *"A stand-alone short course will be helpful to close the gap in literature and in knowledge, especially for other clients such as farmers, educators and community"* *"Water harvesting information is also needed in the college as an additional resource material meaning that on top of the information about water harvesting and conservation they have got from the course, they can have an additional resource material to equip them (students) more on water harvesting techniques and practices."*
Expanded community interaction and civic engagement	Nelisa highlighted that as a group, they involved other people in their work as a way of expanding the knowledge. These stakeholder groups would also bring knowledge and different skills to the team and learning was achieved using different ways including observation, practical involvement, demonstration and information sharing. "*We will involve Zingisa Educational project, agro-ecology learning sites, Farmers, school teachers, women projects, out of school youth, persons with disability, extension officers, trainers and institutions of higher learning. These will bring knowledge, for example, farmers will bring indigenous knowledge, school teachers – technical skills, Extension Officers – technical knowledge and agricultural advice, Institution of Higher Learning – research skills and Negus would offer technical knowledge, advocacy and lobbying."*
Links with universities and other knowledge partners	Nelisa has links with researchers at institutions including Rhodes University and Fort Cox ATI.
How WRC RWH&C material were used	Nelisa's group used the WRC RWH&C material by Denison *et al*. (2011) and Botha *et al*. (2012) for information on different methods and practices to which they used at the productive demonstration site. These practices included use of trench beds, mulching, raised beds and tower gardens.

Participant E: Busisiwe Mgangxela – Fort Cox Agriculture and Forestry ATI curriculum advisory committee – Amathole **Curriculum Innovation Option 1 (from Table 2.1):** Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources	
Curriculum Innovation Dimensions	**Details of curriculum innovation dimensions observed**
Enhanced knowledge of RWH&C	Busisiwe's knowledge enhancement on the significance of RWH&C was shown through evidence of **clarity and depth of understanding** of the content. She provided sufficient details about integrating RWH&C practices in the curriculum.
Integration of knowledge into development of productive demonstration sites	There is evidence of integration of her knowledge of RWH&C into the development of productive RWH&C demonstration sites. Busisiwe used several WRC RWH&C material including sustainable use of greywater in small-scale Agriculture and gardens (Rodda *et al*., 2010), Agricultural Water Use for Homestead Gardening Systems Resource Material for Facilitators and Food Gardeners (Stimie *et al*., 2010) and Water harvesting and conservation (Denison *et al*., 2011). The WRC material were used to inform the use of sustainable techniques such as roof water collection, grey water for irrigation, diversion furrows, trench beds and mulching for clinic gardens which were used as demonstration sites at Amatole basin and Fort Cox ATI.
Actual contribution to development of productive demonstration sites for teaching and learning	Busisiwe's role was organizer of the group and she organized for creation of a WhatsApp group. She advised on having meetings on site and initiated discussions as well as encouraging members to contribute to the discussions. She also encouraged everyone participating to feel important and to know that they were welcome as group members, acknowledging everyone's contributions and limitations. Busisiwe was also actively involved in site activities and making sure the collaborative participatory process continued for future sustainability of the demonstration sites.
Changes made to College Curriculum	Busisiwe showed importance of including RWH&C needs in the nursing curriculum. She made a strong link to a nursing course and potential curriculum. The links are thorough and address the contextual constraints faced by nursing students when dealing with patients and the community they serve at large. An extensive opportunity list was providing making direct links as to why and how RWH&C should be included in nursing training and courses, as well as food gardens in general. *"As health promotion through health education is the centre in nursing training, it is therefore known by learner Nurses that for them to be able to succeed in promoting good quality safe nutrition that will prevent occurrence of chronic illnesses they have to advise clients, families and communities on having vegetable and herb gardens in their homes. One can never have a planted garden without water to irrigate… I strongly maintain that Nurses be taught RWH&C in their curricula. Simple techniques like roof water harvesting for 200L containers that are commonly found in rural villages already, water tanks, direct runoff furrows, fertility pits, trench beds, mulching, tower gardens and grey water harvesting could be demonstrated to clients using clinic gardens, planting vegetables and herbs which also assist in pest control and are also medicinal, assisting in preventing or relieving some aches, illnesses and infections."*

	Busisiwe further highlighted the importance of incorporating the RWH&C techniques into curriculum as a stand-alone course with practical sessions and case studies in the curriculum as part of lessons plan. *"As I am doing a stream following a course where the curriculum for RWH&C does not exist, I would not have changes but go for incorporation of the RWH&C as a stand-alone course during University of Fort Hare Curriculum review as a stakeholder."* *"Integration of the development and use of the sites on my RWH&C curriculum should include practical skills showing how the techniques are performed, demonstration on how to teach the practices included in lesson plan and feedback practical by students showing if they have mastered the skills and theory on the techniques. Case studies could be teaching and learning methods where students would be giving feedback to class sharing their experiences on different techniques."*
Expanded community interaction and civic engagement	Busisiwe provided an activity system that included different stakeholders who formed a collaboration and worked together for continuous production, harvest and sales of agricultural products. Reporting on progress was achieved through a WhatsApp group and members made use of the Imvotho Bubomi learning network WhatsApp group and Food for us App for interaction and getting information on participating and holding meetings to report. 
Links with universities and other knowledge partners	Busisiwe has links with researchers at institutions including Rhodes University, the University of Fort Hare and Fort Cox ATI, and Health care providers.
How WRC RWH&C material were used	Busisiwe used WRC RWH&C material including sustainable use of greywater in small-scale Agriculture and gardens (Rodda *et al*., 2010), Agricultural Water Use for Homestead Gardening Systems Resource Material for Facilitators and Food Gardeners (Stimie *et al*., 2010) and Water harvesting and conservation (Denison *et al*., 2011). The WRC material were used to inform the use of sustainable techniques such as roof water collection, grey water for irrigation, diversion furrows, trench beds and mulching. The WRC RWH&C material were also used for making contours to harvest rainwater, conserve and use it as well as to filter and spread out runoff water at Amatole basin and Fort Cox ATI.

Participant F: Melody Chiume – MASDT Training Organisation – Mpumalanga

Curriculum Innovation Option 1 (from Table 2.1): Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources
Curriculum Innovation Option 3 (from Table 2.1): Integration into a number of different modules, not necessarily only those with obvious and immediate relevance
Curriculum Innovation Option 4 (from Table 2.1): Design of new short courses

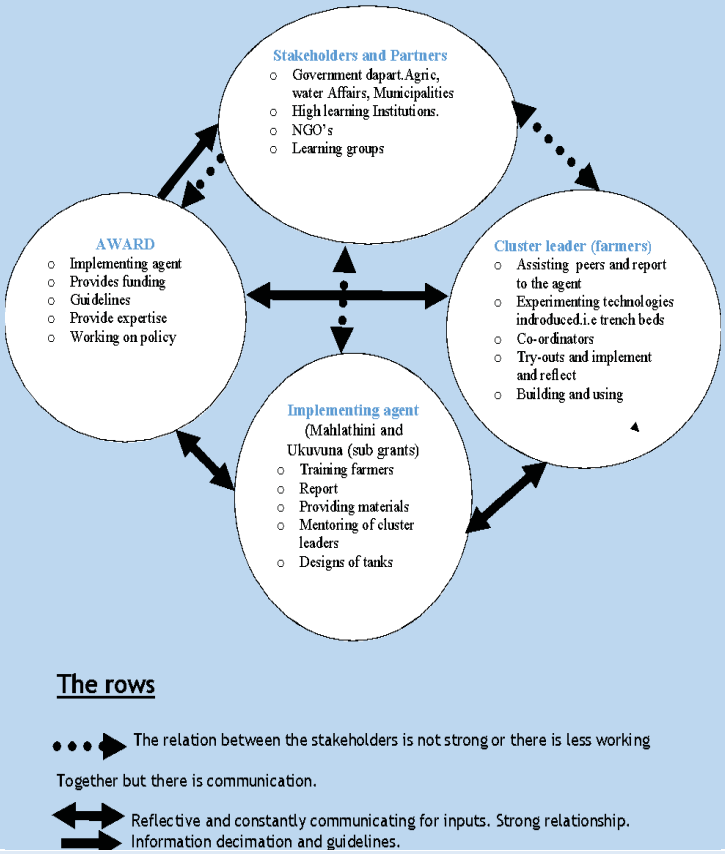
Curriculum Innovation Dimensions	Details of curriculum innovation dimensions observed
Enhanced knowledge of RWH&C	Melody's knowledge enhancement on the significance of RWH&C was shown through evidence of critical engagement with the content and substance in relation to RWH&C practices with underpinning knowledge of the understanding of contours, how to mark them as well as understanding how water flows. She provided details about integrating RWH&C practices in the curriculum, thoroughly identifying the absences of sustainable agricultural water in curriculum and indicating a strong commitment to the inclusion of RWH&C information in the various curricula and courses of MASDT.
Integration of knowledge into development of productive demonstration sites	There is evidence of integration of Melody's knowledge of RWH&C into the development of productive RWH&C demonstration sites. She used several WRC RWH&C material including the manual for Rural Freshwater Aquaculture by the Rural Fisheries Programme (DIFS, Rhode University, 2010), sustainable use of greywater in small-scale Agriculture and gardens (Rodda *et al*., 2010), guidelines on best practice management practices for Rainwater Harvesting and Conservation (RWH&C) for Crop and Rangeland Productivity in Communal Semi-Arid Areas of South Africa (Botha *et al*., 2014) and a manual on the production guidelines for African Leafy Vegetables by Jansen van Rensburg *et al*. (2012). The WRC material were used to inform the use of sustainable techniques such as compost trenches, mulching, compost pits, raised beds and creating small dams or ponds that capture water to be used for even for aquaculture. *"Some of the manuals that I will use a lot will be A manual for Rural Freshwater Aquaculture by the Rural Fisheries Programme Department of Ichthyology and Fisheries Science Rhodes University for the Water Research Commission… Production Guidelines for African leafy Vegetables will also be a beneficial material to hand out as additional material during plant production workshops. Other content will be drawn from the Sustainable use of Greywater in Small-scale Agriculture and Gardens in South Africa... Rain Water Harvesting and Conservation techniques; Guidelines On Best Management Practices For Rainwater Harvesting And Conservation (RWH&C) For Cropland And Rangeland Productivity In Communal Semi-Arid Areas Of South Africa."*
Actual contribution to development of productive demonstration sites for teaching and learning	Melody was involved in the establishment of the demonstration site with the Ehlanzeni South team where her contribution was to make sure that there was more interaction amongst colleagues in the group and other stakeholders. She was mostly involved in a vegetable and herb garden called Thousand Herbs and Vegetables which she intended to make it a learning garden. *"The demonstration site that we have established with the Ehlanzeni South team will remain as a site we will further grow and I will make sure that there is more interaction with my colleagues and other stakeholders. However in my line of work there is a vegetable and herb garden that is near Timbavati called Thousand Herbs and Vegetables and I intend to make it a learning garden*

	because they already have shade nets to reduce the impact of the weather elements. They make an average turnover of R30 000 a month and I have invented them to the symposium. I started mentoring the project in March and I have told them that we will try and get more people who have received awareness of the rainwater harvesting techniques to come and share with them the ideas of harvesting rain water as they sometimes run out of water."
Changes made to College Curriculum	Melody emphasized on the importance of including RWH&C needs in the MASDT curricula and training material. The participant has pointed out that the MASDT curricula and training material has several practices and elements of RWH that are not emphasized. She also noted that the topics that are related to soil and water conservation practices needed to add emphasis on the specific techniques. Melody further highlighted the importance of incorporating the RWH&C techniques into school curricula as long-term courses with experimental learning and short-term courses through the use of workshops. *"Looking at the operations of the organisation as it runs the learnerships… when the learners are taken through the curriculum of Learner ships, it is mostly done in a classroom setup and the element of making sure that the learners get their hands dirty and go through experimental learning and actually be assessed practically whether they have been able to implement what they learnt in class. The possible options of integrating rain water harvesting concepts within the learnership programs will be to actually have a demonstration site where the learners can also go and implement a few techniques and be assessed based on that."* *"For short-term courses, in the list of the workshop topics that are part of the interventions we offer for the three-year mentorship program, we have none that precisely addresses the challenge of water as a scarce resource. Therefore, a great gap still needs to be addressed and as such the mentorship staff would need to develop material that will specifically guide the farmers that we work with according to their scale bands aspirations and average affordability."* *"The MASDT curricula and training material have several practices and elements of rain water harvesting that are not emphasized and therefore on the topics that are related to soil and water conservation practices we will need to add emphasis on the specific techniques. This will be easier to change on the material that we use for short workshops…"* *"There are many of our farmers that are in quite hot areas and they often have challenges of drought conditions especially outside the rainy season, therefore our approach to rainwater harvesting needs to be more aggressive and innovative because that would be the best possible way to avoid drought conditions in farm and possible loss of crop."*
Expanded community interaction and civic engagement	Although Melody did not provide an activity system with expanded community interactions, she highlighted that she was offering some mentorship techniques to people in Timbavati who were involved in a vegetable and herb garden called Thousand Herbs and Vegetables which was regarded as a learning garden. The intention was to get more people involved and be aware of RWH&C techniques. "*I started mentoring the project in March and I have told them that we will try and get more people who have received awareness of the rainwater harvesting techniques to come and share with them the ideas of harvesting rain water as they sometimes run out of water.*"

Links with universities and other knowledge partners	Melody has links with researchers at Rhodes University and the University of Mpumalanga
How WRC RWH&C material were used	Melody used several WRC RWH&C material including a manual for Rural Freshwater Aquaculture by the Rural Fisheries Programme (DIFS, Rhodes University, 2010), sustainable use of greywater in small-scale Agriculture and gardens (Rodda *et al*., 2010), Guidelines on Best Management Practices for Rainwater Harvesting and Conservation (RWH&C) for Crop and Rangeland Productivity in Communal Semi-Arid Areas of South Africa (Botha *et al*., 2014) and a manual on the production guidelines for African Leafy Vegetables by Jansen van Rensburg *et al*. (2012). The WRC material were used to inform the use of sustainable techniques such as roof top water harvesting, diversion furrows, compost trenches, mulching, compost pits, raised beds and creating small dams or ponds that capture water to be used for even for aquaculture.

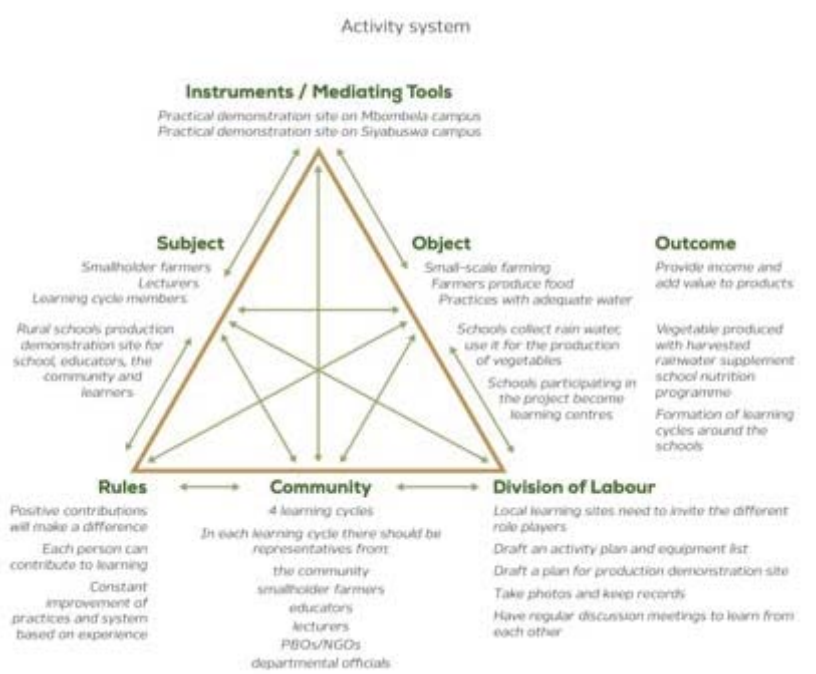
Participant F Bigboy Mkhabela – AWARD, Mpumalanga **Curriculum Innovation Option 1 (from Table 2.1):** Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources	
Curriculum innovation dimensions	**Details of curriculum innovation dimensions observed**
Enhanced knowledge of RWH&C	Bigboy's knowledge enhancement on the significance of RWH&C was shown by critical engagement with the content and substance in relation to RWH&C practices including trench beds and tunnels, tunnel/ shade cloth, mulching and grey water harvesting.
Integration of knowledge into development of productive demonstration sites	Bigboy used knowledge gained into development of productive demonstration sites. The techniques that were applied included contours, trench beds and tunnel, as a good system to help store water and building soil fertilizer to increase soil fertility and yields, use of tunnel / shade cloth above a trench bed to minimize evaporation and maintain soil moisture for long periods and grey water harvesting. Furthermore, knowledge of the concept of using cheap drip irrigation with grey water was introduced in the community. Mulching was also used for protecting soil from burning/ direct sunlight while it maintains soil moisture and provides soil fertility.  Farmers trained on design the pipes for grey water.

	 Community practiced mulching as a water harvesting techniques strategy.
Actual contribution to development of productive demonstration sites for teaching and learning	Bigboy contributed significantly to the development and maintenance of the productive demonstration site as a community facilitator, liaison person as well as an interpreter and translator during workshops. He also provided strategies on ways to use, save and store water sustainably and in an affordable manner, carrying out drip irrigation trials, promoting rainwater harvesting techniques including grey water harvesting. He was also involved in training communities and assisting members to gain access to training material. Bigboy facilitated various means of communication like WhatsApp or Facebook groups as platforms for assessment and troubleshooting of problems arising or anything needed to be shared with the team. *"My role is divided in different spheres within the organization ranging from community facilitator and liaison to interpreter. If I was a car, I would say I am pistons which help the car to be propelled. I provide facilitation to the farmers and introduce ways to cope with climate change challenges and alternative smart ways of farming including mulching of soil through the dead and live mulch, coming up with strategies in providing ways to use, save and store water sustainably and in an affordable manner, carrying out trial runs such as drip irrigation systems, rain water harvesting techniques, and grey water harvesting techniques. The latter is already up and running in the villages of Mameje. I also translate during workshops and thereafter ensuring that the captured information is disseminated accordingly with ease."* *"My role involved organizing expertise to come and support fieldwork and trial runs where I find the scope of work to be out of my area of expertise, training the community about the importance of thinking holistically… assisting them in planning, prioritizing and implementing natural resources management activities and assisting them in gaining access to this information and the resources and opportunities which will assist them. For example, the addition of infiltration pits in the contours ridges so that aquifers can benefit passively."* *"As part of the scoping team, a variety of exploration methods were carried out to address soil and water challenges. This included cluster meetings and discussions, visiting other projects/initiatives to learn about their strategies (such as underground storage tanks) and household visits to get an idea of the needs and potential sites for building such structures. What other options can be implemented including use of different? Crop varieties, and other forms of soil and water conservation practice"*
Changes made to Curriculum	Although there were no changes to the curriculum that were mentioned in the assignments, Bigboy highlighted the importance of including the development and use of the productive demonstration site in RWH&C training for those who want to learn. In his response, He explained how he would include this in RWH&C training.

	"…use it as a training site and demonstrations for those who want to learn more about water harvesting techniques, include this into big communication tools for easy access like google maps and GPS coordinate location, capture this and write a narrative to be used by other stakeholders and farmers, monitoring tools as a key reflexive to help identify challenges and better working condition as well as stakeholder engagements."
Expanded community interaction and civic engagement	Bigboy provided an activity system with expanded community interactions in agricultural and water learning community relations. Videos were also used as a good tool especially to the people who love to learn by doing. Some video archives which were used are (i) Rainwater Harvesting and Food Security (Erna Kruger), and (ii) Indigenous Water Harvesting and Conservation Practices: Historical Context, Cases and Implications (Jonathan Denison and Luvuyo Wotshela) 1. 
Links with universities and other knowledge partners	Bigboy has links with researchers at Rhodes University, the University of Mpumalanga, MASDT and AWARD
How WRC RWH&C material were used	Bigboy used several RWH&C material from different sources including material from AWARD and its partners, own manuals from Mahlathini and Ukuvuna, university papers on water harvesting and government publications. The WRC RWH&C material that was used by the participant is 'Development of a comprehensive learning package for education on the application of water harvesting and conservation' by Denison *et al*., 2011.

	Participant G: Gerhard Viljoen – University of Mpumalanga **Curriculum Innovation Option 1 (from Table 2.1):** Integration within existing programmes via enrichment with productive demonstration site development and new knowledge resources **Curriculum Innovation Option 3 (from Table 2.1**): Integration into a number of different modules, not necessarily only those with obvious and immediate relevance **Curriculum Innovation Option 4 (from Table 2.1):** Design of new short courses	
	Curriculum innovation dimensions	**Details of curriculum innovation dimensions observed**
	Enhanced knowledge of RWH&C	Gerhard's knowledge enhancement on the significance of RWH&C is evidenced by critical engagement with the content and substance in relation to RWH&C practices with a good comprehensive analysis of RWH&C in relation to the current short courses. He gained knowledge on the RWH&C practices such as mulching, diversion furrows, roof-top collection and the use of tied ridges.
	Integration of knowledge into development of productive demonstration sites	Gerhard used knowledge gained in the development of a productive demonstration site in a teaching school garden where a school facility consisting of six buildings was used for roof top collection of rain water for agricultural practices. The school garden was used as a practical demonstration site for learners to learn about food production and the care for plants and as a teaching facility for the Education students to equip them with practical experience that can be applied at their homes or at the schools where they will be employed. The demonstration site was also used for the training of teachers, farmers and the local community in water harvesting and food production. Gerhard also integrated RWH&C knowledge such as basin tillage to form small catchment areas around the trees and vegetable beds to collect as much rainwater as possible during rainy days, improvement of soil fertility by adding organic matter like compost and animal manure and mulching or shade net cover to prevent evaporation. 
	Actual contribution to development of productive demonstration sites for teaching and learning	Gerhard played an important role as a coordinator, fundraiser and facilitated links between his team and the University of Mpumalanga management. *"My role in the programme was that of project coordinator, doing fundraising and creating linkage with the UMP management. The*

		project is regarded as a scholarly engagement and a typical example of cross disciplinary research. In this project the emphasis will be on training (education/extension/ Continuing education), water usage or management and practical agriculture. I also liaise with community structures, the Education department and other role-players."
	Changes made to Curriculum	Gerhard highlighted some changes that need to be made in the curriculum programme to include the RWH&C practices and ways of irrigation in teaching and learning. This included changes in: i. BEd. foundation phase where RWH&C is currently not part of the curriculum and need to be included as an additional add on programme or incorporate into one of the current subjects. This can also be considered to be an extracurricular activity. i. Diploma in Plant production, Bachelor of Agriculture and BSc. Agriculture. Although RWH&C is part of the original curriculum in water management in all three curricula, with the new curriculum review it is suggested to include it into water management, Soil science, agronomy and vegetable production. i. Advanced Diploma in Extension. The principle of RWH&C as well as a component of social learning and learning networks need to be included into the curriculum. The training of trainer programme with the students need to be considered. v. The principle of RWH&C as well as a component of social learning and learning networks to be included into the curriculum. The training of trainer programme with the students needs to be considered. The other suggestions included the use of RWH&C as a project for students to work on (from diploma to PhD level), and emphasise the importance of these techniques and encourage lecturers to add it as a focus. "*The principles of RWH&C are vital for food security, production and the alleviation of poverty in the rural communities as well as amongst the upcoming commercial and commercial farmers. UMP is ideally placed to position itself as a Centre of Excellence with regards to irrigation and water usage. As a Centre of Excellence research will be conducted to improve practices and increase the efficiency of water use from Diploma level up to PhD level.*" *"Ideally the concept of water collection and effective usage should be included in the curriculum of the B.Agric. and Dip.Agric. programmes as well as those in the teacher training curriculum and conservation."*
	Expanded community interaction and civic engagement	Gerhard has illustrated the main components of the activity system developed around RWH&C in the curricula in UMP, including the participants envisaged for the courses. The productive demonstration site was used to train educators, community members and farmers on water harvesting techniques. "*The site will be used to train educators, community members and farmers, in the Nkangala District on water harvesting and food production through school gardens. A training guide will be developed as a guide for the participants and a constant review of the guide is envisaged to add new knowledge and practices.*" *"Rain Water harvesting can be applicable to the smallholder farmer where they collect the rainwater in small quantities and implement infield practices to retain as much water as possible. The commercial farmer whether crop farmer, fruit famer or livestock farmer all need to realise the importance of the retention of rainwater to make dryland farming possible."*

		
	Links with universities and other knowledge partners	Gerhard has links with researchers at Rhodes University and the University of Mpumalanga and other Agricultural Training Institutions across the country.
	How WRC RWH&C material were used	Gerhard was very thorough in identifying and highlighting the WRC RWH&C material which he used although he was less specific on the information drawn from the material. The WRC RWH&C material used included the books listed below: 1. Denison J, Smulders H, Kruger E, Ndingi H, and Botha M (2011). Development of a comprehensive learning package for education and training on the application of water-harvesting and conservation. WRC Report No. TT/492/11, Water Research Commission. Gezina, South Africa. 2. Stimie, C.M., Kruger, E., De Lange, M., and Crosby, C.T. (2010) Agricultural Water Use for Homestead Gardening Systems (Volume 2: Resource Material for Facilitators and Food Gardeners, Part 1 – Introduction, Chapters 1-3). Water Research Commission Research Report no. TT 431/1/09, Water Research Commission. Gezina, South Africa. 3. Botha, J.J., Anderson1, J.J., Joseph, L.F., Snetler, R.M., Monde, N., Lategan, F., Nhlabatsi, N.N. Lesoli, M.S. and Dube, S. (2012). Sustainable Techniques and Practices for Water Harvesting and Conservation and their Effective Application in Resource-Poor Agricultural Production, Volume 2 of 2: Farmer and Extension Manual. WRC Report No. TT 542/12, Water Research Commission. Gezina, South Africa. 4. Rhodes University (DIFS). (2010). A manual for rural freshwater aquaculture. WRC Report No. TT 463-P-10.2, Water Research Commission. Gezina, South Africa. 5. Botha, J. J., van Staden, P. P., Anderson, J. J., van der Westhuizen, H. C., Theron, J. F., Taljaard, D. J., Venter, I. S., & Koatla, T. A. B. (2014). Guidelines on best management practices for rainwater harvesting and conservation (RWH&C) for cropland and rangeland productivity in communal semi-arid areas of South Africa. WRC Report No. TT 590/14. Pretoria: Water Research Commission. 6. Jansen van Rensburg, W.S., Van Averbeke, W., Beletse, Y.G., and Slabbert, M.M. (2012). Production Guidelines for African

Leafy Vegetables. WRC Report No.TT 536/12, Water Research Commission, Gezina South Africa.
7. Rhoda, N., Garden, K., and Armitage. N. (2010).TT 469-11-Sustainable use of Grey Water in Small-scale Agriculture and Gardens in South Africa. WRC Report No TT 469/10, Water Research Commission. Gezina, South Africa.
8. Smith, M.T., and Everson, T.M. (2016). Improving rural livelihoods through biogas generation using livestock manure and rainwater harvesting. Water Research Commission Research Report No. TT 645/15, Water Research Commission. Gezina, South Africa.
9. Stephens, J.B, Van Heerden, P.S, Reid, P, Liebenberg, A., Hagedorn, E. and De Kock, G., (2012) Technical learning guide vol 2, Part 8: irrigated crop and fodder production. Training material for extension advisors in irrigation water management. WRC report no.TT 540/8/12, Water Research Commission. Gezina, South Africa.

6.6 Some Examples of Farmer-centred Curriculum Innovations Focussing on Rainwater Harvesting and Conservation Practice in Learning Networks

While it is very important that Agricultural Educators and Trainers update their knowledge and expand it to be inclusive of a wider range of rainwater harvesting and conservation practices, it is also important to find out what farmers already know about these practices, as farmers hold much experiential and indigenous knowledge. They have learned this through their experience of farming, and through inter-generational learning from their families over time.

In the rural Eastern Cape, for example, Denison and Wotshela (2009) found that farmers had a local rainwater harvesting and conservation practice called ‘Gelesha’ which is a practice of soil ripping. This technique involves post-harvest ripping of the soil, usually during the winter to spring period to conserve the moisture still in the soil and mulched by the crop residue. This avoids turning the soil after the rains have come, thus losing moisture, and allows for planning immediately the ground is wet.

In KwaZulu-Natal, a student Bonginkosi Vilakazi (2017) researched farmers’ knowledge and use of rainwater harvesting and conservation in two villages. This is what he found, “To conserve soil and water, farmers use raised beds, mulching, early maturing crops, furrows and ridges, earth dams and animal manure in the gardens; while contour farming, zero tillage, fallowing, terraces and animal manure are used in the fields. Techniques such as zero tillage, terraces, furrow/ridge, raised bed and mulching were adopted from science. Whereas fallowing, contour ploughing, manure addition, earth dams and rainwater harvesting are part of the local indigenous knowledge system (IKS). In uMsinga most farmers still prefer their indigenous methods, whereas in Bergville, farmers prefer scientific methods". This interesting student research is a good example of how students can be engaged in finding out what farmers already know, and how they have come to learn about these practices. From this research it is possible to see that even though farmers have their own indigenous knowledge they also learn from new knowledge produced by researchers, and that they often combine these forms of knowledge in improving their agricultural practices. Farmers in different places and contexts might also prefer to use existing knowledge or be more open to using new scientific knowledge. These insights from Bonginkosi Vilakazi’s study are very important for

the training of extension services as they need to learn how to link new knowledge with farmers' existing knowledge.

Curriculum innovations in Agricultural Education and Training should take careful account of not only new scientific knowledge, but also farmers' existing experiential and indigenous knowledge and how this can be linked with new knowledge, in and through practice. **One approach to doing this is to work with farmers and students to set up productive demonstration sites as a curriculum innovation project or process, as has been pilot tested in the Amanzi for Food programme.** The productive demonstration sites have been reported on in more depth in Chapter 5, with the few examples below illustrating how these are also *curriculum innovations* that involve

Example 2: Students working with innovative farmers to dig trench beds and mulch

In another example, students in the colleges were invited to co-operate with innovative farmers who were willing to host college lecturers, students, extension staff and local economic development personnel on their plots to demonstrate new rain-water harvesting and conservation practices.

Figure 7 *Students working with farmers to dig trench beds and lay mulch*

Example 3: Students and lecturers building an integrated productive demonstration site system

In this example we see students and lecturers setting up tied ridges and a drip irrigation system for vegetable production in the grounds of the agricultural training institution. They also built a small dam to collect rainwater for pumping to a tank which was then used to feed the drip irrigation. This combined productive demonstration site allowed students to learn how to develop and manage rain water harvesting approaches within a systems perspective, where different approaches were used in a complimentary mix of practices to ensure adequate water for food production in a small-scale field scenario.

Figure 8 *Dam, raised tank and tied ridges with drip irrigation system*

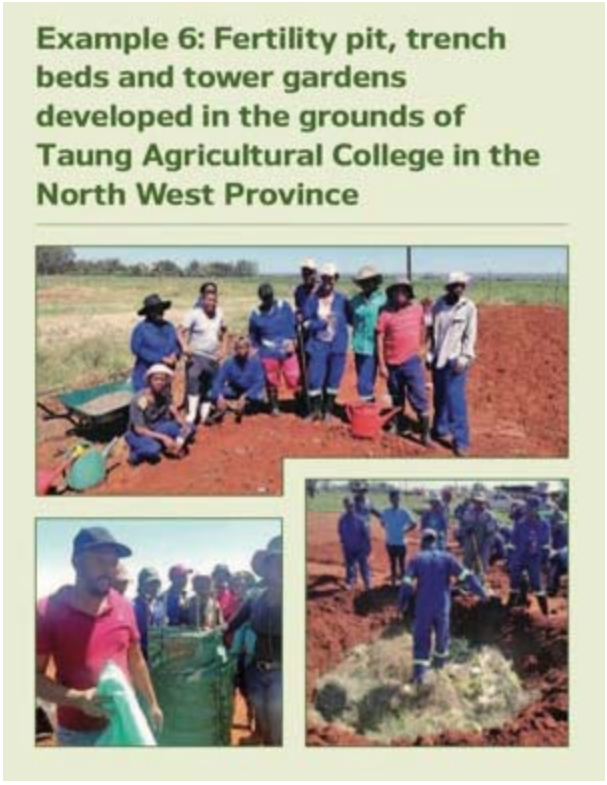


Figure 6.3. Extracts from the Curriculum Innovation Booklet that demonstrate how the productive demonstration sites have become a site of curriculum innovation

Consider the statement made by a senior lecturer in an Agricultural Training Institute when he was considering these challenges in the regional farming environment, and when he started to put the farmers at the centre of his thinking about Agricultural Engineering and the way in which water for agricultural production was represented in the curriculum.

> "There are a lot of triggers that are going to influence this type of thing. Shortage of water, the unavailability of irrigation water and things like that are just going to force us actually to make use of rainwater harvesting and conservation and to know more about it, we will have to look for this knowledge." (Senior Lecturer, Agricultural Training Institute, Eastern Cape)

As this senior lecturer indicates, there is a need for Agricultural Educators and Trainers to look for new knowledge that may be needed by the farmers that they are servicing regionally.

6.6.1 Productive demonstration sites as community engaged curriculum innovations

As identified in our earlier research (cf. Lotz-Sisitka et al., 2016) and one of the main motivations for the approaches developed in the Amanzi for Food project is that one of the major challenges facing Agricultural Education and Training is a loss of emphasis on practical work. As Agriculture is an applied practice, it is very important to integrate theory and practice *in practice* in Agricultural Education and Training. In our research we found that one of the challenges facing Agricultural Education and Training Institutions is a lack of resources to set up and maintain practical demonstration sites for their students. A solution proposed in the

Amanzi for Food programme for rainwater harvesting and conservation curriculum innovation teaching and learning was to work within the community and support the community to develop **productive demonstration sites,** as reported on in more detail in Chapter 5. This was seen to be a 'win-win' solution because communities could get the support of students and the Agricultural Lecturers and their expertise while the College, University or Agricultural Training Institute, AND Colleges, Universities and Agricultural Training Institutes could obtain 'real-life' sites for practical learning for Agricultural Curriculum innovation, as shown above.

As discussed in Chapter 5, productive demonstration sites are places where food is being produced and rainwater harvesting and conservation approaches can be demonstrated in ways that also improve food production practices. These differ from demonstration sites where practical approaches are demonstrated just to show a practice. The 'productive' in the demonstration site concept is therefore very important because it is this that motivates farmers to work with agricultural educators and trainers, as well as other stakeholders to improve their food production via the rainwater harvesting and conservation practice demonstrations. They are meaningful to farmers because they have real outcomes in practice, and they are a meaningful learning experience or site for students and other co-learners because they deal with real-life situations and challenges.

In our research, the co-engaged learning that emerged around the co-development of productive demonstration sites, was a significant agricultural education curriculum innovation for all involved: lecturers, farmers, students, extension officers and others. The productive demonstration sites offered a 'space' where all could learn together to do new things. Importantly these also helped to build new relationships between the farmers and the Agricultural Education and Training Institutions, making them much more farmer-centred and community engaged.

From these examples it is possible to see that a wide range of productive demonstration sites can be constructed in the college or Agricultural Education and Training Institute grounds, with communities in their fields, and even on larger areas or bigger fields. All of these offer important learning opportunities for students and most are low cost alternatives for ensuring that the practical aspects of agricultural education and training are well covered. Importantly with the focus on the **productive** side of the demonstration sites, they also help farmers and help with food production in the local areas.

As reported on in Chapter 5, in some of the research sites where we worked, the productive demonstration site concept has become so popular that it has developed into a regular practical project experience for students where they work with communities in a practice called 'ilima' which derives from the isiXhosa practice of 'farming together'. Here students and their lecturers are invited to the farms of innovative farmers for 'special practice days' when they can participate in assisting the farmers to strengthen their farming practice (see Figure 6.4 below).

Figure 6.4. Students assist an innovative farmer to develop tied ridges to keep moisture in the soil (which will be mulched) and to build a tunnel to protect seedlings against heat

These practices build relationships between Colleges and Communities, and bring the **extension** dimension of the ASSAf knowledge triangle into focus as the practices also give students real experience of how to help farmers improve their agricultural water practices. This could therefore be an important curriculum innovation for extension training in future, especially where there are problems experienced with resources for practicals.

By putting farmers at the centre of curriculum innovation, agricultural educators have been able to enrich their curricula with new knowledge needed by farmers as found in research, which they have linked to the knowledge that farmers already have; they have new material (the WRC material) for use in their classrooms and they have developed new approaches for practical learning opportunities. Most importantly their programmes are also more community-engaged, and offer the students a 'living' classroom experience in which they are able to develop understandings, skills and values and integrate theory and practice *in practice.*

The productive demonstration site and *ilima* practice approaches create an approach to curriculum innovation that also gives students the opportunity to learn from excellent farmers. Two college lecturers reflect on the value of this for their students:

> [Lecturer 1]: Wait till u listen to the video. The way the garden looked and how the technique is working. Also the money she is making on that piece of land. She was excellent in her teaching
> [Lecturer 2]: I think the teaching place, who delivers the lesson plays a significant role in the learner. In a way it looks as if when they learn in class and through a lecturer is all about assessment but with a farmer base, it is a real life application.

As also indicated in Chapter 5, at the University of Mpumalanga, the lecturers are planning a whole campus demonstration site which will benefit not only agricultural education and training students but also student teachers. As these are learning to become teachers they can also see how to improve school campuses and offer teaching in food security practices in schools. The drawing below shows the plans for this wider-scale educationally-oriented productive demonstration site. In this way the agricultural faculty can influence other areas of education and learning in inter-disciplinary ways.

"Now we have new curriculum content in the form of enriched teaching notes, videos and photos and we are using these together with demonstration plots to teach our students on relevant water for food knowledge and practice. We are now doing more practicals with students" (Lecturer at Fort Cox Agriculture and Forestry Training Institute).

ASSAf (2017) recommended that the Ministerial Committee should constitute a special working group to investigate and propose strategies to increase the collaboration and partnership between AET and related industry and business partners, in order to promote inclusive innovation in the agri-food value chain. (ASSAF, 2017, pg. 17). This involves enabling the curriculum innovation approaches that are demonstrated in this book, and opening the doors of the Colleges and Agricultural Institutions to the farming community and other stakeholders.

ASSAf (2017) notes that within the knowledge triangle for innovation in the agro-food value chain, the "the roles of each of the actors are intersectional, and extend beyond the actions of what each actor does in isolation." (pg. 64). They also note that although the links between research, teaching and extension are important, various challenges remain in effectively integrating these, including lack of skills and contextual understanding on the part of each of the actors on how to engage effectively with farmers (Christoplos, 2010).

A good way to develop this approach to curriculum innovation is to also work within a Learning Network (see the Amanzi for Food Guidelines for Establishing and Supporting an Effective Learning Network, available for download from the website www.amanziforfood.co.za .)

6.7 The Importance of Professional Development of Agricultural Lecturers to Support Curriculum Innovation

All of the examples from Participants A-G shared above, were supported through a Training of Trainers programme in which participants worked in a learning network to develop curriculum and agricultural learning system innovations.

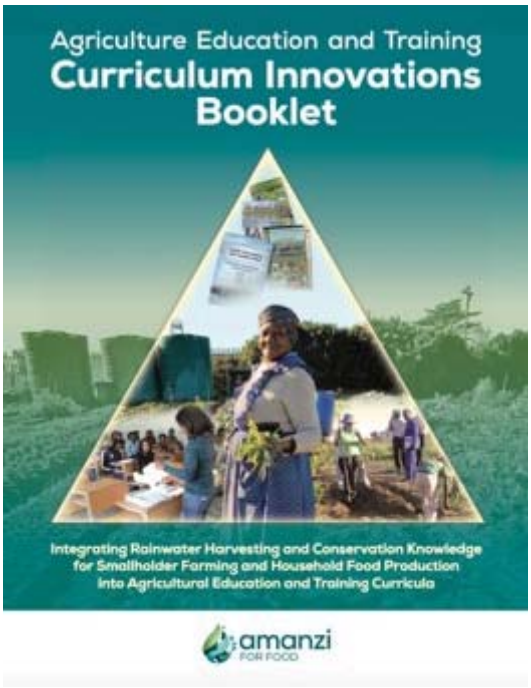
The Training of Trainers programme was designed around the model proposed by ASSAf, to put the farmer first, and to address challenges related to ensuring that knowledge, extension and education (the 'Knowledge Triangle') were addressed and brought closer together as outlined in the sections above.

As reported in Chapter 5, the Training of Trainers programme will be available as an OPEN ACCESS, FREE COURSE for lecturers, students, farmers and extension officers and others in the agricultural and related sectors in a diversity of contexts.

The cases above provide compelling evidence that this approach substantively supports curriculum innovation for integration of rainwater harvesting and conservation into Agricultural Education and Training programmes using an approach that sees curriculum as contextualized social process *as well as* curriculum as blueprint.

6.8 Curriculum innovation Booklet to Guide Farmer-centred Approaches to Curriculum Innovation

As mentioned in the introduction above, the content in this chapter has been used to inform the development of an 'Agricultural Education and Training Curriculum Innovation Booklet'. This booklet, as indicated above, takes a farmer-centred approach to curriculum innovation, and is based on the experiences of the participants in the Amanzi for Food programme who have focussed on curriculum innovation in the ToT course. We anticipate that this booklet will be used to support those who sign up for the online ToT course and who are also interested in curriculum innovation in Agricultural Education and Training. The booklet will be made available on the Amanzi for Food website, and will also be promoted into the agricultural education and training sector as an example of good practice that is aligned with national policy intentions as discussed in Chapter 1. It therefore forms an integral part of the Knowledge Uptake Strategy.



6.9 Conclusion

This chapter has outlined a farmer-centred approach to curriculum innovation. This offers a way of moving away from a top-down approach to curriculum innovation only, and rather helps lecturers and educators in the Agricultural Education and Training system to engage in curriculum innovation practices that are also responsive to local farming needs, and that also develop the applied practice dimensions of agricultural education and training, especially also strengthening the integration of theory and practice, but more importantly creating a better and stronger approach for linking the 'knowledge triangle' so crucial to successful agricultural

education and training – in ways that link research (e.g. from the WRC material) with extension (e.g. the collaborative engagement around productive demonstration sites) and education (e.g. the resulting new content and integration of theory and practice activities for students in the ATIs). In the next chapter we look at some of the evaluation processes that have helped to understand the creation of value, new knowledge and agency of those who have been involved in the Amanzi for Food programme, including the students, college lecturers, university staff and the farmers themselves.

CHAPTER 7

TOWARDS A KNOWLEDGE UPTAKE STRATEGY PART 6: Evaluating social learning and knowledge uptake

7.1 Selecting an Appropriate Evaluation Tool for Social Learning and Knowledge Uptake

There is a long history of evaluation research that moves from positivist correlational evaluations (1st generation), to quasi experimental (2nd generation), and illuminative and more qualitative evaluation research designs. The latter fall into hermeneutic and constructivist research traditions where meaning making of the participants in the evaluations were privileged firstly via a process of illuminating or revealing the situation (3rd generation), followed by a process of deliberative consultative co-construction of understandings of the situation (4th generation). Following critiques of positivism and relativism, these evaluation designs were replaced by evaluation designs that take stronger account of context and the underlying mechanisms that shape programmes and their theories, i.e. realist evaluation designs (Pawson and Tilley, 1997). Within this broad framework has also emerged a new set of evaluation designs which are specifically framed for evaluating knowledge dissemination and social learning processes on landscapes of practice, namely the Value Creation Framework (VCF) of Wenger, Trayner and de Laat (2011), Wenger-Trayner and Wenger Tranyer (2020). This is a nuanced evaluation framework, specifically designed for evaluating social learning processes over time. It is located more in the hermeneutic tradition, but can also be used within a co-construction model of evaluation, and can be deepened with a realist approach that asks questions about what works for whom under what conditions (Pawson and Tilley, 1997). In designing the M&E framework for the Amanzi for Food programme, we chose to work with the VCF, but found the need to adapt it to the particular project context and mediation processes. We also aimed to under-labour it with realist questions such as ‘what works for whom under what conditions’ in a second phase of the evaluation. We focused on the applied adaptation of the Value Creation Framework for M&E of the Amanzi for Food project, with an in-depth analysis of the ToT course as this was the most catalytic of the social learning processes. We also undertook VCF analysis of the other processes, but with less in-depth analysis. Findings of the evaluation process are reported on below.

The value creation framework of Wenger et al. (2011) (cf. also Wenger-Trayner et al. ,2020), is a nuanced evaluation framework that was specifically designed for evaluating social learning processes over time, hence we found it most suitable to the intentions and objectives of this project. One of the challenges with evaluation is to decide on how to undertake evaluations, and why we choose to value certain measurements. Most importantly, the initiative has goals, in the case of this project, to facilitate the uptake and use of the WRC material via curriculum innovation, and support for farmers’ learning and practice. While it is important to focus on the goals for evaluation purposes, there is also a need to measure steps towards meeting those goals. But, in social learning processes, there is also a need to ask bigger questions that move us toward thinking about how engagement in a course, community or learning network impacts the way in which participants approach their work, logistically, socially and intellectually. The VCF evaluation framework was created for use in communities of practice or with communities

of practice that are active on a landscape of practice (as is the case with the Amanzi for Food Learning Networks). Their approach suggests ways we can evaluate how a community supports growth in member's work habits, relationships, understandings and practices.

Learning takes place in both communities and networks. Communities of practice are defined as "a learning partnership among people who find it useful to learn from and with each other about a particular domain" (Wenger et al., 2011:9). Social networks on the other hand do not form identities and are defined as a set of connections among people who have personal reasons to connect such as for information flow, joint problem solving and knowledge creation (Wenger et al., 2011). Communities and networks have different effects on learning potential. The learning value of a community is the "ability to develop a collective intention to advance learning in a domain" (Wenger et al., 2011:10). Wenger et al. (2011: 10) argue that "Over time, a joint history of learning also becomes a resource among the participants in the form of a shared practice – a shared repertoire of cases, tools, stories, concepts and perspectives".

To evaluate a community by logistics alone or even to include a few simple survey questions does not reveal whether and to what extent that community is promoting knowledge creation and knowledge exchange among members or changing members' behaviours. And for success in the types of communities and learning networks that the Amanzi for Food project is supporting, members must move beyond discourse; members must grow together and share in creating ideas and solving problems, and in using the knowledge provided by the WRC in practical contexts of action.

The following questions, adapted from Wenger et al. (2011) framework were useful for evaluating the learning networks and knowledge dissemination processes in the Amanzi for Food Programme, where the knowledge dissemination was directly linked to practical interests:

1. What is the value within the activities and interactions themselves?
2. Does the learning network result in a creation of knowledge and practice that can be shared?
3. Are members able to leverage that knowledge and practice?
4. What is the impact of knowledge and practice on learning network members goals if any?
5. How does involvement in the Learning Network and the knowledge and practice created and shared caused members to reframe, reconsider and transform their actions or work?
6. What insights are gained for expanding the Learning Networks, for knowledge dissemination, and for managing and supporting such processes?

7.2 Applying a Value Creation Framework to Evaluating Social Learning and Knowledge Uptake in Key Areas of the Knowledge Uptake Strategy

7.2.1 Applying the Value Creation Framework

The VCF requires researchers to generate data from a range of different sources, and to develop value creation narratives which are then analysed to identify potentially 8 different types of value. Wenger et al. (2011) explain that are potentially 5 cycles of value creation in

social learning initiatives which could help to establish how knowledge dissemination processes such as that being developed in the Amanzi for Food programme can be created:

- Cycle 1 – Immediate value whereby interactions and activities are observed and identified as valuable.
- Cycle 2 – potential value/ knowledge capital. In this cycle the value is in possessing knowledge that may be useful in the future.
- Cycle 3 – applied capital – changes in practices. In this cycle the value is in using knowledge to do something, particularly to do something new or different to what has been done before.
- Cycle 4 – realised value – performance improvement. In this cycle value is observed by noticing that doing something differently as a result of new knowledge has yielded positive results, and has achieved the desired outcomes of the actions.
- Cycle 5 – reframing value – redefining success. In this cycle the value is observed when the participants have developed a new understanding of what success and value is.

They indicate further (Wenger-Trayner and Wenger-Trayner, 2020) that these forms of value are influenced by, and also influence the generation of orienting value, enabling value, transformative value and strategic value, explained briefly (as also applied to the Amanzi for Food study) as:

Orienting value: A social learning space always takes place in the context of a broader social-ecological) landscape. Locating the social learning in such a space offers important orienting value to a social learning process. In this study we used contextual profiling to establish the orienting value for the social learning process.

Enabling value: This refers to value that is created by the external context (e.g. resources; useful material, etc.), and the internal context (e.g. participant's willingness to learn and work together). The converse of this is constraining conditions (e.g. historical circumstances, lack of access to land, etc.). In this study, enabling value is the value that is created by for example the WRC knowledge resources, and by the willingness of communities and lecturers and other partners to co-operate.

Transformative value: This refers to the value created through significant changes to people, or something in the world. This is normally also value that challenges the status quo, or when very substantive, leads to transformation of social structures or deep changes in agent's capabilities. It is value that makes a real difference. In this study this is signified by the difference that the social learning process is making to people, to farming practices, and to food production.

Strategic value: This refers to value that helps to clarify the direction and usefulness of a social learning space or process. Strategic value is often necessary to elevate the relevance of learning in the mind of stakeholders, organisationally or societally. In this study, this is captured in the findings of the study that are most useful for structuring a Knowledge Uptake Strategy and the associated tools that have been produced for this work going forward with others in other social learning settings.

Value creation stories give meaning to the value creation cycles and their complimentary indicators shown in Figure 7.1 below. Wenger *et al*. (2011:37) articulate this well when they explain that, "…stories substantiate indicators, give them life, and make them more meaningful by connecting them into more extensive processes of value creation". Stories and indicators thus point to and reinforce one another and the data from each cycle needs to be combined with the cross-cycle stories in order to provide an integrated understanding of the value created in communities and networks. If this is not done then an indicator by itself is only suggestive and one story merely anecdotal. In Figure 7.1 below, this is indicated by the broken lines that show the cycles, and the connections between the cycles of value creation, and how these are influenced and shaped by the orienting and enabling value (and constraining factors) and by the emerging transformative and strategic value, which in turn then can shape new orienting value and enabling value that helps to create new forms of immediate, potential, applied, realized and reframed value. This framework is very useful for social learning evaluation as it creates a means of monitoring and also reflecting on 'what value is created for whom under what conditions', and also sheds light on how this value is created over time.

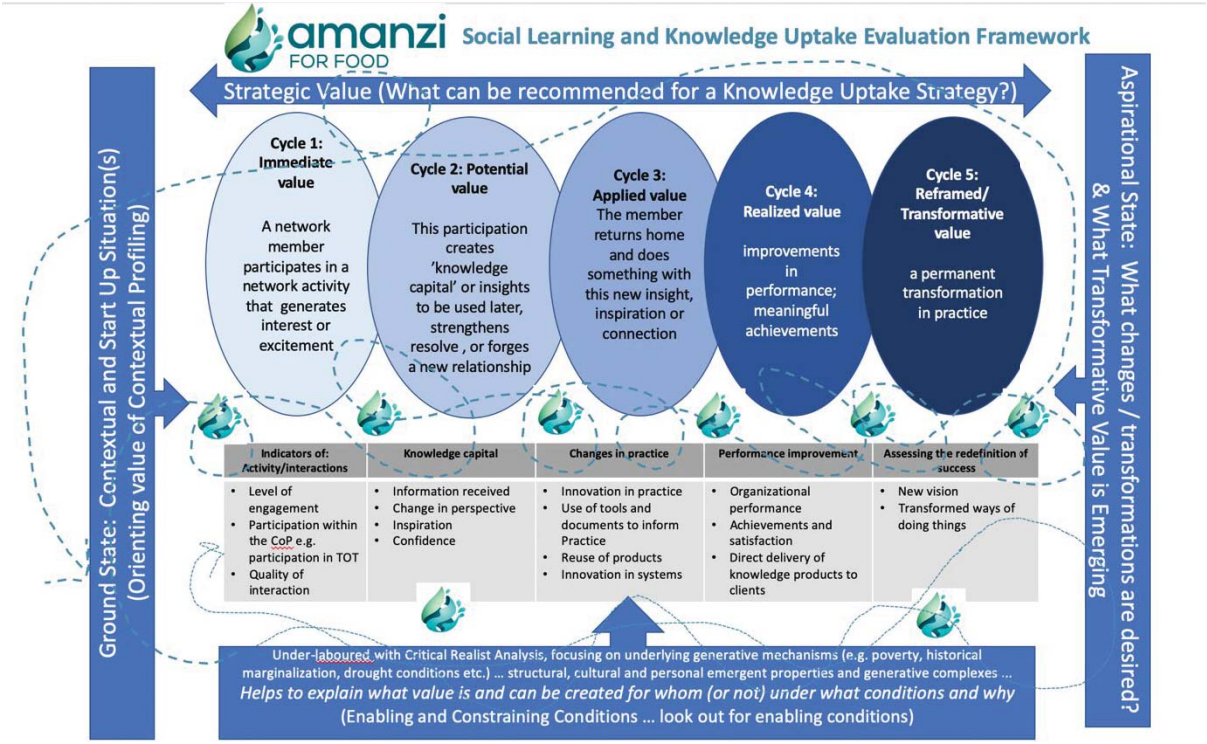


Figure 7.1. Diagram showing the Amanzi for Food Social Learning and Evaluation Framework, indicating the types of value, and types of indicators that can be developed in a social learning and knowledge uptake process over time (Evaluation framework diagram adapted and developed from Wenger, Trayner and De Laat, 2011; Wenger-Trayner and Wenger Trayner, 2020, and Bhaskar, 2016)

Important to this evaluation design, is the emphasis that Wenger et al. (2011: 37) place on cumulative evidence when presenting stories. For example, across the different learning networks in the Amanzi for Food programme, the one practice that participants have found valuable was the productive demonstration sites. There is therefore a need to synthesise and interpret the cumulative stories about this activity and this will then better indicate what

participants found relevant to their work practice as well as what they consider good value for their time.

Using this framework can be helpful in that monitoring indicators and collecting associated value-creation stories provides the tools to construct a holistic picture of the value created by the learning and knowledge dissemination in the learning networks. From the value creation narratives, and a following of the 'cumulative threads' across the stories, data is then analysed into a matrix – see Table 7.1 below, and from there indicators are refined further for each type of value aligned with the different activities that make up the full knowledge dissemination process.

Table 7.1 Evaluation Matrix for analysing types of value created for different activities (with indicators being developed for each one based on the data), showing how data can be captured in the analysis process

	Immediate Value	**Potential Value**	**Applied Value**	**Realized value**	**Reframed/ Transformative Value**	**Other**
ToT Course Process	Mediated access to new information	Long-term access to information through permanent access to the WRC material	Information supporting and guiding new practices	Practices improving productivity	Developing new approaches to food production	
Demonstration Site Development	Engaging with others to plan and develop the site	Potential for sharing ideas and practices with others	PDS reaching out to others while improving productivity n site	PDS used by all LN members to train others	Shift in agricultural practices	
Change Projects	Recognition of need for and opportunity for change	Sharing vision for change with others	Providing specific guidance to others (lecturers, farmers, etc.)	Enhanced curricula, improved, more sustainable practices	Recognition of value of change and adaptation. Breaking out of conventional ways of thinking	
WRC Material	Immediate access to valuable information	Specific practices seen to be potentially useful in different contexts	Handouts and other printed material useful for field demonstrations, and using PDS as teaching resources	Material become part of ways of thinking and understanding	Application of new ways of thinking to other aspects of farming, teaching and life	
Learning Network Meetings	Face-to-face meeting with respected friends and colleagues	Opportunities for sharing ideas and information leading to growth	Working together on *ilima* days to support each other in implementing new practices	Development of strong collective understanding and consciousness around sustainable agriculture	Collective energy and strength to lobby government for better policies	

WhatsApp group interaction	(Almost) immediate response to questions and concerns. Also recognition of success.	Build long-term support network and increase in shared knowledge base	Use to explore interesting questions, provide support to others, counter negative and false narratives	Ongoing interactions around widening range of interests and concerns. recognition of skills and understanding held by all members	Collective strength used to influence important shifts in agricultural practices, approaches and policies	
Media extension	Recognition of achievements	Potential for sharing ideas beyond the group	Developed use of media for promoting ideas widely	Recognition by others of individual and collective voices and achievements	Farmers and others can shift the agricultural discourse to one more responsive to them.	

NOTE: this represents just one range of examples to indicate the kinds of evidence that can be found tom populate the matrix for analysis (we provide a more comprehensive version of this table as summative evaluation at the end of this Chapter).

7.2.2 Evaluation Data and Progress with Data generation

Data that was used for the evaluation came from all three learning network sites and it involved the following:

1) **ToT Course Observations** (video and photographic data has been generated from all course sessions), especially course excursions and practical demonstrations which helped to mediate the content of the WRC material.
2) **ToT Course Assignments and Assessments** (course assignments and assessments contained information on the 'sense' that course participants made during their participation in the ToT programme. The course assignments also showed participants' plans for change projects, and gave indications on which of the WRC material were most favoured for supporting their planned change projects).
3) **ToT Course Evaluations** (course evaluations provided information on how the programme was being experienced, as well as information gained, and value of the course to participants) – see Appendix 7.1 in the accompanying Appendices document for an example of a course evaluation sheet. Course evaluations have been generated from all course sessions to date and have been placed in the google drive folder.
4) **Demonstration site observations via follow up site visits**: The Amanzi for Food research team have been following up with follow up site visits to capture evaluation data on the demonstration sites. This captured data on the learning, and learning network links, as well as the practical value of the WRC material and the demonstration sites. Practical site visit follow-ups were done in the Eastern Cape and Mpumalanga, and the plans to visit North West Province in the final year were disrupted by COVID-19 travel and movement restrictions.
5) **Learning Network Minutes and Interactions on WhatsApp**: Learning Network meetings were also documented using minutes, and ongoing interactions in the Learning Networks were captured on the WhatsApp groups.
6) **Interviews with co-ordinators of the Learning Networks**: A series of interviews were done with co-ordinators of the Learning Networks, and with farmers who have been benefitting from the use of the WRC material to probe the value that has been created, as well as difficulties experienced.

7) **Ongoing Contextual data generation including documenting radio, newspaper and website interactions and coverage**: The project continued to generate contextual profile data and document media interactions.
8) **Evaluation questionnaire**: An online evaluation questionnaire was used to 'fill in' any gaps in insights that were not covered via the above-mentioned data sources.

All of these data sources were used to develop this report, and the value creation narratives, and the evaluation analysis. The evaluation process is on-going and as shown across this report, all aspects of the programme have been covered in some depth in terms of the narrative descriptions (cf. Chapter and 2 for contextual data to establish orienting and enabling value, as well as constraining conditions and circumstances); Chapters 3, 4, 5, 6 to develop narratives of the contextual and relational processes involved in learning network formation (Chapter 3), use of social media tools to expand social media (Chapter 4), the Training of Trainers programme and associated demonstration sites developed as Change Projects (Chapter 5); Curriculum Innovations (Chapter 6). Throughout the report it is evident that the value creation narratives described per chapter, were in fact interrelated and iteratively developed processes over a period of time.

In this Chapter we demonstrate how we undertook the value creation evaluation analysis based on the narrative data reported on above. The evaluation analysis started with capturing information on the different types of value that were being created for different groups of participants and different types of activity (e.g. farmers, LED officers, lectures, NGOs) in the form of value creation narratives that were written up based on triangulation of the raw data. From here, cumulative narratives on key emerging themes were identified and written up, and these were then plotted into the analytical matrix, to inform the development of indicators which provide more insight into the types of value created via different types of activity via the social learning process. To make sense of the data within a useful evaluation framework for the project, we needed to 'customise' the generic evaluation framework of Wenger et al., (2011) and Wenger-Trayner et al. (2020) so that we could offer more meaningful interpretations of the value that was created (or not) in the evaluation work.

We turn now to the initial evaluation framework development and analysis that we developed to a) develop the applied methodology for the WRC project, and b) to test the validity of the framework using data from mainly one of the mediation processes that has been used to activate and support the social learning network development process, namely the Training of Trainers course. We chose to focus in on the Training of Trainers course in more depth because of its catalytic role in enabling the establishment and follow through activities of the Learning Networks.

7.3 Examples of How to Apply the Value Creation Framework to Elements of the Knowledge Uptake Strategy

The VCF has been applied to all elements making up the Knowledge Uptake Strategy followed by the project, particularly since the beginning of Phase 2. As the most intensive component of the strategy, and one which was implemented in three widely different contexts, the Training of Trainers courses provided the most substantial data on which to draw for a VCF-based analysis.

7.3.1 Three case study sites, course modalities, participants, and selection of data

As described in Chapter 5, in the second phase of the WRC 'Amanzi for Food' project the Training of Trainers' (ToT) course was conducted in three provinces: the Eastern Cape, Mpumalanga, and North West. Each province provided quite contrasting contexts in which to run the course and support the development of learning networks and productive demonstration sites, providing experience of wide-ranging opportunities for promotion of access to the information provided by the WRC material.

As reported in Chapter 5, in the first iteration of the project, the ToT course was developed and facilitated as a five module/ five contact session process, requiring participants to complete five assignments. The experience, however, suggested that it was extremely challenging for many participants to be able to dedicate sufficient time for such an intense and demanding process, and in the second phase the modality was changed to three modules facilitated over three one and a half days, with the participants being required to complete just three assignments. This modality was applied to the courses in the Eastern Cape, and Mpumalanga. In North West Province, however, the workload of the staff at Taung Agricultural College, where the course was to be run, militated against the possibility of this three session approach (a good example of constraining factors) and the course was facilitated over a three day single session. These differences in modality had implications for several aspects of the course, including the development of learning networks and productive demonstration sites. The fact that the course in the Eastern Cape was the second in this area also had considerable and positive implications for both the expansion of the already existing learning network and a substantial increase in the potential for more productive demonstration sites.

Further contextual differences were presented by the range of participants attending each course and the geographical areas from which they were drawn. Table 7.2 identifies some of the key contextual differences and some of the key implications of these; in other words it helps to identify the orienting value and the enabling value of the social learning processes and learning networks catalysed via the ToT courses.

Table 7.2 Contextual differences between the 3 Sites

Province/Location/Catchment	Course Modality and Assignments	Participations	Implications for Learning Network development	Implications for Productive Demonstration site development
Eastern Cape Fort Cox Agricultural and Forestry Training Institute (FCAFTI) Predominantly Amathole District Municipality with some participants from Buffalo City Metropolitan Municipality	3 x 1 ½ days 3 individual and 1 group assignment The second course was implemented in this area. Completed November 2017	Farmers, Agricultural advisors (extension officers), NGO personnel, Staff and students from FCAFTI Staff and students from Fort Hare University Local economic development officials	Imvotho Bubomi Learning Network established the first running of the ToT course. This expanded through the second course, including NGO personnel. The Network is centred on FCAFTI but with a strong and active farmer constituency, and comprises representatives of all stakeholder groups	Productive demonstration sites established at FCAFTI and on farmers' lands out of first course. Added considerably between courses and during and following the second course. Course graduates sharing their experiences with others, using their own gardens and farms as demonstration sites. Strong links to the WRC Climate Smart Agriculture (CSA) project.
Mpumalanga University of Mpumalanga (UMP) Province-wide	3 x 1 ½ days 3 individual and 1 group assignment First course in this area Completed May 2018	Agricultural advisors (extension officers) NGO personnel Staff and students from UMP	Some potential for establishing a baseline for a learning network, but geographical spread limits direct interactions. The Sinakekela Sibusiso Semanti province-wide learning network, involving primarily course participants, established centred on UMP as an umbrella network, supported through WhatsApp. Smaller local networks led by NGO personnel and agricultural advisors in the districts. Membership of the former comprising course participants, with farmers being brought into the district level networks, although these remain quite limited in membership	Some initial planning done within the course process, and in some areas sites developed before the end of course. NGO personnel and agricultural advisors negotiate with partner farmers to establish sites on their lands, and on which RWH&C practices to introduce. Productive demonstration sites viewed and used as extension of support from NGO and agricultural advisors to their existing farmer groups.

North West Taung Agricultural College (TAC) The TAC itself (although students from further afield)	1 x 3 days 1 individual assignment First course in the area October 2018	Students Lecturing staff Technicians and farm staff	Limited potential for setting up strong learning network within the course process, but the #PulaWise learning network, as a WhatsApp group, proposed for establishment, centred on TAC. To comprise predominantly TAC personnel (including students), with local agricultural advisors, and local political and traditional leadership. Idea to expand into broader Taung area. Suggestions for learning networks in some students' home areas.	No potential for establishing sites within course process, but some planning carried out as course activity. Main proposals for establishing sites on TAC grounds. Some suggestions for sites in community areas and farms around Taung, and also in students' home areas.

As described in Table 7.2 the contexts provided both different challenges and different opportunities. The limiting of course participants at the TAC to only staff, students and technicians from the college, reduced the potential for the rich interactions which figured so strongly in the other sites, which also impacted on the dynamic of the #PulaWise Learning Network, and its eventual decline.

7.3.2 Adaptation of the Value Creation Framework (VCF) into the Amanzi for Food context

As noted above, the Value Creation Framework from Wenger et al. (2011) and Wenger-Treynor et al. (2020) was adapted into the Amanzi for Food context to enable deep probing of any changes which may have resulted from the project's work in the three provinces. The indicators and questions were designed to explore the experiences of the participant groups and individuals, and the tangible and intangible outcomes arising out of these experiences. The individuals and groups from which the information was obtained for the analysis were those who participated in the ToT courses and were members of the learning networks. Box 7.1 provides an overview of the adapted framework:

Box 7.1. The VCF Adaptation for Amanzi for Food

Amanzi for Food VCF: Indicators and Questions

Cycle 1 – Immediate Value: *Activities and Interactions*

1.1 Undertaking course in collective with others (individuals, organisations, departments, disciplines, etc.)
- People/organisations involved in collective?
- Degree of interactions within collective?

1.2 Gaining access to new information and ideas (WRC material, others' experiences, input from facilitators, etc.)
- Sources of information?
- Types of information?
- Means of access to the information?

1.3 Collaborative activities (group discussions, field visits, etc.)
- Types of activities?
- Engagement with the activities?
- Initial outcomes of activities?

1.4 Initial steps in developing networks (or consolidating and expanding networks)
- Locus and membership of networks?
- (Proposed) structure of networks?
- (Proposed) focus for networks

Cycle 2 – Potential Value: *Knowledge Capital*

2.1 Reinforcement of existing knowledge (including indigenous/local)
- Types of existing knowledge?
- Sources/locations of existing knowledge?
- Applicability of existing knowledge?

2.2 Gaining new knowledge and skills (from WRC material, course texts, videos, facilitators, other participants)
- Types of new knowledge?
- Sources of new knowledge?
- Applicability of new knowledge?

2.3 Locating new knowledge into own context
- New knowledge located in context?
- Reasons for selection of this knowledge?

2.4 Establishing connections (*some overlap with networks indicators*)
- Kinds of connections established?
- With whom connections established?
- Purposes for establishment of connections?

2.5 Increased agency through connections/collaborations
- Collaborative activities undertaken?
- Outcomes of activities?
- Evidence of strengthened agency through collaborations?

2.6 Increased understanding of and capacity for learning (from open process of ToT and learning-focused elements within the course), including of notions of curriculum and training processes
- Learning processes engaged in within the course?
- Course elements dealing with learning processes?
- Learning processes drawn on for assignments?
- Learning processes proposed for further sharing of information?

Cycle 3 – Applied value: *Changes in practice*

3.1 Changes in curricula/training processes:
- Curriculum/training process changes identified in assignments?
- Justifications for these changes?3.2 Use of new approaches/media, including

establishment of WhatsApp groups, for sharing information and ideas from WRC material:
New approaches/media uses identified in assignments?
Justifications for these new approaches/media uses?
3.3 Adopting more collaborative approaches through planning for/developing productive demonstration sites and other activities:
Collaborative processes, described in assignments, for planning and developing productive demonstration sites?
Collaborative processes associated with other activities?
3.4 Drawing on information in WRC material (and other sources) to support changes in practice:
Information used to inform changes/activities?
Sources from which information is drawn?
Specific information from specific WRC material used to support changes/activities?

Cycle 4 – Realized value: *Performance improvement*

Not directly relevant in relation to courses and assignments but some evidence available through more established Learning Network activities:

4.1 Enhanced and productive collaborations
4.2 More effective lobbying
4.3 Recognition of achievements by external observers
4.4 Productivity of sites
4.5 Cascading of demonstration site development
4.6 Expansion and usage of elements of the ToT course and the WRC material

Cycle 5 – Reframing value*: Redefining success*

Limited scope in most situations at this stage; insufficient data for analysis:
5.1 Previous definitions of success
5.2 Changes in definitions
5.3 Reasons for changes

7.4 Findings from the Evaluation Analysis, Informing Indicators and Evaluation Methodology for a Knowledge Uptake Strategy

For development of the Knowledge Uptake Strategy it is very important to have a deep understanding of the effectiveness of the various project components in promoting the uptake and use of information. The applied analysis of the data gathered through the VCF process was central in making this determination.

7.4.1 Applied Analysis of the VCF in the 3 Sites

The VCF was applied as appropriate in the contexts of the three provinces. Given the relatively early stages of learning network and productive demonstration site development in Mpumalanga and the North West Province only the first 3 cycles were examined, whereas in the much more established context in the Eastern Cape the first 4 cycles were examined. The 5th cycle was not examined as to date there has been no data collected which could inform the questions.

The data to support the analysis was selected from the assignments, the course evaluations and other course records according to the key questions in the framework. The experiences related to some of the questions, especially many of those associated with Cycle 1, in

particular, and some in Cycle 2, were inevitably similar for all participants within a particular course. These were analysed on a generic basis for each course. However, where there were opportunities for a more individually oriented analyses, these have been taken through the inclusion of individual examples. The questions associated with Cycles 3 and 4 provided more opportunities for such analysis at an individual level.

As this is the first time this framework has been applied, and it departs in some ways from previous evaluation approaches, some gaps in information have been revealed. The intention is to shape all subsequent evaluation processes to include accessing the information required to address these gaps. However the development of the framework itself is considered something of an iterative process at this early stage, and the framework is certain to be refined in which process it is likely that the indicators and associated questions will be adapted.

The following tables summarise the analysis for each of the provincial courses:

Table 7.3 VCF analysis of the impact of the TOT course at the TAC

North West Province (Taung Agricultural College)		
Cycle 1: IMMEDIATE VALUE Indicators	**Evidence and Outcomes**	**Analysis**
1.1 Undertaking course in collective with others	There was in this course a limited range of participation, solely from within the college. Technicians and farms staff seated themselves together, while the lecturers and students were more mixed. One evaluation comment suggested that working with unknown people was initially a challenge, but ultimately liberating. The productive demonstration site groups deliberately including representatives of all college sectors. It was clear that such collaboration within the college was not usual, and there were positive responses to the opportunity.	The opportunity to work and learn with others, although limited in this context, was well taken and appreciated. It remains to be seen how this will play out in future college activities.

1.2 Gaining access to new information and ideas	Commercial agriculture in the Taung area is heavily dependent on conventional irrigation systems, which are not accessible to smaller-scale emerging farmers or household food producers. The information in the WRC material shared though the course, and the means of sharing them introduced through the training, in particular the value of practical demonstrations, were almost entirely new for most course participants. There was an overwhelmingly positive response to the information and the ideas. From the evaluation summary: *I have learnt about the importance of conserving water and soil, the different indigenous knowledge systems such as planting pits used to conserve water and soil, climate smart agriculture.*	There was recognition that RWH&C practices may not be immediately appealing to the commercial farming sector, although there is recognition that the water from the Vaal river, which is used for the irrigation systems, is very polluted. The new information from the WRC material, and shared in the course, appears to have provided an opportunity for stronger engagement with local small-scale farmers and household food producers, with whom this information and these ideas can be shared further.
1.3 Collaborative activities	In this 3-day course there were limited opportunities apart from the practical exercise to initiate development of ideas around productive demonstration sites. The mixed groups of lecturers, students, farm staff and technicians took this opportunity extremely well and produced clear and well-thought through plans. Assignments indicate emphasis on collaboration in developing the productive demonstration sites, including in one case (**NW2**) involving partners from outside the college.	The value of collaboration was recognised particularly during the practical exercise. The assignments suggest that this value has been well embedded in the thinking of most participants, although how this materialises in reality remains to be seen. The notion of collaboration, including with others outside the college, appeared to spark considerable interest, and to provide a stimulus for more engagement with farmers and other partners in the area.

1.4 Initial steps in developing networks	The #PulaWise network was proposed as the main umbrella learning network, centred on the college. The establishment of this network was supported and reinforced through most assignments, with proposals to include a good range of partners from outside the college, including local radio. In assignment **NW2** these include representatives of the ELRC and Fort Cox College: *The reason I have chosen the college as the first demonstration side, is because it is in a position that connects a lot of stakeholders. The college connects with its academic and support staff, the student and the community (through its community outreach program). That means the college will have a lot of members in the learning network and not forgetting everyone that attended the Amanzi for Food TOT.* *Support will be needed from the Environmental Learning Research Centre for guidance in utilising the resources from the WRC in establishing demonstration sites and also in disseminating information through their Amanzi for food Facebook page and website.* *Chamu from Fort Cox College of Agriculture and Forestry will be added to the learning network since he has been a part of the programme for years and has not only gained knowledge on rainwater harvesting and conservation but has also implemented most of the practices.* *From the community of Greater Taung, I would invite the Chief, Kgosi Mankuroane, this is because there is no initiative that one could bring to the community of Taung without it first being approved by the tribal office. Next I would invite Vaaltar FM, they will help to spread the word on rainwater harvesting and conservation through their radio station. Information of the different practices and the productive demonstration sites will be discussed on the radio shows.* *The Local Agricultural Office and the Greater Taung Municipality will help us identify backyard gardeners through the food security programs. This is where another backyard demonstrations site will be established in future.*	The importance of and potential contribution to everyone's work of learning networks was well appreciated. There was full consensus on the desirability of establishing the network and, eventually, on the name chosen for this. However, the network is yet to be established.

Cycle 2: POTENTIAL VALUE Indicators	Evidence and Outcomes	Analysis
2.1 Reinforcement of existing knowledge	The predominant existing knowledge was of conventional irrigation systems, although 2 participants (assignments NW1 and NW2) had previous experience of RWH&C and Climate Smart Agriculture (CSA). In the former case the new knowledge was in some ways contradictory to the existing knowledge, although the ideas around soil management were fully compatible with previous understandings. For those with previous exposure to similar ideas the course was entirely reinforcing, and enhanced already strong commitments to a more nuanced approach to water and soil management. There was some limited discussion of local knowledge of practices, such as small dams, for managing rainwater as a key resource.	Although there is a considerable gulf between the underlying philosophies of RWH&C and conventional irrigation practices, discussions helped to identify the potential synergies. Basic understandings of soil and water management, from more conventional perspectives, were well reinforced through the deeper understandings of these required for RWH&C.
2.2 Gaining new knowledge and skills	Much of the knowledge on RWH&C shared through the course was new to most participants, and this knowledge was displayed through almost all assignments. There has been too little time to assess any development of new skills, although the skills of collaboration across different college sectors were demonstrated for the first time in the practical exercise, and indeed in the sharing of ideas throughout the course. New knowledge relating to methods of sharing information, was also demonstrated in most assignments.	Considerable excitement was generated through the introduction of new knowledge, which was absorbed avidly, and permeated the assignments. While there was no opportunity to assess the development of new practical skills, 'soft-skills' such as collaborative learning were evident throughout the training.
2.3 Locating new knowledge into own context	The assignments provided the opportunity for course participants to take their new knowledge and locate it within their existing work, and extend it into new areas. In particular the curriculum changes proposed in assignments **NW1 and NW2**, provided strong evidence of locating knowledge into context. The proposals for establishing productive demonstration sites on campus also provide a real opportunity for location in context.	The willingness and ability of course participants to locate the new knowledge into their various contexts was evidenced by the assignments, and the initial plans for productive demonstration sites. However, how the proposals in the assignments and the site plans actually materialise remains to be seen.

2.4 Establishing connections	There has been limited time for the establishment of new connections except for those established within the course itself between teaching staff and students, and the farm staff and technicians. It is also too early to say how well these connections have been maintained and/or developed further. Further connections are proposed in the assignments.	The importance and value of establishing strong connections was well appreciated However there has been no opportunity to date to assess the effectiveness and sustainability of these connections.
2.5 Increased agency through connections	There is, as yet, no evidence available to suggest increased agency though the new connections, although the tenor of some assignments, suggests that this should emerge.	As above, more time is needed to be able to assess any strengthening in agency as a result of the connections made and proposed.
2.6 Increased understanding of and capacity for learning	The collaborative approach to learning exemplified by the way in which the course was facilitated, and elements focussing specifically on learning, opened up opportunities for new understandings. The strengths of many assignments, with their inclusion of new ideas on practices and on sharing information in different ways, suggests that real learning (about learning) has taken place within the course.	The concept of 'learning' as a specific capacity or skill is generally not strong in contexts such as agricultural colleges, where the focus is on the practical content of the curricula. However, it appears that the discussions and demonstrations of different approaches to learning resonated with many participants.
Cycle 3: APPLIED VALUE Indicators	**Evidence and Outcomes**	**Analysis**
3.1 Changes in curricula/training processes	The main evidence for proposed curriculum changes is found in assignments **NW1 and NW2**. In these the lecturers propose inclusion of RWH&C components into most aspects of the curricula for which they are responsible. None of the other participants are involved in formal training processes, but they are involved in sharing information with farmers on an informal basis. The assignments (**NW3-6**) in which these processes are described indicate that this sharing of information will now include RWH&C practices and use of the WRC material. From **NW3**: *I would share the information with other farmers by:* *Handouts (H)* *As Case Study or Stories (CS)* *As information in the text*	Detailed descriptions of proposed curriculum changes are included in these assignments. These include specific aspects of RWH&C to be included in various modules (NW1), and a course outline with a strong focus on RWH&C (NW2). Including, from NW2: *The practices will be introduced in Unit 2 and 3. This is because as you are teaching the effects of land*

	In some case I would share the information by presentation using visual aids such as Power Point. *Viewing Videos.* *Using Internet especially the WRC Amanzi for food website* *Practical Exercises.* *Demonstration using WRC Amanzi for food Teaching Garden.* *Visits to working demonstration and face to face discussions with farmers implementing RWH&C Practice*	*degradation and water scarcity, rainwater harvesting and conservation will be the solution but the actual practices will be discussed in detail during unit 4.*
3.2 Use of new approaches/ media	The ideas supporting new approaches and use of different media for sharing information were discussed in some depth in the course. These ideas have been taken into most assignments, with references to the use of the internet and social media, and community newspapers and radio stations as means of sharing information. A fairly typical example (shortened, but otherwise unedited) comes from **NW4**: *A Workshop would be a start, gathering most of the local upcoming farmers and go with them through the water harvesting and conservation* *The practical demonstration site where the benefits of such is to actually show the farmers how it's done in the field so that they could be able to make it for themselves or they could have an idea how it's done.* *Local radio would also do since it is also part of the learning ways,* *The aid of Newspapers would also be a wonderful point where I would be telling people who loves to read newspapers about the importance of Rain Water harvesting and Conservation* *Social media would be one of the tools to distribute the information faster and more especially to the youth of the country since they are the one who are more into social media (Facebook, WhatsApp and Instagram).*	The course led to a broadening of understanding of the many approaches and media which can be employed in the sharing of information. This was perhaps one of the most positive impacts of the training.

3.3 Adopting more collaborative approaches	As discussed above (1.3, 2.2, 2.4 and 2.6), the practical activity showed the value of collaboration and the assignments provide strong evidence of a desire for more collaboration. A slightly shortened and edited example from **NW6**: *The most important support I will need is to get hold of the local people. The Taung chief/king will give me support by spreading the message to the locals and give me the authority to implement programmes in his land.* *To make the learning programme a success and reach organisations or distribute information I am going to need the local radio station Vaaltar FM,* *I will need guidance during the learning programme therefore agricultural advisors and lecturers in my school could offer help to make the programme a success.* *In order for me to develop a poster I am going to need students to be part of the practicals so that we can take pictures and then share our poster with farmers.*	Although there is strong reference to collaboration in all assignments, there is also a sense that some individual participants see this as a process which is led by them individually and supported by others. The example in the previous column provides some evidence of this orientation. This may require further examination when some of the collaborative activities have been implemented.
3.4 Drawing on information in WRC material	The main focus of the course was on accessing the information in the WRC material, in particular through the use of the navigation tool. This focus was carried through into **almost** all assignments, with many references to the WRC material themselves and the use of the navigation tool to assist in accessing the information. This applied both in relation to proposed curriculum changes and in relation to informal sharing of information with farmers. The WRC material were provided to all participants on a memory stick, as hard copies are not available. From **NW2** (edited): *In 2018, during the first semester, while I was busy lecturing ISWC 2018, I wanted to introduce the concepts of rainwater harvesting and my biggest problem was obtaining relevant material that I would utilize in class that was accurate and relevant. Through the WRC research publications acquired through the Amanzi for Food program I will be able to use the books for teaching and learning.* From **NW3** (edited): *When coming to help other farmers in accessing and using the information in the WRC material I will simply introduce the Navigation tool to them. The Navigation tool is designed to help access critical information on rainwater harvesting and conservation (RWH&C), i.e.* *WH&C – Water Harvesting and Conservation* *AWHGS – Agricultural Water Use in Homestead Gardening System.* *The information can come in any of three forms.* *As Handouts (H)* *As Case Study (CS)* *As Information in the text (T)*	For almost all course participants the training provided the first opportunity to access the information in the WRC material, which were previously unknown. The value of the material and the information they contain was immediately recognized, and stimulated a strong desire to share the information further.

The ToT course at the TAC clearly opened up considerable interest in the WRC material and the information on RWH&C contained in them and led to immediate, potential and some forms of applied value that was created for participants on the course. Energy and enthusiasm developed over the 3 days of the course, leading to the establishment of the #PulaWise Learning Network (applied value), and initial work on the productive demonstration sites planned during the course (potential and applied value). There was appreciation of the opportunity to work with others, who while being on the same campus, had previously had no chance to get to know and learn and work with each other (potential and possible reframed value). The information from the WRC material shared in the course was extremely well received, as evidenced in the table, with concomitant recognition of the opportunities presented by various media, for people to share their understanding more widely (potential value high). At the level of direct impact, therefore, the course was clearly effective, with the assignments indicating real intent to make changes in both curricula and practices. However there is limited evidence of translation of this immediate impact into longer-term change (i.e. immediate and potential value not translated into applied or reframed or longer term transformative value). There are many possible reasons for this, one of which is perhaps the relatively low level of influence carried by the lecturing staff who attended the course in the quite strict hierarchical college structure (i.e. constraining factors), and the lack of involvement of people, such as farmers and extension personnel in the course itself (i.e. problems with enabling value). The longer-term collaborations which emerged in the other contexts never really took off in the North West Province, due perhaps to the lack of enabling value that resulted from the project team also being a far distance from the College and other factors such as COVID-19 in the last year of the project, when we hoped to upscale the learning network to learning network interactions.

Table 7.4 VCF analysis of the impact of the TOT course in Mpumalanga Province

Mpumalanga Province (University of Mpumalanga)		
Cycle 1 IMMEDIATE VALUE Indicators	**Evidence and Outcomes**	**Analysis**
1.1 Undertaking course in collective with others	The course included wide representation within the agricultural sector in the province. This included teaching staff and students from UMP, agricultural advisors from DARDLEA, NGO personnel, and community radio personnel. Many of these had no previous contact with each other and the rich mixture provided a dynamic context for the learning. There is some evidence of this being taken into collaborations in the field.	The wide representation made for a rich learning experience, with participants gaining considerable understanding of each other's contexts, experiences and challenges. There are indications that this is strengthening collaborations between various sectors across the province.
1.2 Gaining access to new information and ideas	The focus of the training was very much on making the information in the WRC material accessible, and it was through the assignments that evidence of participants accessing this information was presented, for example:	The availability and accessibility of the information was welcomed by participants as it opened

	MP1/2: *Material used are mentioned below:* *Amanzi for food booklet (Gelesha practise and rain water harvesting)* *WHC Planning (Chapter 6) Topography (aspect, slope, elevation)* *WHC Method (Chapter 6) (To understand how tied ridges are made and any other rain water harvesting technique)* MP2/2: *The practice we chose as a group was acquired via using the WRC Resources Library but also from information given to us by the farmer and her employees. Within the WRC we made use of WHC volume 2 parts 1 and Volume 2 part 2. We made uses of Chapter 5 dealing with Soils, Chapter 6 dealing with WHC planning and Chapter 7 dealing with the different methods.* MP6/4: *From the WRC material I think that the following documents or booklets will greatly assist;* *TT 542-12 Sustainable techniques and practices for RWH&C and their Effective Application in Resource-Poor Agricultural Production.* *The printable information cards on the Amanzi for Food website. This will assist in sharing the information as it offers visuals or pictures for participants who are unable to respond to the English medium.* Other assignments cited almost the full range of WRC material from which they intended to draw information, suggesting that these will be seen as central support resources for their work. The combined evidence makes clear that participants were accessing the information in the material in a variety of ways. The diversity of participation also provided opportunities for everyone to access new ideas from other sectors.	doors into new ways of working with their farmers and others. The ideas shared between participants, out of their experiences, were also extremely valuable in fostering better mutual understanding and strengthening knowledge of different approaches and practices.
1.3 Collaborative activities	The course provided a number of opportunities for participants to engage in collaborative activities. Apart from group discussions, for which care was taken to ensure that the groups included representatives from different sectors, there were various practical activities, including soil analysis, field visits to agricultural projects, and a planning activity for productive demonstration sites. The assignments then provided clear evidence of an adoption of a collaborative approach to their work: MP2/2: *The group that I was part of consisted of 4 members, two members worked for the Department of Agriculture covering Bushbuckridge south area. The other remaining member came from an NPO called MASDT* MP4/2 (lightly edited): *Christian Thobejane a Cluster leader who is also a farmer in Sedawa* *Mariam Malepe from Bochabelo an Induna and Farmer* *Gogo Maphori an old lady who is determined to save water* *Trygive Nxumalo – a permaculture specialist working with the local community in promoting soil and water conservation.*	The strongly collaborative orientation of the training was well received. The specific collaborative activities enabled participants to learn from each other, and recognise that, despite institutional and other contextual differences in their work environment, they were working towards the same goals. This in turn opened up opportunities for future collaborations.

	Patricia Novena from Lepelle a potential area for future water harvesting *Edgar Kgwedi – a young farmer from Willows keen upcoming farmer*	
1.4 Initial steps in developing networks	The framework for a province-wide network, linked through a WhatsApp group, was established at the first training session. This evolved into the Sinakekela Sibusiso Semanti (SSS) learning network which remains active at a fairly low level. It is proving particularly useful when arrangements for events or visits need to be made, and there is some sharing of experiences and information. Many members of the SSS network are also linked to the national Climate Smart Agro-ecological Network, which has an agro-ecological activism and advocacy focus. Subsequently at least one other WhatsApp group/learning network has since been established, in Ehlanzeni North. Other local networks exist, but are quite restricted in membership and representation, and tend to be focused on single activities or demonstration sites. There is little evidence available to assess the functioning of these networks.	The establishment of the Sinakekela Sibusiso Semanti learning network represented a major step towards bringing together a province-wide community of practice around RWH&C, and other agricultural activities. The full potential has, though, not yet been realised as there are relatively few active members. The link with the national network does provide more opportunity for active engagement. The local networks are presumably fulfilling some role in maintaining communication between members.
Cycle 2 POTENTIAL VALUE Indicators	**Evidence and Outcomes**	**Analysis**
2.1 Reinforcement of existing knowledge	While the information on RWH&C from the WRC material was completely new to many participants, for some, especially in the NGO sector, it served as a strong reinforcement of their existing understandings and practices; from the evaluation: *Gained a lot in terms of the new techniques which were presented. The workshop has increased knowledge in terms of the techniques that I knew before the training* The recognition and inclusion of indigenous knowledge on RWH&C was also cited: *Relevance of indigenous knowledge in today's farming systems, and combining both systems to come up with solutions for today's challenges.*	Many of the course participants brought considerable experience from their different roles in the agricultural sector to the training. There was therefore a solid foundation of knowledge on which to build, and the information from the WRC material, and other sources, shared during the course built on this quite substantially.
2.2 Gaining new knowledge and skills	There were numerous claims for gaining new knowledge, with comments from the evaluation of the 1st training session including: *More Knowledge in terms of techniques and strategies on dealing with harvesting of rainwater.* *Different practices that other provinces are doing. It motivated me to go back and encourage the Community to harvest rainwater. I learned more on networking systems to help each other and integrate the practices for the benefit of the country.*	The focus for most participants was on the technical knowledge provided by the WRC material, and most participants claimed to have gained much in this respect. However the references to networking systems, and to creation and innovation,

	I have gained practical knowledge on what to advise especially small-scale farmers on being creative, innovative and being able to improve according to their affordability. Utilising water to the best efficient level. The gaining of new skills only became apparent as the knowledge was applied, as evidenced by the assignments: MP1/2: *My main role as a motivator would be to ensure that all agricultural skills are applied and followed in conjunction with RWH&C practices*	cited in the examples here, suggest that the new knowledge and skills gained were not restricted to the technical, but also encompassed social and pedagogical issues.
2.3 Locating new knowledge into own context	There was an immediate willingness expressed by participants to take their new-found knowledge into their own work and home contexts. From the evaluation: *I have gained knowledge on how I can assist farmers who have a challenge on water. The farmer will be able to store and use rainwater from now on, of the knowledge that I will transfer to them.* *How to assist the emerging farmers with water catchment methods so that they can provide something for their families* The tasks required for the assignments, especially the development of the productive demonstration sites, provided real opportunities for locating the knowledge in participants' contexts. MP5/2: *Application of scientific research and new knowledge to innovative agricultural practices through farmers training, awareness and demonstrations.* During a field visit to one of the sites the course participant said that she *"…needed to come and integrate my work with the knowledge that I have received"* and also *"We have not introduced widely the WRC rainwater harvesting practices, but we introduced traditional ways of agriculture as MSDT. But we plan to introduce the WRC rainwater harvesting methods in the future.* (Melody Chiume, pers. comm.)	A key orientation of the training was the recognition of the importance of the application of the learning into participants' contexts. The design of the course itself and particularly the assignments was specifically inclined to achieve this, and the evidence shows strong and immediate location of the learning into these contexts. The enthusiasm of the participants to share their new knowledge with others, especially the farmers with whom they were working was a further guarantee of this happening.
2.4 Establishing connections	Good connections were established within the scope of the training sessions, but the wide geographical coverage militated against some of these being maintained. However there is some ongoing connection through the SSS Learning Network WhatsApp group. The province-wide connections have also been maintained through the establishment at UMP of an annual Water Symposium, to which learning network members are invited to share their work. Otherwise it is very difficult for people to meet with each other given the distances and costs involved. Connections have also been established at the local levels, in conjunction with the development of the sites (see 1.3 above).	The maintenance of connections across such a large geographical area is always a challenge, and the establishment of the WhatsApp group and the Water Seminar can go a long way to overcoming this. It is not to be expected that string connections can be maintained without both the virtual link, and the occasional physical interaction.
2.5 Increased agency through connections	Evidence for increased agency is currently not available in any concrete form and will require focused attention. However, the collaborative groups established for the demonstration sites can certainly be considered evidence of collective agency to achieve	There is a clear requirement for further examination of any enhancement of agency through the connections that have been established. Until

	what a single individual or organisation may not be able to achieve on their own, but this will require more probing. The connection to the national agro-ecology network (see 1.4 above) should also enhance the agency of member groups in achieving their objectives, but again, this will require deeper examination.	then there can be insufficient data to form the basis for a realistic analysis.
2.6 Increased understanding of and capacity for learning	Although the training itself had a strong learning emphasis, the participants' focus was clearly on the practical aspects, in particular on the RWH&C practices. While many participants are involved in both formal and informal learning processes, these were not strongly articulated in the assignments, or indeed in class discussions. The assignments did identify the learning methods the participants intended to use with their farmers, and these were often very rich and varied. For example, from MP4/4 (lightly edited and shortened): *Listening to talks, lectures, radio programmers* *Viewing moving images, such as television programmers or videos this can used in the field as an earning tool as farmers prefer visuals to talking* *Viewing still images, such as drawings, photographs* *Reading information (such as the WRC material or posters) with a combination of text and images* *Talking with peers/colleagues – this is a good platform for trouble shooting and cross referencing with others as learning activates and stimulates conversation that will be of benefit to all .* *Observation of practical activities/demonstrations (either local or through look and learn / exchange visits)* *Involvement in practical activities. These stimulate learning and make everyone to be involved in the process and interact. It gives a chance to try out and reflect* *Farmer-centred learning approaches* *Discussion*	Perhaps one of the most significant outcomes from the assignments was the realisation that although most course participants are involved, in one way or another, in knowledge and skills transfer, they do not see themselves as educators. It is probable, that through the course process, and through the assessments of the assignments more may now recognise their pedagogic role. In their work, however, the practical aspects are by far the most overt, with little direct attention given to the learning aspects. Again, though, there are good indications that there is more consciousness of teaching and learning processes, as evidenced by the range of learning methods cited and justified in many of the assignments.
Cycle 3 APPLIED VALUE Indicators	Evidence and Outcomes	Analysis
3.1 Changes in curricula/training processes	The final Stream 1 assignment was focused on how RWH&C components could be integrated into existing curricula. Some good evidence was provided of substantial changes proposed. 4 options were cited in MP3/4: *1. Include into the curriculum of the Agricultural Qualifications such as Diploma in Plant Production, Bachelor of Agriculture, BSc Agriculture or the Advance Diploma in Agricultural Extension. The inclusion can be done as part of the Water Management Module, Agricultural Engineering module in the Diploma, as part of the Soil science module and can also be included into the Vegetable Production and/or the Agronomy module.*	Within the formal education sector, the course stimulated quite fundamental rethinking around curriculum design and content, which is clearly reflected in the assignments. The question remains as to how much of the proposed changes will in fact be implemented, as curriculum change can be a complex process, requiring considerable consultation. To date the proposed

	2. Include it as part of the curriculum for the Bachelor of Education Degree in Foundation phase education as a component to teach the children about the production of vegetables as food, where learning will take place through interaction and play *3. RWH& C can be offered as a standalone Short Learning Programme (SLP) that focus on the principles and practices of RWH&C, such as the Amanzi for Food programme, or the principles of RWH&C can be included in SLPs on Soil Science, Vegetable production and the programme we have on Sugarcane production.* *4. As a Scholarly engagement programme involving the community* *The social learning aspect of RWH&C can be incorporated as community projects that can be implemented at schools, orphanages, old age homes and anywhere in the community where it will be beneficial to the community* Stream 2 participants were asked to provide a framework for their proposed training programmes, and these again indicate some quite interesting changes to their existing training approaches.	changes have not yet been effected. At the less formal level of in-field training, the proposed changes constituted the main new content (from the WRC material), and some new learning methods. Evidence from the assignments suggests that many of these are already being implemented in the development of the productive demonstration sites. There is certainly more scope and freedom to introduce new ideas and approaches within the informal training sector, and individual trainers and advisors are exploiting this scope.
3.2 Use of new approaches/media	The course opened up ideas about the use of a variety of approaches, including use of various media. New teaching and learning approaches were proposed in most assignments, as discussed in 2.6, above. Engagement with the media was evident from the first training session, which was attended, in part, by a journalist from the Lowveld media group. Two articles covering the training course were produced by this group, and connections with local radio stations were also established. These initiatives were spearheaded by the lead UMP partner, and it appears that such media connections remain here at the centre of the SSS learning Network, and are not yet being replicated at a more local level. However, the Ehlanzeni North group have plans to involve radio in their activities, and have established contact with a local radio journalist, who happens to be the same one working with the UMP group, but who lives in the Ehlanzeni area. The Gert Sibande group tried to establish a relationship with their local community radio, but as they were to be charged R1500 for a 'slot' this was not possible.	Although there was certainly considerable willingness to engage with new approaches, particularly through the use of different media, this has not yet, for a variety of reasons, materialised to any significant extent. At least the evidence gathered so far does not indicate a major shift. However the assignments do suggest that accessing information through the internet portals, and sharing this via social media and local radio and newspapers are key to many future plans. It appears that more support will be needed to help people realise these plans.
3.3 Adopting more collaborative approaches	The importance of taking collaborative approaches is emphasised throughout the course, and the concept has been picked up quite strongly by most groups in the province. Indeed most participants have some experience of different degrees of collaborative working. Course discussions suggested that while participants recognise the value of collaborations, they know that they can also be quite challenging, especially where partners fail to fulfil their obligations. It is therefore	It is important to recognise, as raised in class discussions, that while collaboration can be a very positive force, it can also be very challenging, and at times counter-productive. There can never just be collaboration for collaboration's sake. The pragmatism towards

	often easier to limit collaborations to those with whom there is already a strong and productive relationship. As a result, representation within most local groups and learning networks tends to be fairly narrow, including the course participants, other members of their organisations, the farmers with whom they are working, and sometimes other organisations. This is a pragmatic approach in order to establish a sound collaborative framework through which they can attract other collaborators.	collaboration displayed by people working in their home contexts is entirely appropriate, however there should be support and encouragement for widening the networks to bring in more partners and share the ideas and information more widely.
3.4 Drawing on information in WRC material	Course participants cite a wide range of WRC material on which they intend to draw in the future training activities, indicating that they see this as a valuable resource. This is discussed in 1.2 above, and reinforced though most assignments. From MP5/4: *Diversion furrows – Guidelines on Best Management Practices for Rainwater Harvesting and Conservation (RWH&C) for Cropland and Rangeland Productivity in Communal Semi-Arid Areas of South Africa WH&C (T: Pp 132-133 &H),* *Trench beds – Sustainable Techniques and Practices for Water Harvesting and Conservation and their Effective Application in Resource-poor Agricultural Production, WH&C (T: Pp124, 134-139 &H), AWHGS(CS:Vol.2, Part1,Pp28&29, and T:Vol.2.Part3, Pp 6-63)* The details concerning page numbers and the forms in which the information can be found are derived from the Navigation Tool, indicating that this is being used to aid access to the information.	The information in the WRC material was very well received by course participants, and they were pleased with how the Navigation Tool assisted them in finding the information they required. There is strong evidence from the assignments that they intend to draw on the WRC material to support their work, suggesting that they will become a key resource.

As in all the courses the immediate impact and immediate value was considerable, with all participants expressing genuine interest in the ideas and practices shared through the training process. The assignments and subsequent visits and interviews revealed substantive engagement with and learning from the WRC material showing the potential value in the course and material, and the use of this to inform creative and innovative collaborations for the introduction of a wide range of new RWH&C practices in a variety of farming contexts showed the applied and realised value of the ToT. Here there was quite substantive translation of the ideas proposed in the assignments and in discussions to real activities on the ground, in terms of the development of productive demonstration sites and the provision of support to farmers to improve their use of rainwater in their production practices (i.e. strong applied and realised value). There is less evidence of real curriculum change although quite fundamental changes were proposed by the leading participant from UMP (strong potential and applied value at the level of curriculum design), which later showed strong realised value as well. The process of curriculum change in any university requires buy-in from and the support of senior staff, and this may not have been forthcoming early on, but later on gained traction amongst other staff members (showing that translation of potential to realised value can take time). However enthusiasm for integration of RWH&C understandings and practices into the curriculum continues unabated, and will certainly bear fruit in the near future, in other words potential value remains strong.

In Mpumalanga the course involved a wide diversity of people in the agriculture sector. This diversity has led to some very productive collaborations, initiated during the course and which have continued ever since (i.e. the enabling value of the multi-partner relationships proved to be important to the success of the programme). The importance of collaborations between various actors in the sector is vital if any meaningful change is to be effected, and this needs to be taken on-board in the development

of the Knowledge Uptake Strategy, as it has important enabling value for supporting realised, reframed and also transformative value.

Table 7.5 VCF analysis of the impact of the TOT course in the Eastern Cape Province

Eastern Cape Province (Fort Cox Agricultural Training Institute)		
Cycle 1 IMMEDIATE VALUE Indicators	**Evidence and Outcomes**	**Analysis**
1.1 Undertaking course in collective with others	In this second running of the course many participants were already connected, either through the IBLN, or through their institutions (UFH, FCAFTI). Their sense of collective was therefore very strong, and the course enabled this to strengthen further.	The sense of collective is enormously strong in the IBLN, and shows no sign of abating. Indeed, many of the participants in the second EC running of the course came to this through the network.
1.2 Gaining access to new information and ideas	For some participants almost all the information concerning RWH&C was new, while for others less so. However the opening of access to the ideas and information in the WRC material was a positive experience for all. Interesting and valuable information was also shared on other topics, such as seed saving, during the course.	The course participants universally welcomed the access to the new information and ideas provided by the course, suggesting that they previously felt some lack of access to valuable information.
1.3 Collaborative activities	Again, many participants were already involved in collaborative activities, but this was extended through the various course activities, including the Group Assignment (3) undertaken during Module 3, and the increase in the range of practices demonstrated at the various sites.	In addition to the collaborative activities within the course process, there was an evolution of the notion of 'ilima' where IBLN members collaborate to develop new demonstration practices and sites. Collaboration is seen as an essential process for farmer development.
1.4 Initial steps in developing networks	In this context some strong networks already existed, including the IBLN. The course brought more people into these networks. The IBLN itself shows signs of becoming more self-sustaining, and of taking on a more activist role with lobbying and advocacy linked to the increasing agro-ecology focus of the group.	The IBLN is itself a strong network, and is becoming increasingly connected to other national, regional and continental networks. Through this process they are increasing their collective agency in

		support of farmer development.
Cycle 2 POTENTIAL VALUE Indicators	**Evidence and Outcomes**	**Analysis**
2.1 Reinforcement of existing knowledge	For those participants already aware of the concept and principles of RWH&C the course added to their understanding, and introduced new practices. The course also recognised and built on participants' understanding of indigenous RWH&C practices, such as 'gelesha' and 'matamo'. One farmer who undertook the course said, during a field visit to her productive demonstration site: "… *before I joined the group I was an agroecologist. Trench beds and agroecology practices I learnt from the WRC books. I was interested in reading the Amanzi for food books and getting knowledge from these because we are facing climate change issues"* (Aviwe Biko, pers. comm.).	Many of the course participants already possessed considerable reservoirs of knowledge and experience on which to draw. New information and ideas exposed through the course process were fully compatible with existing knowledge both reinforcing and building on this. Thus, there was no undermining of existing knowledge, rather a validation of this.
2.2 Gaining new knowledge and skills	This course involved some very knowledgeable and skilled farmers, and less experienced participants took the opportunity to gain from their knowledge and skills in addition to the information and ideas being shared more formally through the course processes. For one of the course participants *"Before we went to the training of trainers' course, we did not know anything about the practices so we learnt from these practices, but after we attended the training of trainers course, we were constantly checking the WRC books for information."* New skills were developed through the course practicals, and the development of the productive demonstration sites.	Evidence from both the assignments and from field visits showed clearly that all participants, whatever their levels of experience, gained new knowledge and skills, which they intended to share with others at the first opportunity. The course itself was considerably enriched by the knowledge and experience brought by some participants.
2.3 Locating new knowledge into own context	The course is designed specifically to afford participants the opportunity to locate their learning directly in their work contexts. In particular the assignments are structured to support this process. Participants showed great enthusiasm to take their new understandings and skills back to their communities and their work and implement new practices. From the evaluation of Module 3: *"By telling my friends and other students.. ..and when I am home I will tell my parents and other people in the community"*, and *"Through organising farmers' meetings, field trials…, farmers days and visits."*, and *"The information I got I will include in my practices."* Perhaps most encouragingly	The location of the learning into context is perhaps one of the strongest and most immediately positive outcomes of the course. The strong practice orientation of the training clearly enables transfer of new information and ideas into the home practices of the participants and their communities.

	"During farmers' meetings, in church, in a taxi and the bus". A very specific example of location of knowledge into context was provided during a site visit by one of the farmers…*"We chose the tower garden because we work with the elderly people from the community, so it is easier for them to work on the tower garden." (Nomphindiwe Msisiwe, pers. comm.)* This last quote also provides an example of the change in participant dynamics from the first EC course, in that for the second course the majority of participants were small-scale farmers and household food producers, many of whom came to the course through their membership of the IBLN. This new dynamic was very welcome and led to considerable elements of the contact sessions being conducted in isiXhosa. This undoubtedly helped with the internalising of the new ideas and information by the participants, and in them then locating these in their own context with their neighbours and fellow farmers.	
2.4 Establishing connections	Many participants were already strongly interconnected and these connections were extended to other participants, leading to a growth in the membership of the IBLN. The farmers, education and training institutions, NGOs, department of agriculture and local economic development agency are well connected in this district. Over time this connection has been extended to national and continental networks, such as the Rural Women's Assembly (RWA), and the African Biodiversity Network (ABN).	There is a deep understanding of the importance and value of connections, which is expressed through ongoing collaborations (see 1.3 and 3.1). It also manifests through wider lobbying and advocacy activities.
2.5 Increased agency through connections	The well-established IBLN with its growing activist membership and institutional connections is asserting more agency in promoting agroecological and RWH&C practices. Members engage closely with the government whenever possible to influence policy or to express their concerns regarding agricultural issues. They are also well connected with national and continental lobby groups, such as the ABN. Through this they are representing large numbers of emerging farmers, not only in the district, but also provincially and nationally.	The sense of agency is palpable, particularly at events such as the World Food Day event hosted by the Mxumbu Youth Group, in collaboration with the ABN, in their village. It will be important to probe the sense of agency felt by farmers more deeply. (See also 4.2)
2.6 Increased understanding of and capacity for learning	The process of learning and how different people learn in different contexts is a core component of the course. It has also been recognised that there are considerable barriers to learning, including that of language. For this	While there is clear evidence of an enhanced understanding of learning, this is rarely if ever articulated as such by

	second running of the course in the Eastern Cape it was agreed that as much of the course as possible would be facilitated in the main language of the group, namely isiXhosa. This enabled participants to engage much more directly in the learning and discussions. In terms of increased understanding of learning, this was reflected most clearly in the assignments, where participants indicated the different methods they would employ in sharing information. In particular those involved in the formal education sector shared a range of learning approaches from formal presentations, to discussions, and practical exercises. Farmers themselves cited 'ilima' (where farmers and others come together to work on a specific activity and share their knowledge and skills), as a key learning process.	course participants. Their focus is almost solely on the practical outcomes such as the implementing and sharing of RWH&C practices. More focus on the learning processes used in sharing with others is needed to develop a better understanding of how participants view and use different learning approaches.
Cycle 3 APPLIED VALUE Indicators	**Evidence and Outcomes**	**Analysis**
3.1 Changes in curricula/training processes	The clearest evidence for real change comes from the Stream 1 assignments, where considerable curriculum changes are proposed. From **EC1/4:** *Within appropriate existing curriculum course modules – ideally within mandatory (foundational or core) modules… it is important for RWH&C to be included in the curriculum in order to… increase the knowledge around RWH&C…sustainable use of available resources is the key in agriculture*. OR*...as a stand-alone short course… will be helpful to close the gap in literature and in knowledge. Especially for other clients such as farmers, educators and community.* Also… ***As additional resource material...RWH&C*** *is also needed in the institute as another source of material on top of the information about water harvesting and conservation they have got from the course* There is also good evidence for changes already implemented by previous course participants in the FCAFTI curriculum. In this second course a lecturer (a participant from the first course) from FCAFTI gave a presentation on the changes she had introduced into her curriculum, and how these were implemented: *Agriculture Programme Exit Learning Outcomes "sustainable agriculture"*	Perhaps unsurprisingly the clearest evidence for changes in curricula come from the formal education sector, where the lecturers at Fort Cox AFTI have already instituted changes to their curricula as a result of the first ToT course, and further, more fundamental changes are proposed. These are linked to the introduction of more practical components, associated with the productive demonstration sites established on the campus. This second feature is more significant than may appear as there has, over recent years, been a general reduction in the practical component of courses offered at Agricultural Colleges and Training Institutes. This reduction is of considerable concern to many, including the lecturers as practice is seen as crucial for developing agricultural

	Cross subject offerings for relationships within a programme, e.g. Crop production option: *List of related subjects: irrigation, soil and water conservation, soil fertility and nutrition, crop production subjects, soil classification, rangeland and pasture management* *Individual subject links and topics in vegetable production to RWH&C* (Louise Madikiza, 2018)	skills. The opportunity to reverse this trend through the inclusion of RWH&C in curricula is therefore much welcomed.
3.2 Use of new approaches/media	The IBLN has long been engaged in working across and with a range of media, in particular the WhatsApp social media platform through which they communicate regularly and frequently, including through the posting of photographs of various activities, and through use of Forte FM the local community radio station. Many of them regularly access the WRC material through the WRC and Amanzi for Food websites. However, while most of the IBLN members are well connected to the internet through their smartphones, not all are. The reliance on WhatsApp for most communications has had the unfortunate side effect of side-lining some of the original members, and steps need to be taken to rectify this. Also, while the use of social media and internet channels are apparently self-sustaining, the use of the radio is requiring continued support. An interesting correlation has been observed between the broadcasting of radio programmes, and numbers of people accessing the websites and Facebook pages, suggesting that the value of the radio goes beyond its immediate connection with a wider audience.	Despite the issue concerning IBLN members without internet connections – an issue which requires speedy resolution – the use of internet media enables instant communication of information, ideas and experiences. The radio programmes serve another purpose, namely to inform farmers and others outside the network of issues related to water management and other valuable agricultural practices. The link between the radio broadcasts and the 'hits' observed on Facebook and the websites should be a strong motivation for the IBLN to take more ownership of and responsibility for the planning and airing of the programmes.
3.3 Adopting more collaborative approaches	Collaboration has long been a feature of the way in which most farmers in the area work, but this has been extended to include others previously not so connected. The increase in 'ilima' collaborative workdays indicates an increasing recognition of the benefits of collaboration.	The farmers and other members of the IBLN take an essentially collaborative approach to all their activities. How much this has been influenced by their engagement in the ToT course is difficult to assess, but it is fairly

		certain that the nature and scope of the collaborations, including other players in the sector, has its roots in the collaborative ethic of the course.
3.4 Drawing on information in WRC material	For many of the farmers the WRC material have become an indispensable tool to support them in their farming, and almost all material are cited by them, and by the college lecturers and students in their assignments and in discussions. From **EC4/4**: *…the material that are going to be used will be adopted using the WRC information and that will make it more useful and more practical in implementing these aspects of RWH&C practises. The content followed from the WRC material… will be able to create a platform for farmers to learn, participate and share information.* *"We consulted the WRC books and we knew we had to read thoroughly to find the information. In the WRC books, you can find each of the rainwater harvesting practices. Practises such as raised beds, tower gardens and furrows can be found in the WRC handbooks".* (Xolisa Dwane, pers.com.)	The introduction, through the ToT course, of the information in the WRC material has opened many new doors for course participants. They are using the information directly from the material to support their experimentation with various practices, and their sharing of these with others. There is little doubt that the material with their wealth of information have enriched the practices of everyone associated with the course, and now of many more family members, neighbours, communities and students.
Cycle 4 REALISED VALUE Indicators	**Evidence and Outcomes**	**Analysis**
4.1 Enhanced and productive collaborations	The idea of collaboration is being broadened constantly. As one course participant explained during a site visit: *"The people involved in the demonstration site at my home are my family, me, my husband, Mrs Madwendile, and lecturers and students from Fort Cox…* *I would also like to involve the community members in my area. I also have the liberty of involving people from outside my area."* (Busisiwe Peter, pers.com.) The IBLN itself is a prime example of ongoing and productive collaboration, as articulated by a network member: *"I do not face any challenges in accessing the information because there are many sources of information. I get most of the information from the Imvotho Bubomi learning network where I have been a member since*	As discussed in 3.3 (above), collaboration is central to the way in which the IBLN members work together and with others. There can be no doubt that these collaborations have been considerably enhanced by the new ideas and information shared through the ToT course, supported by the WRC material. As the collaborations are almost invariably around practical activities, such as productive demonstration

	2014. I also learn from students who have knowledge on these practices. The elderly people also have knowledge and we use their knowledge as well. The Rhodes team and others also share their knowledge with us. The best place to access information is the learning network…It's good being a member of the IBLN." And further: *"I share my knowledge with people; I have shared my knowledge with people from Khayelitsha. I also teach other people on agro-ecology, I have so far assisted 3 households by teaching them agroecology practices. The tower garden, trench beds, raised beds and mulching were learnt for the WRC booklet on Water Harvesting and Conservation, Volume 2 Part 1."* (Aviwe Biko, pers.com.)	site development, they are essentially productive.
4.2 More effective lobbying	Lobbying is a long-term process, and finding and assessing evidence of its effectiveness is challenging. However members of the IBLN are increasingly invited to policy dialogues with the national and provincial government, and also make their views known through the partners and wider networks with which they are involved. In particular IBLN members have been active in opposing the imposition of genetically modified organisms (GMOs) into the food chain, and in particular any moves to restrict farmer seed saving and sharing. They were very much involved in lobbying against the Monsanto proposal to introduce "Triple Stacked GM Drought Tolerant Maizie", a proposal which the SA government rejected in November 2018, citing lack of credible scientific evidence for its effectiveness and safety. A striking picture of Aviwe Biko, a very active member of the IBLN and Rural Women's Assembly, holding a copy of the government's rejection of the proposed GMP seed, was posted on the WhatsApp Group on the day following the decision.	The ability to lobby effectively is directly connected to the sense of empowerment or agency felt by individuals or groups (see 2.5). The IBLN includes many members who already had strong activist backgrounds, but also others who had little or no direct contact with lobbying activities. Their engagement with the ToT course and the IBLN has certainly provided a greater sense of collective empowerment and agency, leading to more direct involvement in farmer activism, including lobbying. The effectiveness of this is less easy to assess, but their confidence to enable such engagement has certainly been strengthened.
4.3 Recognition of achievements by external observers	Considerable interest has been shown in the activities of the IBLN members, in particular the way they willingly and voluntarily share their learning with others The Mxumbu Youth Group is very proactive in this respect, and as youth themselves they are powerful mentors for other young people. This was recognised by a project operating in an area called Machubeni, near	The work being done by the members of the IBLN is becoming increasingly recognised at local, national and regional levels. However, this is mostly within the wider agroecology networks,

	Lady Frere, some 130km from Middledrift. This is the GEF5 Sustainable Land Management Project, Eastern Cape, and it's coordinator, Dr Rebecca Powell requested the help of the Mxumbu youth group in an email as follows: *My thinking was just to expose our team to some CSA* (Climate Smart Agriculture) *taking place in another communal area to get them excited and encouraged. I had asked Xolisa if he could teach them how to do tied ridges, raised bed gardens and then speak a bit about their experiences with intercropping. So for now it would be an informal knowledge exchange and then we could plan to do more formal training in 2019…They seem to have done some really good work already and I'm sure it'll encourage them to know that they are sharing their knowledge with another communal area.* Recognition of the IBLN members and their keenness to experiment has also been recognised by another WRC project, on Climate Smart Agriculture (WRC), based in Pietermaritzburg. Several of the IBLN productive demonstration sites are also sites for farmer experimentation with CSA practices and are providing the Eastern Cape locus for this project which also operates in Limpopo and KwaZulu-Natal. Further recognition was afforded by the Mxumbu Youth Group hosting a World Food Day event in partnership with the African Biodiversity Network (ABN). Three members of the IBLN were also invited to the Zimbabwe National Farmers Seed Fair in October 2018, where they presented on the work they are doing to save and share seeds, and experienced the vibrancy of the Zimbabwean food sovereignty networks.	and not yet within the mainstream agricultural discourse. There remains a clear need for good documentation of this work and dissemination of the stories across various media, in particular the mainstream agricultural media.
4.4 Productivity of sites	The question of productivity is more complex than at first appears. This is due in part to the vagaries of the weather, in particular some extended periods of drought that have affected the area in recent years, and also to the fact that many of the new RWH&C practices have been introduced on previously fallow land. The impact of drought has been to suppress productivity to a considerable degree, while the cultivation of new areas of land as demonstration sites has inevitably led to an increase in productivity. Insufficient quantitative data is available by which to formally assess any changes in productivity. However anecdotal evidence	A clear imperative is emerging for more quantitative assessment of productivity associated with the RWH&C practices being implemented at the various productive demonstration sites. This is happening to some extent with the sites associated with the WRC CSA project, which has a more quantitative

	suggests that the farmers believe that the practices are increasing their productivity, in particular through the scope for more intensive use of available land by means of practices such as trench beds, tower gardens, intercropping, and increased availability of water. Some initial quantitative experiments were established at the Fort Cox AFTI, but, according to the lecturer in charge, these were not conclusive. More such experiments are planned. There is clear potential for some in-depth research into site productivity by suitable qualified researchers.	productive focus than the Amanzi for Food project, but in order to promote RWH&C practices, more data is needed to provide evidence of enhanced productivity resulting from these practices. However, this is not the remit of the ELRC, and discussions should be held with the Department of Agricultural Sciences at the University of Fort Hare to assign a researcher to this aspect.
4.5 Cascading of demonstration site development	Evidence has not yet been sought regarding any major cascading of productive demonstration sites to new locations. There is one case, in Mxumbu village, where a demonstration site has been established at the Xhukwane primary school, with the principal, Mr Jende, establishing a further site in his own garden, where he also takes learners. He says: *"This type of agriculture has been forgotten in schools so I am trying to instil this knowledge so that the school kids grow up with the knowledge."* Also, the initial sites themselves now demonstrate a far wider range of practices as these are added through the interests of the farmers on the sites (and the lecturers at For Cox AFTI), often stimulated through discussions within the IBLN network. These practices have often been introduced through the process of 'ilima' where farmers come together to support each other in implementing new practices. Some sites, including that at Fort Cox AFTI have been expanded to allow for inclusion of further practices. Additionally, the wide sharing of information by many of the IBLN members with their families, neighbours and other communities, suggests that other sites are being developed. This is particularly the case with the Mxumbu Youth Group, and the Zingisa Education Project who are both involved in training farmers in different communities, with the training involving practical demonstrations and the establishment of RWH&C practice sites.	As there has been wide sharing of the practices at the productive demonstration sites, it is very likely that these have been implemented in many different places. However there is a need to follow through to see where practices are being implemented, and also to see whether these sites are also being used as productive demonstration sites and shared with others.
4.6 Expansion and usage of elements of the ToT course and the WRC material	There is considerable evidence from all the productive demonstration site farmers and lecturers that the information from the WRC material, and the material themselves form an integral part of their training processes. All cite	While there is ample evidence concerning the increasing use of the WRC material, there is nothing yet available

	specific WRC material as being used to support their training. There is less evidence to suggest that other elements of the Training of Trainers' course itself were used in the training. However the wide range of sources of information and support cited by the farmers suggests that the fundamental principles on which the course is built are being perpetuated through the sharing between farmers. Mrs Busisiwe Peter says that the sources of information on which she draws include: "*the Imvotho Bubomi learning network, WRC material, the demonstration site we started in Alice where we went to a village in Memela. We also learn through the Rhodes university training of trainers' course, the website, google, WhatsApp groups from the discussions."* (Busisiwe Peter pers. com.). The main course elements that are universally practised are the sharing of ideas through discussions, sharing experience, and practical demonstrations, supported by information in the WRC material.	concerning other elements of the ToT course. In particular it will be extremely useful to see whether concepts such as the different scales of farming, other decision-making factors, and 'underpinning knowledge' are integrated into the sharing process. Also, whether the Navigation Tool is being used to inform decision making in terms of practices suitable in different contexts.

The longevity of the IBLN, following 2 courses facilitated in the Eastern Cape enabled a more in-depth analysis of the impacts of the ToT course in this province. This included an analysis of Cycle 4 of the VCF, which was not possible in the other areas. The proximity of the Amanzi for Food team to this network, indeed their active involvement in the network, facilitated a deep understanding of the dynamics involved and of the collaborations between members (and with others) and the impacts of these.

The IBLN network is described in detail in previous chapters, but it is worth recalling that the second facilitation of the course brought in a number of new activist farmers and organisations who changed the network dynamic quite considerably. The new energy brought into the network by these members fostered a resurgence of interest in a range of pressing issues, including agroecology, seed rights and food sovereignty, through which alternatives to conventional agricultural practices were highlighted and explored, indicating a commitment to reframed and transformative value. These alternatives continued to include RWH&C practices, which for many farmers became almost the default position in terms of water provision (i.e. realised and transformative value on this front had been achieved). The inherent activist nature of the new members also added to the already strong culture of sharing information and understanding (i.e. strengthened potential value), not only within the network, but beyond into their own and neighbouring communities (strategic value). The impacts of the ToT courses were therefore amplified through the passion and dedication of IBLN members (i.e. enabling value).

Table 7.5, above, contains detailed descriptions and analyses in relation to the first 4 cycles of the VCF, with the relevant indicators showing a strong and lasting impact in almost every area (i.e. sustained value creation). The most compelling areas are certainly the idea and proactive nature of collaboration and sharing (potential value), with a focus on practical activities (applied value), including productive demonstration sites (realised and

transformative value), but increasingly focussed on individual farmer practices that are reframed towards more sustainable agricultural practice and improved food production and social engagement. References to the use of the WRC material have continued for several years after the implementation of the second course, indicating an on-going engagement with the material and their strong potential value for applied and reframed value. This is taken further by clear indications of wide sharing of the information contained in the material, confirming their potential value for applied, realised, reframing and transformative value.

Similarly, the new members' involvement with activist networks has both widened the influence of the IBLN and increased the levels of lobbying and advocacy for agricultural policies (potential value) better attuned to the needs of small-scale and emerging farmers and household food producers, and greater recognition of the importance of sustainable practices such as RWH&C (contributing to reframed and transformative value creation). These activities have led to greater recognition within and beyond the farming sector of the IBLN and what it stands for (strategic value).

One Cycle 4 indicator with which the project has perhaps not been sufficiently engaged is the issue of productivity, in terms of the quantitative outputs achieved by farmers using RWH&C practices. Any serious analysis of this will require focussed research activities conducted in collaboration with agricultural scientists and other specialists.

7.4.2 Appropriate evaluation indicators and methodology

As can be seen by the wealth of evidence in tables 7.3, 7.4 and 7.5, collected in relation all three Training of Trainers courses implemented in this reporting of the project the VCF approach can provide considerable insight into all aspects of the processes and outcomes associated with the project and the value that is created via the WRC material as they are taken up and used via a social learning network approach.

It would appear, from the rich data provided by application of the adapted VCF indicators to the activities and outcomes emanating from the WRC Amanzi for Food project, that both the VCF methodology and the associated indicators are entirely appropriate for analysis and evaluation of the project impacts. This suggests that the VCF should be retained as the key evaluation approach within the Knowledge Uptake Strategy. Continuation of this approach will also enable the introduction of the Cycle 5 indicators to analysis of the IBLN activities and the wider Eastern Cape context, and the Cycle 4 and potentially Cycle 5 indicators to the Mpumalanga context.

7.5. Recommended Evaluation Processes and Indicators for Social Learning and Knowledge Uptake

From the above development of the VCF specifically applied to this project that focussed on development of a social learning network model for mediating and supporting rainwater harvesting and conservation practice amongst smallholder farmers and household food producers, it is possible to see that the Value Creation Framework as applied to this project (with emphasis on the ToT programme and outcomes – which are also linked to the other components of the programme, e.g. productive demonstration sites, learning network

formation, use of social media and curriculum innovations) have produced an initial set of indicators that can be used for the ongoing monitoring and evaluation of social learning and knowledge uptake in this context. In Summary, (Table 7.6) these are:

Table 7.6 Indicators of value creation in a social learning network approach to knowledge uptake and use

Orientation value	Immediate Value	Potential Value	Applied Value	Realised Value	Reframed / Transformative Value
History of neglect of smallholder farming in agricultural education and training Extension services now empowered to develop social learning approaches to extension Valuable knowledge of water harvesting and its relevance to smallholder farming and household food production not in use Multi-stakeholder Interest in working with farmers, and farmers willing to work with each other can co-learning	1.1 Undertaking course in collective with others	2.1 Reinforcement of existing knowledge	3.1 Changes in curricula/training processes	4.1 Enhanced and productive collaborations	Farmers feeling more empowered and able to produce food Social solidarity strengthened in communities Stronger partnerships and networks for collaborative learning, production and marketing Improved use of agricultural water in dryland conditions creating stronger safety nets Farmer-centred curriculum innovations in place reducing dominance of monoculture and large scale irrigation as only way of teaching extension agents
	1.2 Gaining access to new information and ideas	2.2 Gaining new knowledge and skills	3.2 Use of new approaches/media	4.2 More effective lobbying	
	1.3 Collaborative activities	2.3 Locating new knowledge into own context	3.3 Adopting more collaborative approaches	4.3 Recognition of achievements by external observers	
	1.4 Initial steps in developing networks	2.4 Establishing connections	3.4 Drawing on information in WRC material	4.4 Productivity of sites	
	1.5 Being able to share own experience and challenges with others in a similar situation	2.5 Increased agency through connections	3.4 Participating in productive demonstration site development	4.5 Cascading of demonstration site development	
		2.6 Increased understanding of and capacity for learning		4.6 Expansion and usage of elements of the ToT course and the WRC material	

Enabling Value and Constraining Factors (generative mechanisms – what enables and constrains the learning and knowledge uptake:

Enabling Value:

- Relationality (building networked relationships) and co-learning (learning together)
- Productive demonstrations that benefit farmers, as well as students and educators (mutual-beneficiation from practice-based, engaged approaches)
- Social media tools (especially WhatsApp) for immediate, easy to apply communications and networking
- ToT material, tools, and facilitation processes bringing diverse stakeholders together around a common 'matter of concern' (water for food production)
- The navigation tool's usefulness in mediating entry into a whole wealth of material and ideas in the WRC archive

- The agency of individuals who are willing to support others in a learning network and share their experience, expertise and knowledge

Constraining Factors:

- Droughts, Transport, Institutional hierarchy, Inadequate time and resources, Organisational cultures, Hegemonic ideas and approaches (e.g. monoculture, large scale irrigation, etc.)

7.6 Conclusion

The chapter has outlined a monitoring and evaluation approach and methodology for the Amanzi for Food Learning Networks. It has drawn on a historical analysis of the main trends in evaluation research to identify a suitable approach for social learning evaluation, finding the Wenger et al. (2011) Value Creation Framework to hold potential for adaptation to the social learning network context and objectives of the Amanzi for Food programme. Through applied adaptation of the Wenger et al. (2011) framework a set of questions were developed to guide indicator development and reporting on the emergence of social learning in the Amanzi for Food learning networks. The methodology was then 'tried out' focusing mainly on one of the mediation processes being used in the Amanzi for Food learning network, namely the Training of Trainers course. The application of this framework to analyse data from the courses namely assignment data, evaluation data and other course record data, shows that in all three cases there is immediate value (activities and interactions), potential value (knowledge capital) and applied value (changes in practice) being created. In the longer standing Learning Network (Eastern Cape) it was also possible to detect realized value (performance improvement) and transformative value. These forms of value were identified via a set of appropriate indicators that were developed for each type of value creation. The evaluation of this mediation approach (using a ToT course in a Learning Network) is clearly bearing fruit in terms of the overall objective of the programme which is to catalyse knowledge flow to influence knowledge uptake and use of the WRC material in contexts of practice, with emphasis on small-scale farmers and household food producers and the ATIs and other actors that are involved in supporting their learning, i.e. the small-scale farmer and food producers learning system. The monitoring and evaluation methodology, as developed here, shows potential for further adaptation and development, and has importantly also shown up areas where there are inadequate sources of data to provide perspectives on the indicators. It is offered as a Knowledge Dissemination and Uptake Evaluation Tool (KDU Value Creation Framework Evaluation Tool) for further use and application via a Knowledge Uptake Strategy (Appendix 3.2, Appendix 3.2(a).) This can therefore also improve the methodological processes for ongoing monitoring and evaluation as the programme unfolds, and to form the basis for evaluation within the Knowledge Uptake Strategy. In the final Chapter, we consider the overall broader transformative value of the social learning networking approach as developed in this project.

CHAPTER 8

RECOMMENDATIONS AND STRUCTURE OF THE KNOWLEDGE UTAKE STRATEGY

8.1 A Social Learning Network Approach to Knowledge Dissemination and Uptake

8.1.1 Social learning in the WRC Amanzi for Food Project

The WRC Amanzi for Food project was strongly premised on social learning as the primary means of sharing the information on Rainwater Harvesting and Conservation (RWH&C) provided in a number of WRC material. The main reasons for taking this approach were:

1. That this provided an opportunity for people involved in the agricultural sector to work and learn together; sharing not only the 'new' information in the material, but also their own understandings and experiences
2. That the essential lack of hierarchy in social learning contexts, where everyone is both learner and educator, levelled the playing field so that everyone's input was valued
3. That the relationships developed through collective learning could be translated into long-term mutually-supportive collaborations around both further learning and sharing, and implementation of newly learned ideas and practices
4. That such long-term collaborations would help in developing a shared vision for an approach to sustainable agricultural practice, appropriate for the various contexts, which could be promoted through engagement with government policy development processes
5. That this would bring farmers voices to the fore in discussions around agricultural policy

The experience of the WRC Amanzi for Food project, most especially in the longest-standing learning network – the Imvotho Bubomi Learning Network (IBLN) in the Eastern Cape – was that all these reasons proved well-founded, and that social learning, as envisaged in this way, was very empowering both for the farmers and for those who supported them.

8.1.2 Role of Learning Networks in social learning

The social learning processes associated with the WRC Amanzi for Food project were mostly framed within learning networks. These comprised a diversity of role-players in the agricultural sector, and were instigated as these all came together in the Training of Trainers (ToT) courses, facilitated in 3 different provinces. The facilitation of these training courses was founded on this understanding of social learning and enabled participants to experience and develop their own understandings of such an approach, and their roles within it. The role-players involved in the courses included:

- Farmers – in particular small-scale and emerging farmers and household food producers, and members of farmers' associations;

- Government agricultural extension and advisory personnel;
- Lecturers, students and researchers from Agricultural Training Institutes (ATIs) and university agricultural faculties;
- Trainers from agriculturally-focused NGOs and CBOs

The ToT courses provided an opportunity for many people working in the same sector, but who had never previously interacted, to work and learn together for the first time. The learning networks grew from and built on the core networks established through the shared training. Subsequent to the training, the networks continued to operate, both through direct face-to-face interactions and through the use of WhatsApp as their primary social networking platform. As expected from the beginning, the range of issues dealt with through these networks has expanded considerably. From a focus on RWH&C (as this was the starting point) to all other matters affecting food producers such as how to deal with pests and diseases, and broader issues such as the value of seed saving and the importance of food sovereignty. Discussion on these broader issues have entailed making connections with other networks, on a regional, national, continental and even global scale. In this way the members of local networks become part of global movements, and recognise that the issues they face are shared by farmers across the world, in itself an empowering process.

These experiences have helped to confirm the value of learning networks as important sites for social learning which empowers everyone involved, with this empowerment, and strengthening of agency impacting on all aspects of people's lives.

8.2 PART 1: Analysis of Potential Knowledge Use Contexts and Knowledge Resources Available

8.2.1 Knowledge use contexts

One of the first activities to be conducted by the WRC Amanzi for Food team at the very beginning of Phase 1 of the project, was to research the contexts in which the information in the WRC material was most likely to be used, and be of most value. The project's mandate specifically identified a focus, in Phase 1 on homestead food gardeners and cropland food producers, and in Phase 2 on small-scale farming and household food production. The farmers engaged in these activities and at these scales, therefore, were seen as the 'end-users' and ultimate beneficiaries of the knowledge provided through the sharing of the information.

However it was clear that the use of the knowledge would not be restricted to the working contexts of these groups, but it would also be used in the contexts in which farmers derive their knowledge. These were, in addition to the farmers' own contexts, with knowledge passed down through generations and farmer to farmers exchanges, the organisations and institutions mandated to educate, train and support farmers. These included, in the formal education sector, the agricultural training Institutes (ATIs – formerly agricultural colleges), agricultural faculties or departments in universities, agricultural high schools, and other high schools at which agriculture is taught from Grade 10 upwards. The less formal sector included the government agricultural extension and advisory services, and agriculturally focused non-governmental organisations (NGOs).

A detailed study was conducted into the existing education and training programmes offered by the 2 main players in the agricultural education and training sector; the ATIs and the government extension and advisory services.

In the first case an examination was made of 9 ATI curricula, which revealed that although there was varying coverage of agricultural engineering, including construction of farm dams, and setting up of conventional irrigation systems, there was almost nothing on RWH&C directly, although some of the underlying principles and preparatory practices were covered in some curricula. Research into the agricultural extension training programmes again showed that the emphasis was on generally large-scale irrigation systems, with no evidence of training in or support for RWH&C practices.

Although no formal study was undertaken of training offered by NGOs, the experience of team members who had worked in this sector indicated that there tended to be more focus on small-scale farming, with emphasis on low cost, generally organic or permaculture practices such as mulching, and trench-beds, although some NGOs work with more conventional approaches to agriculture. The small-scale practices promoted by most NGOs fitted very well with the philosophy and principles of RWH&C.

This early research revealed the considerable scope and opportunity to introduce the information from the WRC material into the formal curricula within the ATIs, universities and high schools, the training and support offered by the extension and advisory services, and the training provided by the NGOs. Together with the farmer-to-farmer sharing of information, the research indicated a wide variety of contexts into which the knowledge could be introduced and shared.

A process for making the WRC material available to educational institutions, together with guidance on integration of information from these into curricula should be an integral element within the strategy. The availability of all the material on the Amanzi for Food website together with this document and the four supporting ‘Technology Transfer Tools’ (identified in the following section) can be promoted through all the media discussed later in this strategy.

8.2.2 Knowledge resources available

The primary objective of the WRC Amanzi for Food project was to make the information in the WRC material (2 sets in Phase and 8 in Phase 2) available and accessible to as many people in the farming sector as possible. This objective was articulated in Phase 1 as the development of an: *Action oriented strategy for knowledge dissemination and training for skills development of water use in homestead food gardening and rain water harvesting for cropland food production*, and in Phase 2 as: *Developing a social learning network approach to knowledge dissemination and uptake in the agricultural learning system, focusing on the management, use and conservation of water for small-scale farming and household food production.* The information in the WRC material was seen as the foundational knowledge for attaining these objectives. These objectives also led to the development of this Knowledge Mediation, Uptake and Use Strategy, which draws on the experiences of both phases of the project.

The information provided in the 8 sets of material was summarised in a booklet: *'WRC Learning Material for Rainwater Harvesting and Conservation'.* This is available in downloadable format on the Amanzi for Food website: https://amanziforfood.co.za/downloadble-resources/ All the original WRC material, including handouts from the material, are also available in downloadable format from the website, together with a 'Navigation Tool', which was designed to assist farmers and others find information on specific practices in the WRC material. All key outputs from the WRC Amanzi for Food project, have been designed as tools to aid the integration of RWH&C knowledge and practices into a variety of contexts, and are all also available on the website. These Technology Transfer Tools, which are vital components in the Knowledge Uptake Strategy are:

- Contextual Profiling Tools
- WRC Learning Material on Rainwater Harvesting Summary Booklet and Navigation Tool
- Guidelines for the Establishment and Support of Learning Networks
- Agriculture Education and Training Curriculum Innovation Booklet (including the Options for Integration into College Curricula document)
- Radio Handbook: A guide to using community radio and community newspapers for sharing the WRC rainwater harvesting and conservation material and information
- Amanzi for Food Website (with posters, video material, infocards, news and events and all of the eight WRC material made accessible via a multi-layered knowledge access platform)
- Amanzi for Food Training of Trainers Course (Open source on the website, which leads participants into the website and its tools to support knowledge uptake and use)
- Facebook platform for news and updates
- Applied Knowledge Dissemination and Uptake Evaluation Tool (the KDU Value Creation Framework Evaluation Tool)

Information on all the key practices has been placed on downloadable 'Info Cards' which provide very simple summaries of the practices, and the scales at which they are appropriate. Information on some practices has also been captured in downloadable posters and videos. All these additional, supplementary resources provide easily accessible 'stepping stones' into the main material; the idea being that if a particular practice looks interesting people can explore further into the material, with the aid of the Navigation Tool, and find more information.

The project experience suggests strongly that the mere existence of valuable information in well produced material does not guarantee access to the information, and that different pathways need to be opened up to make accessing the information as easy as possible. Any barriers to finding information can stop people in their tracks and deter them from looking further, or even for looking for any more information from that source. One of the main challenges for the project has been ensuring ease of access to the information, and the diverse activities described in the following sections have all contributed to addressing this challenge. They are all key to the development of the Knowledge Uptake Strategy.

8.3 PART 2: Contextual Profiling and Learning Network Formation

8.3.1 Contextual profiling

In developing any strategy for sharing information it is vital to have a good understanding of the people for whom the information is intended, and the contexts in which they operate. The WRC Amanzi for Food project developed and employed a contextual profiling tool to assist in achieving this. This involves different methods of collecting data, or information, in particular interviews and observations. The profiling questionnaire was developed particularly with learning networks in mind, and this is the focus of Part A of the contextual profiling tool. However this is also applicable in any contexts where learning is taking place including in formal situations such as universities and FET colleges, such as ATIs. The understanding of farmers' and others' contexts developed through this profiling exercise is crucial for identifying the existing knowledge they have both in regard to their farming or teaching practices, and in particular in regard to their knowledge in relation to RWH&C practices. The profiling also identifies the principle means by which people access information; vital in shaping the development and implementation of an effective strategy.

Contextual profiling, however is not a once-off process, and continues throughout the entire engagement with various partners, leading to an ever deepening understanding of their situations, changes taking place within these, and changes in both their developing understandings and their evolving requirements for more knowledge and skills. It also informs adaptations to the different means by, and media through which information can be shared at any given time, in any given set of circumstances. In this way contextual profiling is a crucial tool in enabling adaptation in approaches to information sharing, a critical need for any effective Knowledge Uptake Strategy.

The contextual profiling which has been conducted as part of the WRC Amanzi for Food project has informed much of the development of this strategy. The contextual profiling Technology Transfer Tool represents a key component of the strategy.

8.3.2 Learning network formation

The central approach to information sharing in the WRC Amanzi for Food project was through social learning, where groups of people work and learn together to address issues in which they have a shared interest. In this case the interest was, certainly in the beginning, the use of rainwater, through effective harvesting and conservation, to enhance food production. The Training of Trainers courses were premised on social learning, and facilitated in such a way as to promote and foster this. In this way the ToT courses laid the foundation for social learning among diverse groups in the agricultural sector. For such learning to continue beyond the courses the approach adopted was to suggest and support the establishment of Learning Networks. These initially involved course participants, but had the potential to draw in additional members as more people became aware of and interested in the networks and the work they were doing.

Out of the experiences of supporting the establishment of these learning networks a booklet: 'Guidelines for Establishing and Supporting an Effective Learning Network'' has been

produced, and is available on the Amanzi for Food website. This booklet is one of the key Technology Transfer Tools developed to provide support in both establishing and supporting learning networks, and in implementing the strategy.

In relation to the Knowledge Uptake Strategy, it is clear that learning networks are extremely productive in terms of the sharing of information that takes place between members. They also provide real opportunities for the introduction of new ideas and new information from outside the group, while recognising the skills and understandings held by the members themselves. This suggests the need to promote the establishment of learning networks in different contexts, something that will be supported by the information provided in the booklet. From the very beginning, with the initial establishment of the very first learning network in the project, the Imvotho Bubomi Learning Network (IBLN) in the Eastern Cape, it was recognised, indeed expected, that the focus of a learning network is likely to change over time, and so it has proved. This can only be encouraged, as it helps maintain energy within the network, and ensures, to some extent at least, its sustainability. So while a learning network may initially be premised on sharing information on RWH&C, it is only right that new ideas will be brought in, which will augment the learning in this area and take it into other connected areas, such as, in the case of the IBLN, agroecology and food sovereignty.

It has also become clear that the role of an education and training institution such as a university or an ATI as an anchor organisation for a learning network, should not be underestimated. Again in the case of the IBLN, having both Rhodes University and the Fort Cox ATI as founding and indeed central members has played a significant role in maintaining both the integrity and the dynamic of the network. The role played by the University of Mpumalanga (UMP) in the Sinakekela Semanti Sibusiso Learning Network (SSSLN) is similarly critical, although here both the extension services and well-established NGOs also play pivotal roles. This suggests that it is advisable for any group considering establishing such a network to partner with at least one such functioning institution. This is not to say that learning networks cannot survive without these, but that there is a higher chance of long-term sustainability with such substantial anchors. The strategy should therefore be cognisant of this and look at how learning networks concerned with RWH&C knowledge and practice can best be centred on institutions or established organisations with the appropriate agricultural focus.

The ‘Guidelines for the Establishment and Support of Learning Networks’ Technology Transfer Tool provides a strong foundational understanding of learning networks and how to establish and support them.

8.4 PART 3: Development and Use of Social Media Tools

8.4.1 Social media for social learning

An almost limitless space for natural extension of social learning is provided by the wide range of social media available to everyone with the necessary technology (smartphones, computers) and the ability to access the internet via data or Wi-Fi. The use of social media is perhaps more widespread than might be expected, even in the rural areas, with the most favoured media being WhatsApp, followed by similar messaging media such as Messenger, Snapchat, Signal, Telegram, Viber and others.

Other internet-based platforms, such as websites, Facebook, Instagram and Twitter, although used by some people in rural areas – those with access to high-end phones and computers and relatively unlimited data access – are not frequently used by most people. However, they do have a role to play in the sharing of information across a wide audience spectrum.

The experience of the WRC Amanzi for Food project suggests that it is the social media which provide a direct extension of the physical face-to-face interactions preferred by learning network members, which are most likely to be used by them. All the learning networks established through the project were founded on the coming together of representatives of different players in the agricultural sector in the Training of Trainers courses, which enabled everyone to connect with each other through the shared social learning processes on which the course was premised. It was then a quite natural progression to take these connections into a social media space where the relationships could continue to develop. New members invited into the networks have been, almost without exception, people who existing members have known personally in their communities or farmer associations, or through other networks. In this way the social 'virtual' connections evolve out of 'real' physical connections, a situation with which people feel more comfortable than with the relative lack of real connection found in the broader public social media.

It is within the favoured social media, such as WhatsApp groups, that social learning takes place most readily, with almost daily sharing of ideas, interests, concerns, knowledge and experiences in a non-hierarchical fashion. Everyone is free to request assistance or guidance, and everyone is free to provide this, based on their own understandings and experiences. The use of such media allows group members to continually interact, sometimes over considerable geographical distances, far more that they would be able to otherwise. WhatsApp and similar group platforms provide almost endless opportunities for the sharing of new information, particularly if this is connected to members' core interests. The Knowledge Uptake Strategy recognises the immense potential of social media connected learning networks in the extension of social learning and knowledge uptake.

8.4.2 Development of appropriate platforms

It is important to recognise the differing roles that can be played by the various types of social media, and the different kinds of opportunities presented by these. It is also important to recognise that each requires a different kind of management to maintain effectiveness.

The experience with the learning network WhatsApp groups suggests strongly that while people with the necessary technology such as smartphones (or the more affordable mid-range cell phones with internet capability) are happy to be part of such closed groups, most of them are not comfortable with accessing websites or public media such as Facebook. These latter platforms are more accessed and used by professionals who use tablets and computers in the course of their work, and individuals who have become familiar with these and have their own Facebook pages, and/or are members of groups who use this or similar media. Other limiting factors in the choices people make in regards to the use of internet-based platforms are the very high cost of data in this country, and the extraordinary system of 'use it or lose it' where if purchased data is not used within a specified time it expires, and is lost. These factors inevitably impact most on people in resource-poor situations, which includes most of the small-

scale farmers and household food producers who represent the main audience for the WRC Amanzi for Food project. These limitations also impact on the formats in which people can access download material. Material such as videos and image-heavy texts require large amounts of data to access, and often even more to download. This makes them essentially unavailable to many people.

An understanding of who uses which platforms, and how these are used is crucial to the framing of the Knowledge Uptake Strategy. The following table provides a brief summary of the key available media platforms and the audiences most likely to use these.

Table 8.1 Media Platforms and Audiences

Media Platforms	Audiences
Amanzi for Food and WRC websites	All with adequate internet connection and access to data, especially professionals in the water research and management fields, environmental educators, education and training institution personnel, agricultural extension personnel, NGO personnel, participants in online Training of Trainers course, farmers (but websites not favoured by many)
Associated Facebook pages	As above, but only those with Facebook accounts (not favoured by many)
WhatsApp (or similar messaging media) Groups	Only members of the Groups. Require internet connection and data (favoured by most)
Other agriculture linked/focussed websites: including Food for Mzansi https://www.foodformzansi.co.za/ , Agri News Net https://www.agrinewsnet.co.za/ or http://www.farmingportal.co.za/ ,	All with adequate internet connection and access to data, in particular agricultural extension personnel, NGO personnel, individual farmers. (Relatively low, but committed readership)
National agricultural/water journals/magazines – print and online: Farmers Weekly https://www.farmersweekly.co.za/ , WRC Water Wheel http://www.wrc.org.za/the-water-wheel/ , Agri-Pulse http://www.agripulse.co.za/ , Harvest SA https://www.harvestsa.co.za/ , South African Journal of Agricultural Extension (SASAE) http://www.sasae.co.za/ People of the Soil https://peeple.online/ , Nufarmer https://issuu.com/nufarmerafrica	All with adequate internet connection and access to data. Farmers Weekly and Water Wheel available in print versions (by subscription or over the counter) for everyone. Primarily for farmers (established and emerging) and agricultural extension personnel. Also researchers and academics. (Highly favoured among farmers and extension personnel)
Farmer Associations/Unions: African Farmers ASA (http://afasa.org.za/), Black Farmers ASA (https://bfasa.co.za/), Southern African Confederation of Agricultural Unions (SACAU – http://www.sacau.org/)	Primarily farmers

Media Platforms	Audiences
Amanzi for Food and WRC websites	All with adequate internet connection and access to data, especially professionals in the water research and management fields, environmental educators, education and training institution personnel, agricultural extension personnel, NGO personnel, participants in online Training of Trainers course, farmers (but websites not favoured by many)
Provincial, district and local farmers; associations	
National broadcast media – TV and radio	All, in principle, but limitations in terms of language
Community radio stations and newspapers	All, particularly in rural areas, with enhanced access through vernacular languages

8.4.3 Mediation of Knowledge Uptake and Information Sharing

The mediation of knowledge uptake is well recognised in formal education and training processes such as through the Training of Trainers course, discussed in Part 4, below). Mediation in these situations involves deliberate and conscious actions by an educator (tutor or facilitator) taking students or participants through a series of predetermined processes. These, given the farmer and context-centred approaches taken in the ToT course, included:

- Presentations – with the educator presenting ideas and information (here, from the WRC and supporting material) for students' consideration
- Discussions – in which the relevance and implications of the ideas and information may have in the students' contexts
- Activities – in which participants themselves work on the ideas and information to further understand them in their contexts
- Assignments – through which students both assimilate their learning further into strategising for its use in their contexts, and demonstrate their levels of learning

The mediation by the educator in these processes is therefore primarily aimed at supporting the students to access, understand, contextualise and use the ideas and information in ways which are relevant and appropriate. Mediation in these situations is informed by the educators' understandings of the ideas, information and the material themselves, and also of the students' contexts, which is where the contextual profiling explored in Part 2 is so important. This mediation is also aided by the use of specific Technology Transfer Tools, such as the Navigation Tool to access the information, and the Curriculum Options paper to assist in thinking how to assimilate the new ideas and information into existing curriculum frameworks.

Taking this form of mediation into the virtual situation presented by the online ToT course is not without its challenges, but processes have been put in place, as discussed in Part 4, to provide as much direct personal support as possible within this context.

Mediation of knowledge uptake on internet-based public platforms such as websites, takes quite different forms. Here, it is the structure of the platform and the ways in which pathways are opened to the material and their information which are crucial. Simply placing the material on a website does not, in any way, guarantee that people will access and use the information they provide. It is necessary to firstly draw people's attention to the existence and location of the material, and then to provide simple tools to stimulate interest and aid access. For the WRC material on the Amanzi-for Food website several processes were put in place to achieve the former. These included posting notices on the News and Updates page on the website itself, posting items on the associated Facebook page, direct mailings, via email, to as wide an audience as possible. In addition conventional media such as newspapers and radio stations were engaged to promote the message. In order to aid access to the information the Navigation Tool was developed, and a series of Info-cards produced to provide basic information on the key practices, from which people could link to more detailed information in posters and videos, and then into the WRC material themselves. Website users can, of course, access the material directly if they choose.

The learning networks, and in particular their WhatsApp groups, present yet another contrasting context in which mediation of knowledge and information sharing inevitably takes a very different form. The essentially non-hierarchical structure and nature of the networks opens the space for a wide range of knowledge and information to be shared in all directions, with essentially minimum mediation. This requires neither any recognised mediator (as in the formal education/training context), nor any clear mediation processes or tools (such as on the website). The knowledge and information being shared is spontaneously self-mediated within the groups. The mediation here focuses on what is, or is not considered appropriate or suitable for sharing within the group. This informal mediation mostly takes the form of members suggesting the deletion of any comment that does not fit within the fundamental agricultural focus of the group, which has the potential to be divisive, or which gives the impression of being unreliable or even fake. A more positive aspect of the self-mediating nature of the networks is the way in which members respond to issues raised by other members; by sharing their knowledge and experience with, for example, a particular crop pest, and by researching further and sharing new knowledge and information on this that they have uncovered. This mediation therefore continually increases the information available for consideration by all members; a process through which all learn together.

The Knowledge Uptake Strategy is considerably enriched through the recognition of the very varied forms of mediation which are possible and necessary within different knowledge uptake and information sharing contexts.

8.5 PART 4: Training of Trainers Course

The WRC Amanzi for Food Training of Trainers course was central to the strategy for sharing the information in the WRC material. It also provided an opportunity to bring different players in the agricultural sector together in a shared learning experience. The facilitation of four

contact versions of the course, each with slightly differing modalities, and the evolution of this into the open access online course, provided considerable opportunities for understanding how the dynamics of such courses can impact on the learning that takes place within them.

8.5.1 Purposes and principles underpinning the Training of Trainers programme

From the very outset of the development of the ToT programme it was recognised that an essentially participatory and engaged approach would be needed. This was informed by the understanding that, while many course participants may not have much experience in or understanding of RWH&C (the focus of the training), they would bring a wealth of other agriculturally-related experiences and understandings to the course. They would also bring their own experiences and understandings of different approaches to sharing information with others, whether in formal situations, such as in universities or ATIs, or in less formal situations as with the agricultural extension provision by government and NGOs, and with farmer-to-farmer interactions. The recognition of the need to understand and work with these critical dynamics informed the strongly 'farmer-centred' approach to the ToT course, and to developments which arose out of the course including the emerging curriculum innovations.

8.5.2 Delivery modalities for ToT Course

- *The Contact Course*

The ToT course was originally conceptualized as a conventional contact course, based on the 'work-together, work -away' model developed over many tears by the ELRC. The first iteration of the programme, implemented in the Eastern Cape in year 3 of Phase 1 of the project, comprised 5 modules/phases, each facilitated over three days with 2-3 months between each module. This version included 4 individual and 1 group assignment, providing a potential 12 NQF credits for those who successfully completed them. The most critical aspect of the assignments is that they were very specifically designed to enable course participants to take their learning from the ToT programme into their work, A crucial feature of the course, in all its modalities, has been to run it as 2 parallel 'Streams':

1. At NQF level 6 – primarily for participants who already have a first degree or equivalent qualification, in particular ATI lecturing staff and senior extension personnel in both government and NGO sectors
2. At NQF level 5 – for everyone else, with only a National Senior Certificate, or 'matric' being required by the university for registration on the course and to be eligible to receive a certificate.

The structure of this version of the programme was presented as follows:

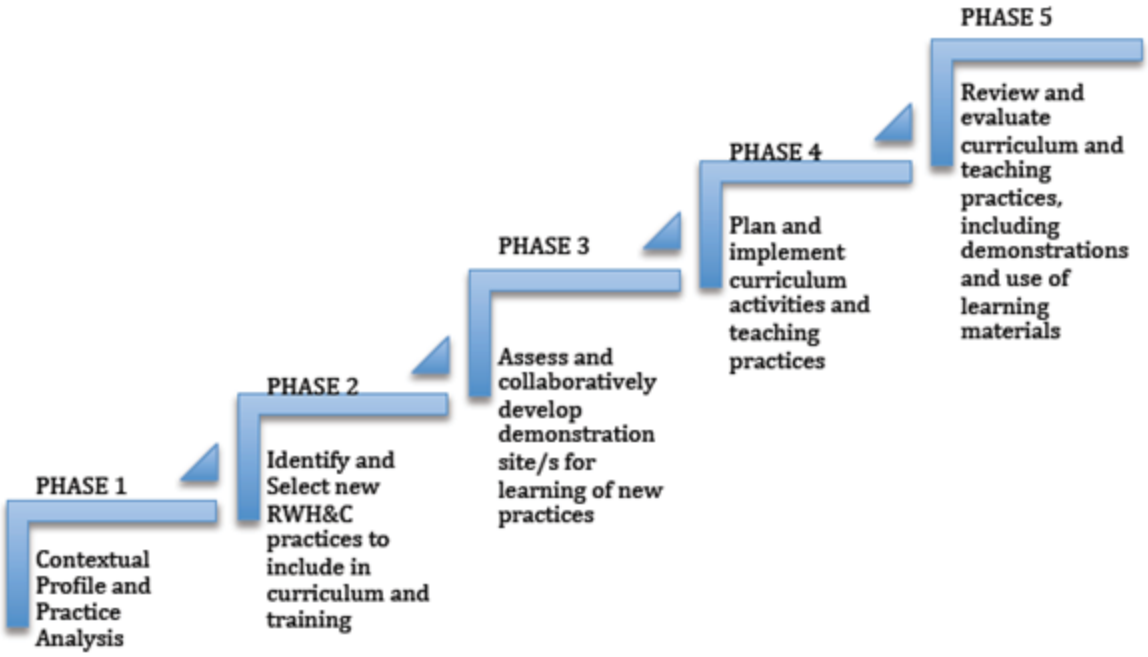


Figure 8.1. Phases of the Initial Training of Trainers Course

Following evaluation of the course by the participants and tutors it was realised that one of the main challenges for participants was finding time to attend 5 modules, in addition to completing 5 assignments. It seemed that this was probably the most significant factor in the almost 40% attrition rate experienced during this first course. The second iteration of the ToT programme, still as a contact course, was therefore reduced to 3 modules/phases. The key content of the initial 5 modules was condensed into the 3 modules, with some reduction in group activities and discussion time. Each session lasted 2 ½ days, and participants were required to complete 3 individual and 1 group assignment. The 3 phases were represented as follows:

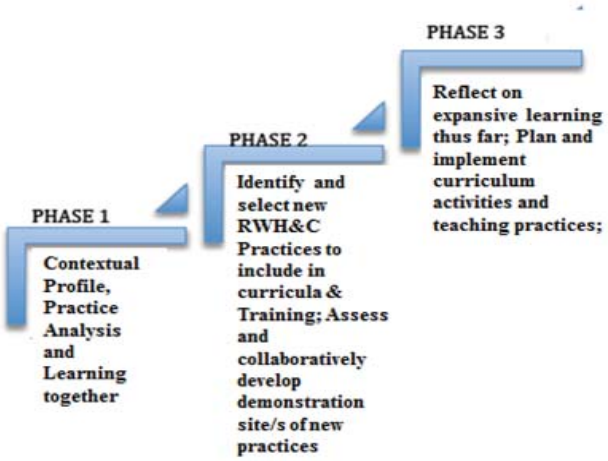


Figure 8.2 Phases of the Revised Training of Trainers Course

This 3-module modality was implemented both in the Eastern Cape and Mpumalanga Provinces, and was very well received with a far reduced attrition rate.

It had been intended to follow the same modality at Taung ATI in North-west Province, but the lecturing staff were under considerable pressure and could not commit to attending 3 modules. They were however very keen to experience the ToT programme and it was agreed to present a shortened version of the programme in one contact session over 3 days. Participants were then required to submit only one assignment.

The use of different modalities in different circumstances has shown the degree of adaptability possible (and necessary) in a course such as the ToT course, when the focus is on placing the users, farmers, lecturers, extension and NGO personnel, etc. at the centre of the course design.

- *The Online Course*

On transition to the Online Course, the 3-module version was taken as the basic framework. There are a few fundamental principles which underpin the online version:

- ***Open Access*** – Great care was taken to remove as many barriers as possible to access to the course and the supporting WRC and other material. This included the course being available to everyone, whether they wish to try for certification or not, and without any need for prior qualification. All the module texts, presentations, and assignments are open for everyone to either view online or download in pdf format. A further move to make the course fully accessible was to negotiate a 'data-free' link for the many people, including very many farmers, who have challenges in affording data. This system entails the university paying for data used by participants, but at a considerably reduced rate. A further dimension of the open access nature of the course is the lack of any registration or other course fees.
- ***Open time frame*** – this is for people who are unsure initially whether they wish to register. They can work on the course and access everything in their own time. There are no fixed teaching and learning sessions (although some webinars are set up to open various areas of the course), and participants can work through everything at their own pace, If at any stage they wish to try for certification they can register, at which point they are given 6 months in which to complete the 3 assignments, which are assessed by tutors, with feedback being provided and the participants having one chance to strengthen their assignments.
- ***Direct contact with tutors for registered participants*** – all participants, upon registration, are allocated a tutor, with whom they can communicate by email. They work with this tutor throughout the course, including on their assignments which their tutor is responsible for assessing and providing feedback. This introduces a personal element into what is otherwise an almost entirely virtual course.
- ***Opportunity to engage with other participants and the tutors*** – this is through a Café Forum webpage attached to the course, where participants can raise questions and issues associated with their experiences of the course.

Given the virtual nature of the course, with no formal teaching sessions, participants can work their own way through the modules, accessing the support material as they go. The modules are structured in such a way that the core texts, which are pared down from the original contact module texts, are interspersed with presentations in pdf format. It is intended that some of these should become either videos or podcasts to vary the media experience within the course for participants. Most group activities in the original modules have been retained in the form

of reflection questions, in which participants are asked to reflect on what various elements of the learning mean in their own contexts, and how they can use them in these contexts.

At the time of writing the WRC Amanzi for Food Open Access Online ToT Course is just taking off, with over 120 registered participants. All aspects of the course will be closely monitored and evaluated which will lead to inevitable refinements and strengthening over time.

The Online Course is a central component of the Knowledge Uptake Strategy, as it is entirely open access, has no costs attached, other than data for those who do not connect through the data-free link, and provides ready access to both learning about RWH&C practices and all the associated material and other Technology Transfer Tools.

8.6 PART 5: Curriculum innovation Options and Approaches

8.6.1 Options for curriculum innovation

The various options for curriculum innovation, in terms of the framework and structure of education and training processes, were developed very early in the project with the aim of providing a guide on the various options to ATI lecturing staff, and others in the formal education and training sectors who work within a curriculum framework. These options, presented as 'Options for Integration into College Curricula' a crucial element of the Agriculture Education and Training Curriculum Innovation Booklet are one of the key Technology Transfer Tools to support the Knowledge Uptake Strategy.

8.6.2 Productive demonstration sites to narrow the gap between theory and practice

In the WRC Amanzi for Food project a variety of approaches to curriculum innovation were taken in different institutions. The most common, but also perhaps the most radical, was the (re)introduction of the idea of the centrality of practical activities, and (productive) demonstration sites as key elements within any curriculum associated with the fundamentally practical field of agricultural production. There has been a tendency in recent years to move away from a focus on the practical in many agricultural curricula, with more emphasis being placed on the theoretical elements, but the project stimulated a resurgence of interest in and recognition of the value of the practical as expressed in the phrase 'The Power of the Practical'. In particular it was recognised that motivating farmers to change their practices or experiment with new approaches required evidence of the effectiveness of these practices. This was as true in extension activities and farmer-to-farmer exchanges as within the formal educational processes.

8.6.3 Expand the scope of Agricultural Education and Training to be more inclusive of smallholder farmers needs

Other approaches, as evidenced by the ToT course assignments produced by ATI lecturers and others included adaptation of existing curriculum elements on water and soil management to include RWH&C understandings and practices. This often included a shift in the scale of farming operations on which most curricula were focussed from large-scale commercial to

more emphasis on emerging farmers working on a smaller scale and even on household-level food production. Taking advantage of the opportunity to effect up to 50% change in curricula without the need for formal approval from the departments of Agriculture or of Education (although sanction was required from within the institutions) some lecturers almost completely rearranged sections of their curricula to create space for the inclusion of different facets of RWH&C.

A further change has been the recognition that large-scale conventional approaches to agriculture are often beyond the financial and other resource capacities of most farmers, and that low cost, low maintenance options, using simple technologies are far more appropriate.

8.6.4 Adopt a farmer-centred approach to curriculum innovation to close the gap between research, extension and education

The Amanzi for Food has developed an innovative farmer-centred approach to curriculum innovation that allows the curriculum to serve the local farming community, while also educating students to engage better with farmers and farmers' needs, and local production systems. This approach as developed in the Amanzi for Food programme centred around making research knowledge more accessible to students and farmers, and also included professional development for lecturers, farmers, extension services in an approach that is also congruent with the demands of the field, where extension services are increasingly required to develop social learning approaches to extension (i.e. work differently in a more engaged way with farmers), and where the demands for extension require multi-actor networks and co-learning. An Agricultural Education and Training Curriculum Innovation Booklet with examples has been developed for use in the online course and for sharing with Colleges and curriculum developers. This approach also addresses the gap between top down curriculums that are very general, and the need for more locally responsive and applied curricula in agricultural regional contexts. The model also aligns with competence based approaches to curriculum, but because it draws in research, it does not make the mistake of focussing on skills only, it focusses strongly on introducing new knowledge (research) into teaching and learning contexts that are practice-centred (extension and education).

The Knowledge Uptake Strategy and its associated Technology Transfer Tools provides support at all levels for institutions to make fundamental changes to their curricula to incorporate a stronger focus on more sustainable and context appropriate approaches to agricultural production, including RWH&C.

8.7 PART 6: Mediation Processes in Social Learning Networks

8.7.1 Social structure of learning networks

The most critical feature of learning networks' social structures is a complete lack of intellectual or authoritative hierarchy. All members are considered equal and their contributions are viewed in the same light and recognised as having the same level of importance and value. This is in a context where members can come from a wide variety of backgrounds, and hold, in conventional terms, junior or senior positions professionally in their work and/or socially

within their communities. The fundamental principle underlying such a structure is that of respect, which goes beyond the merely rhetorical and which imbues all relationships within the network. This is despite, or perhaps because of the wide divergence of membership within an effective learning network. The networks associated with the WRC Amanzi for Food project include new farmers and more experienced farmers, subsistence and commercial farmers, young and more mature farmers, junior and senior agricultural extension personnel, NGO representatives of different levels, students and academic personnel and researchers at different levels. Each places their own understandings, experiences and interests in the service of the collective. Some networks will include an elected committee with particular responsibilities for arranging meetings and other logistical and administrative duties, but such a committee will not play an executive role, and all decisions are taken collectively among all the members.

8.7.2 Information sharing and mediation in learning networks

Each member brings their own understandings and experiences and shares these freely with the network, and often beyond this. This sharing is central to the whole concept of a learning network and the glue which binds it together. As learning networks are usually initially established on the basis of clearly recognised shared interests, it is information related to these interests which is most often shared in the early stages of the network development. However as the network grows and evolves other interests, often linked to the initial interests, emerge and information on these is also shared. In the IBLN, for example, the initial area of interest was, inevitably, RWH&C, but within a year this had expanded to include many other, mostly agricultural, issues of concern to the members, and the range of interests and discussions continues to grow. Sharing takes place most effectively in face-to-face meetings and at *ilimas* where members come together to support each other in implementing a particular farming practice. It also forms the main focus within the WhatsApp groups, where information is shared in the form of text messages, voice notes, photographs and occasional videos. Information shared is often focussed on challenges such as pests or diseases affecting farmers' crops, and on which they seek advice. Information is also shared on funding or training opportunities, or, increasingly, on webinars which may be of interest, or publications on topics related to the farming practices in which the members have strong interests. There is also, certainly within the IBLN and some other learning networks, an element of activism and advocacy, where information is shared on opportunities to make input into government policy, or, alternatively, to protest what are considered unjust or unfair policies.

Mediation of information sharing in social networks is discussed in some detail in Part 3 (above). The critical feature is that the networks are essentially self-mediating, with members themselves, individually and collectively, determining the appropriateness and suitability of the information being shared. Mediation also takes a positive form in the bringing in of newly researched information in response to issues and questions raised by members. In this way the entire collective develops better understandings and grows together. This growth is organic in nature, with each member assimilating the information they deem most appropriate for them and their contexts and bypassing that which is of less relevance. The 'light touch' mediation is well received and understood by members, and maintains a good equilibrium in the network dynamic.

8.8 PART 7: Evaluation of Social Learning and Knowledge Uptake

8.8.1 Purposes of evaluation

Whatever the approaches taken to ensure effective social learning and knowledge uptake processes, no assumptions can be made as to their actual effectiveness. The often vastly different contexts in which these take place provide many varied challenges to both the quantity and quality of learning and knowledge uptake that occurs. It is therefore essential to construct a framework for continual evaluation of the processes, and of their impacts. Some of the critical questions to be addressed through such an evaluation include:

- Who is involved in the social learning and knowledge uptake processes, and what are their roles in these? This can change, sometimes quite radically, over time
- In what contexts are these processes taking place? Contexts, too, can change considerably
- What learning is taking place, and what knowledge shared? These will evolve over time
- What is the immediate impact of the learning on the people involved? Mostly in terms of new understandings and knowledge acquired
- How have people used their new understandings and knowledge? It is the use which is of paramount importance
- How have people shared their new understandings and knowledge? This is vital in terms of understanding the wider dissemination
- How has the use of the understandings and knowledge impacted on the work people do? Looking specifically, with regard to farmers at the productivity of their enterprise
- How have people built on the understandings and knowledge they have gained? Recognising that there might be a continuing iterative development based on the acquisition of new understandings and knowledge
- How have the social learning and knowledge uptake processes changed people's view of themselves and others' view of them? This includes changing sense of self and status within their professional and social communities
- What learnings from this process can be used to inform similar social learning and knowledge uptake initiatives

Such questions, while not exhaustive, can provide for quantitative and qualitative assessments of the effectiveness of the processes over time, with the initial impacts being almost immediate, and others evolving over longer time-frames.

8.8.2 The Value Creation Framework (VCF) approach to evaluation

While there are many different evaluation theories and frameworks available, the peculiar mix of quantitative and qualitative assessments required within the WRC Amanzi for Food social learning context demanded a quite specialised approach. The Value Creation Framework (VCF) of Wenger, Trayner and de Laat (2011), a nuanced evaluation framework, specifically designed for evaluating social learning processes over time, was seen as the most appropriate. It also lent itself to adaptation into different contexts.

The VCF is premised on 5 cycles of value creation in social learning initiatives which can help to establish how social learning and knowledge uptake processes such as that developed in the Amanzi for Food programme can be evaluated:

- Cycle 1 – Immediate value whereby interactions and activities are observed and identified as valuable.
- Cycle 2 – potential value/knowledge capital. In this cycle the value is in possessing knowledge that may be useful in the future.
- Cycle 3 – applied capital/changes in practices. In this cycle the value is in using knowledge to do something, particularly to do something new or different to what has been done before.
- Cycle 4 – realised value-performance improvement. In this cycle value is observed by noticing that doing something differently as a result of new knowledge has yielded positive results, and has achieved the desired outcomes of the actions.
- Cycle 5 – reframing value-redefining success. In this cycle the value is observed when the participants have developed a new understanding of what success and value is.

It can be seen that these Cycles resonate well with the 10 critical questions identified above; but to ensure an even better fit, without any loss of focus, these were adapted and condensed into just 6 questions, as follows:

1. What is the value within the activities and interactions themselves?
2. Does the learning network result in a creation of knowledge and practice that can be shared?
3. Are members able to leverage that knowledge and practice?
4. What is the impact of knowledge and practice on learning network members goals if any?
5. How does involvement in the Learning Network and the knowledge and practice created and shared caused members to reframe, reconsider and transform their actions or work?
6. What insights are gained for expanding the Learning Networks, for knowledge dissemination, and for managing and supporting such processes?

The final question, in particular, is central to the development and further evolution of the Knowledge Uptake Strategy, although all questions have relevance to the strategy.

8.8.3 The VCF for evaluation of social learning and knowledge uptake

In applying the VCF to the WRC Amanzi for Food project, the 6 adapted questions were expanded, in order to be more specific regarding the details of information required, and clustered in relation to the 5 VCF cycles, as follows:

Box 8.1. The VCF Adaptation for Amanzi for Food

Amanzi for Food VCF: Indicators and Questions

Cycle 1 – Immediate Value: *Activities and Interactions*

1.1 Undertaking course in collaboration with others (individuals, organisations, departments, disciplines, etc.)
- People/organisations involved in collective?
- Degree of interactions within the collective?

1.2 Gaining access to new information and ideas (WRC material, others' experiences, input from facilitators, etc.)
- Sources of information?
- Types of information?
- Means of access to the information?

1.3 Collaborative activities (group discussions, field visits, etc.)
- Types of activities?
- Engagement with the activities?
- Initial outcomes of activities?

1.4 Initial steps in developing networks (or consolidating and expanding networks)
- Locus and membership of networks?
- (Proposed) structure of networks?
- (Proposed) focus for networks

Cycle 2 – Potential Value: *Knowledge Capital*

2.1 Reinforcement of existing knowledge (including indigenous/local)
- Types of existing knowledge?
- Sources/locations of existing knowledge?
- Applicability of existing knowledge?

2.2 Gaining new knowledge and skills (from WRC material, course texts, videos, facilitators, other participants)
- Types of new knowledge?
- Sources of new knowledge?
- Applicability of new knowledge?

2.3 Locating new knowledge into own context
- New knowledge located in context?
- Reasons for selection of this knowledge?

2.4 Establishing connections (*some overlap with networks indicators*)
- Kinds of connections established?
- With whom connections are established?
- Purposes for establishment of connections?

2.5 Increased agency through connections/collaborations
- Collaborative activities undertaken?
- Outcomes of activities?
- Evidence of strengthened agency through collaborations?

2.6 Increased understanding of and capacity for learning (from open process of ToT and learning-focused elements within the course), including of notions of curriculum and training processes
- Learning processes engaged in within the course?
- Course elements dealing with learning processes?
- Learning processes drawn on for assignments?
- Learning processes proposed for further sharing of information?

Cycle 3 – Applied value: *Changes in practice*

3.1 Changes in curricula/training processes:
- Curriculum/training process changes identified in assignments?
- Justifications for these changes?

3.2 Use of new approaches/media, including establishment of WhatsApp groups, for sharing information and ideas from WRC material:
New approaches/media uses identified in assignments?
Justifications for these new approaches/media uses?
3.3 Adopting more collaborative approaches through planning for/developing productive demonstration sites and other activities:
Collaborative processes, described in assignments, for planning and developing productive demonstration sites?
Collaborative processes associated with other activities?
3.4 Drawing on information in WRC material (and other sources) to support changes in practice:
Information used to inform changes/activities?
Sources from which information is drawn?
Specific information from specific WRC material used to support changes/activities?

Cycle 4 – Realized value: *Performance improvement*

4.1 Enhanced and productive collaborations
4.2 More effective lobbying
4.3 Recognition of achievements by external observers
4.4 Productivity of sites
4.5 Cascading of demonstration site development
4.6 Expansion and usage of elements of the ToT course and the WRC material

Cycle 5 – Reframing value*: Redefining success*

5.1 Previous definitions of success
5.2 Changes in definitions
5.3 Reasons for changes

This adaptation enables evaluation of both quantitative and qualitative impacts from the very beginning of social learning and knowledge uptake processes to a time when the impacts have spread beyond the immediate people and activities initially involved. Indeed the final 2 cycles only really come into play after some considerable time. The questions associated with the first 4 cycles have been considerably adapted to be suitable for the WRC Amanzi for Food context where the Training of Trainers course was the starting point for all subsequent activities, including the establishment of the learning networks, while the questions in Cycle 5 are in their original form. The very adaptability of the questions is a good indication of the appropriateness of the VCF to a range of social learning and knowledge uptake contexts, and therefore its suitability as the evaluation framework for the Knowledge Uptake Strategy.

The evaluation also showed that it is important to invest in orientation value, and to document reframing and transformative value where it emerges. It is also important to look out for enabling value and constraining factors. Enabling value is particularly important as this can be expanded via the social learning process and network as has been shown across this study. The study also showed that it is crucial to produce immediate, potential and applied value as these are catalytic of realised and reframed value which in turn shapes transformative value possibilities and actualisation. These processes occur in cycles and are iteratively related.

8.9 Conclusion: Implications of this Approach for Advancing Sustainable Development and Food Security in South Africa

The Amanzi for Food project set out to address a paradox or contradiction in South African society, namely that there are many valuable scientifically produced knowledge resources of

high quality that can help to facilitate addressing the problem of poverty and hunger, and the problems smallholder farmers and household food producers (many of whom are women) have in getting water to their fields and gardens. Despite the availability of the knowledge it is not getting to the farmers, or into the agricultural education and training system that is training future extension workers and farmers. Therefore, despite the fact that South Africa is a dryland country with all of its water already allocated, very little knowledge of rainwater harvesting and conservation, especially to support smallholder farmers and household food producers is making its way into the agricultural learning system, viewed in its broadest sense to include agricultural education and training institutions, schools, colleges, universities, extension services, NGO and CBO training activities, with the result that this knowledge also fails to support these farmers.

The project pointed to the dated, and inadequate assumptions of the 'Research-Develop-Disseminate-Adopt' model that characterises most scientific knowledge flow practices. Instead the research proposed to develop and expand a social learning network model for knowledge flow that is more pluralistic (i.e. involves all actors in the agricultural learning system, including farmers, rural women farmers inclusive, youth, extension officers and lecturers from colleges and universities amongst others). The research process developed this model in and through practice over a period of six years, with the first three years in one site, and the second three years expanded the initially piloted approach in two other sites to consolidate and develop the model further while also trying it out in other contexts.

The learnings reported on across this project, and the Knowledge Uptake Strategy recommendations above, indicate that such a model is possible to develop, but that it requires a mix of different mediation and support processes to be working 'in tandem'. Key amongst these are 1) undertaking contextual profiling to understand the situation and farming realities and activities well, 2) making knowledge more accessible via tools that provide easy access to the knowledge and that allow people to approach the knowledge on their own terms (i.e. not through top down transfer), 3) establishing learning networks that are needs driven and that respond to farmers real needs; learning centres have an important role to play in hosting such learning networks and in providing new knowledge into the networks and support, 4) supporting training of trainers processes that help to catalyse and build internal strength in the learning networks and a shared 'repertoire' and identity, 5) focus the course on shared practices (e.g. collaborative demonstration site development) in ways that also benefit local communities and generate interest from them, while also giving students new opportunities to learn from practice and work with communities to also learn from the farmers, 6) work with well selected social media tools in parallel and in complementary ways to continue the learning process in the networks over time, and 7) track and monitor the value that is being created in the networks in ways that also help to make the value visible to the learning network members so that they can deliberate it and build the network through reflexive engagement on what is working for whom under what conditions. It is these 'in tandem' processes that make up the knowledge uptake strategy that we propose.

We propose that this is a community-centred approach to development that is not patronisingly constituted, nor is it devoid of community agency. It is an approach to learning that foregrounds and supports the development of co-learning and transformative agency. Results from the project show that much value is created through such a social learning process, not only

directly for food production and water security outputs, but also for relationship building, social cohesion and social solidarity. Importantly this approach makes knowledge 'live' in practice.

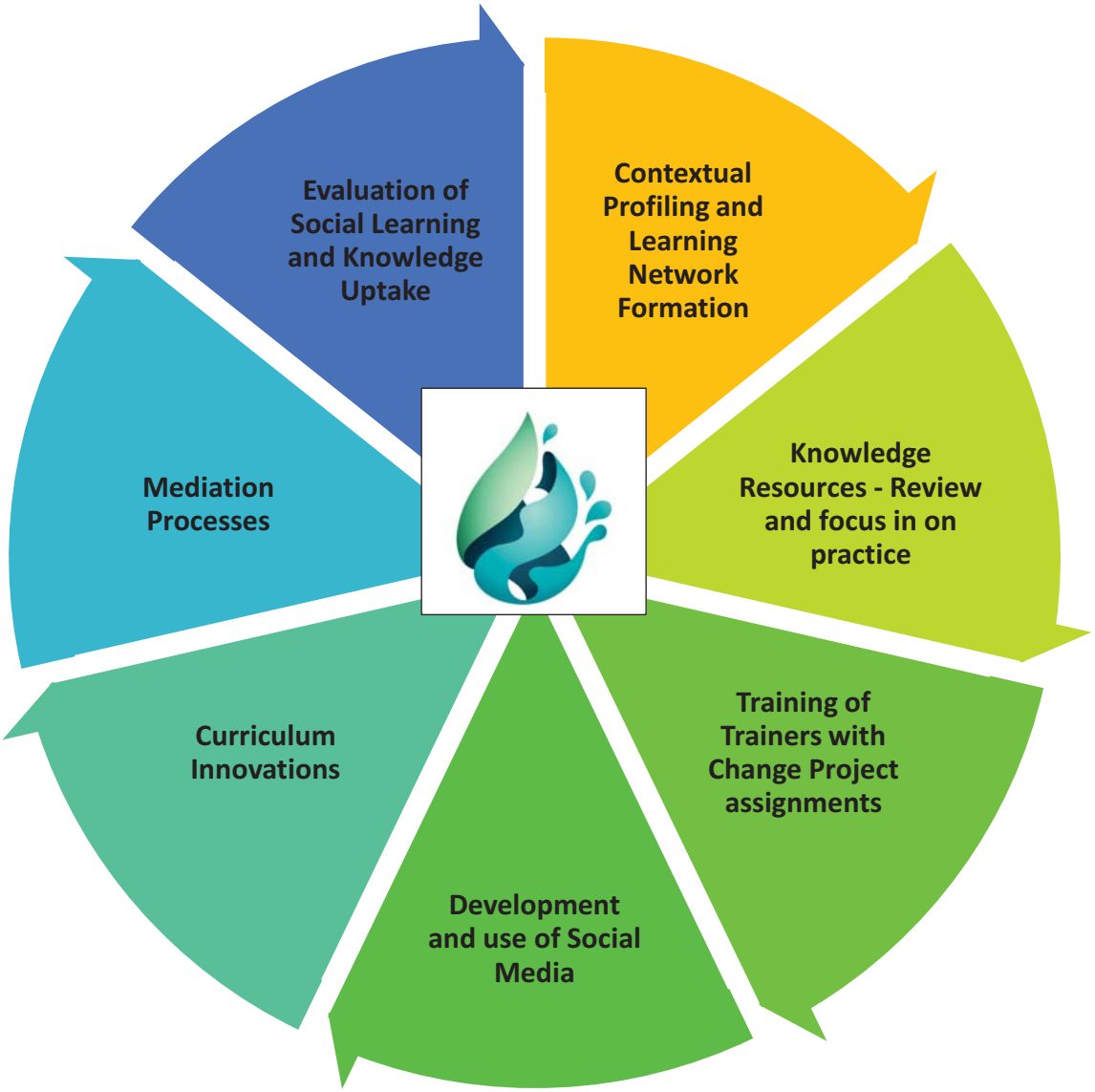
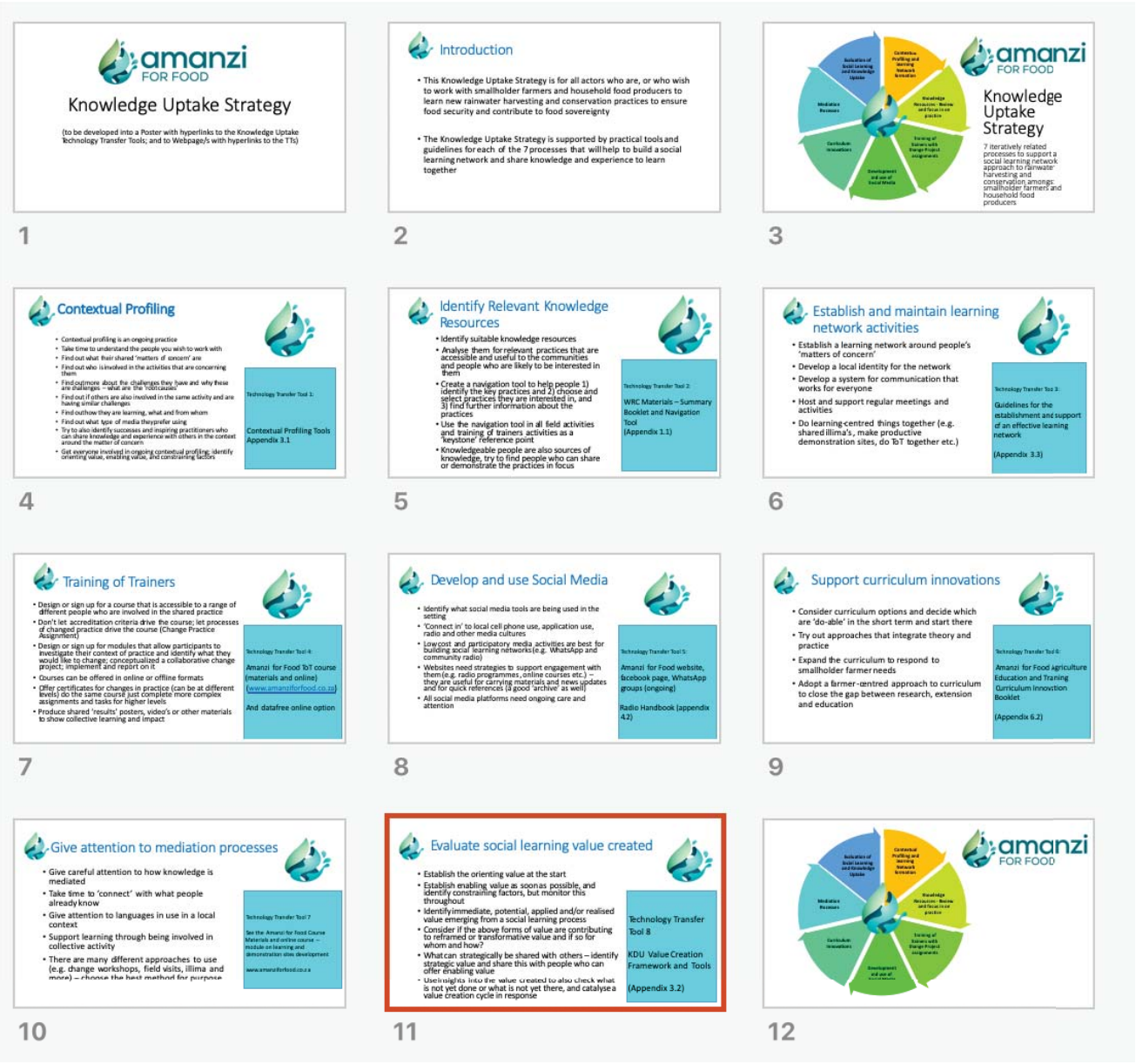
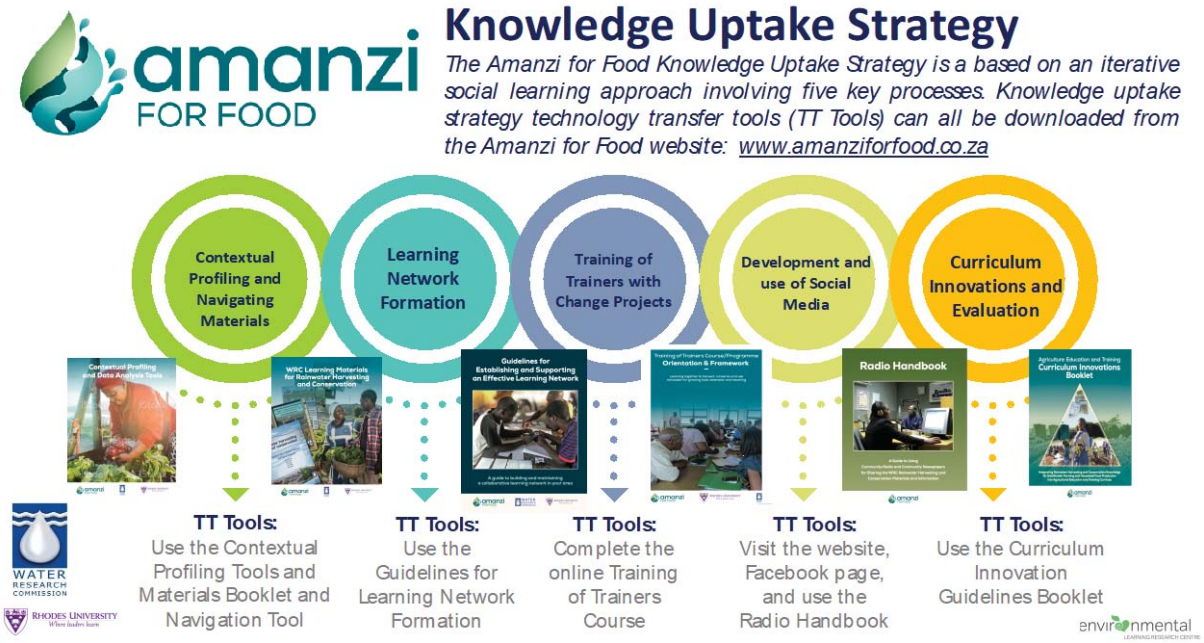


Figure 8.3. Interacting elements of a Knowledge Uptake Strategy with Technology Transfer Tools to support each element – elaborated into an interactive, hyperlinked online tool

DIMENSIONS OF THE KNOWLEDGE UPTAKE STRATEGY



REPRESENTATION OF THE KNOWLEDGE UPTAKE STRATEGY WITH FINAL SET OF TECHNOLOGY TRANSFER TOOLS (on website: www.amanziforfood.co.za).



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