THE UNIVERSITY *of* EDINBURGH

Influencing innovation structures and processes in agro-industries dominated by subsistence producers

An analysis of the rural poultry industry in Tanzania

Vera Florida MUGITTU

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Declaration

I hereby declare that this following thesis is my own work and that, to the best of my knowledge, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institutes of higher learning, except where due acknowledgement is made in the text.

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Vera Florida MUGITTU

Preface

This study emerges from the work of the DFID-funded Research into Use (RIU) programme to commercialise rural poultry production in Tanzania. The programme was implemented between July 2008 and June 2012 aiming to collect and share lessons on how best to enable innovation in developing countries' agriculture. RIU was implemented in six African countries, including Tanzania where it worked in four commodity chains, i.e. rice, maize, dairy and poultry subsectors. This thesis focuses only on what was done in poultry.

In the rural poultry industry, producers are rural households who typically keep an average of one to ten local chickens mainly for social purposes. To most families, producing for the market is not the main goal of keeping chicken. So they mostly adopt the traditional management system where almost no cash investment is done. Breeding is therefore natural, feeding is by scavenging and no veterinary drugs are used except for occasional public vaccination campaigns against Newcastle disease. Usually there is no special housing for chickens. The flock usually shares the main house (mainly kitchen or store) during the night and roam outside during the day. Therefore, this is an activity which even very poor households with small pieces of land afford to do.

When RIU started, keeping chicken under the traditional system was dominant in Tanzania by almost 94%. This was despite the many scientific discoveries on commercial poultry breeding, nutrition, health management and disease control strategies. Seemingly, both public and private initiatives, including government extension services worked towards preserving the *'traditional-ness'* of this system. They practically avoided introducing commercial inputs and technologies already used by urban poultry producers. This trend can be traced back to three scientific arguments that: One, local breeds of chicken have low genetic potential[1] hence they are unfit for commercialisation; Two, *'the poor'* cannot afford to invest in *'modern'* technologies, as doing that alters their farming systems towards unsustainable

[1] Research explains that, compared to exotic breeds, local chickens lay fewer eggs, take longer to reach sexual maturity, and have a very high feed conversation ratio causing them to gain weight too slowly.

economic equilibriums; and Three, local breeds of chicken are more resistant to diseases (an argument which is still contested by some scientists[2]) hence they don't cost much in terms of vaccines and veterinary services. Additionally, consumers preferred the taste of local chicken and hardness of its meat caused by slow growth and the perceived health benefits from organic production. However, despite preferring local chickens, most Tanzanians consume eggs and meat from commercially raised exotic chickens because they are cheaper, more available and well packaged.

Therefore, for the past five decades the three scientific conclusions have shaped the way different actors intervened to develop the industry. Those include the government, researchers, donors, NGOs, private investors and even farmers themselves. In other words, the perceived non-commercial ability of the breed, coupled with its perceived ability to withstand harsh conditions, and the generalised (and even eternalized) poverty state of rural dwellers, have locked the industry into the traditional management system which involves very low levels of investment, including investment in technology and innovation. Consequently, research, policy and practice have reinforced a single development path in rural areas which interlocks *'rural households'*, *'local breeds'*, *'low innovation'* and *'self-sufficiency (as the goal)*', while reserving the alternative commercial paths for the relatively wealthier and urbanised (or peri-urban) citizens.

If I am to elaborate further, these scientific arguments have been interpreted and translated to shape how the industry appears today. For example, economists' interpreted that, if local breeds of chicken are unfit for commercialisation, then investment in technology and innovation along the entire chain (i.e. from production to consumption) will not generate returns. Consequently, what we now see is low investment trends from both public and private sector to produce local chickens, and Government's focus to improve the genotypes of the indigenous flock through promoting cross breeding with exotic cocks. The government also imports exotic breeder stock for commercialisation. These are the two strategies found in the

[2] See (Minga et al., 2001) and (Roothaert et al., 2011)

National Livestock Policy document which guide the development of the rural poultry industry in Tanzania.

On the other hand, development programmes and organisations interpreted the scientific findings as describing a breed suitable to the context of those who cannot afford to invest in commercial enterprises. That the breed is just right for the vulnerable and the marginalised people because very little investment is required. As a result, such organisations promoted local chicken keeping as a popular strategy to supplement rural income especially for women, the marginalised and other vulnerable groups like victims of HIV and AIDS. Supporting family poultry production also became popular among nutrition programmes with the argument that it is 'the most affordable' source of animal protein. Thus for the past 50 years, rural poultry production in Tanzania, as in most African countries, involved local breeds only, and was promoted and sustained under 'low-input-low-output production system. The low-input-low output poultry production system is also promoted and reinforced by the international community from whom African governments draw most policies.

When RIU intervened in the industry, it did not start with the above presumptions of how the industry should operate, or which breed and production system is appropriate for rural areas. Rather, it started by asking rural producers what they wanted and facilitated processes to meet these expectations. So when rural producers said they wanted to earn more money and get out of poverty, it was logical and necessary that they commercialised their poultry enterprises. This meant they had to keep more chickens, control diseases, supplement feeding and engage with the market. Therefore, despite the economic and social limitations present in the target areas at that time, RIU supported rural producers to commercialise their poultry enterprises. This means, RIU focused on what producers wanted and worked to build the capacities needed to achieve that.

Therefore, using different approaches, tools and facilitation methods, RIU promoted industry-wide technological changes which increased farm productivity and consequently improved rural incomes. Reading the RIU final programme report I concluded that, before 2008, the Tanzania rural poultry industry was not well

organised and it had no significant commercial value. So it was not attractive for private sector investment and was not viewed as a commercial activity that could improve rural livelihoods. The number of chickens raised was very small and transactions in the industry were limited, informal and not recorded. Therefore, the introduction of RIU interventions built business networks which connect rural enterprises with urban business for learning and growth. Specifically, the number of chickens produced and production cycles per farmer have increased and triggered a business sense in the industry. As a result, hatcheries, drugs and feed suppliers have increased and improved their production and supply to respond to these new business opportunities. Also, as the number of rural producers increased, transactions along the value chain also increased and were formalised. This means the programme transformed the indigenous poultry industry from Sector four (village or backyard production) to Sector three (Commercial poultry production system) as categorised by FAO.

The purpose of this thesis is therefore two folds. First is to investigate and explain how innovation behaviours changed and why. Secondly, to extract policy and research lessons and contribute to the on-going search for ways to promote innovation in industries dominated by subsistence producers. The study therefore straddles economic development and innovation systems research to specifically explain how innovation processes (which include technological, institutional and organisational changes) can be deliberated promoted to create equitable growth in developing economies.

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I thank God and all the special friends for walking this journey with me. My father died suddenly in May 18th, 2012 barely seven months after I started my PhD. Then four months later my father in law also passed away in September 2012. Losing two important people in a year shook my ground and I don't know how I would have accomplished this thesis without the incredible support from colleagues, friends and family. I know I can't list nor thank them all here. But I am very thankful.

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Abstract

This thesis examines innovation structures and processes in rural poultry industry in Tanzania. In 2005, FAO categorised the rural poultry production system in Tanzania under the lowest sector IV with very minimal biosecurity measures and with no commercial orientation. By 2012, a DFID-funded Research into Use (RIU) programme transformed the industry to Sector III which represents a significant commercial orientation and relatively higher bio-security measures. This thesis explains how RIU achieved that.

This analysis is presented from three perspectives. First, the path dependence framework is used to present the observed dominance of the traditional poultry production system as a *'lock-in'*. The study makes it clear that before RIU, mental frames, resource allocations and how dominant powers behaved reinforced low innovation tendencies. Second, using the agricultural innovation system (AIS) framework and the concepts of *'organisational thinness'* and *'fragmentation'* (also from path dependency theory), it explains that by making rural producers feel self-sufficient in inputs and knowledge, practices in the traditional system disconnect producers from engaging with other actors. Third, the concepts of *'innovation broker'* and of *'exogenous shock'* are used to present RIU as an external force or facilitator which instigated a transformation process. RIU facilitated a large number [3] of rural producers to produce for the market, and which was sufficient enough to create a significant demand for inputs and services. This demand triggered new investment and re-organisation in the supply chains. Then, RIU supported actors to solve capacity problems that emerged from the shock. RIU is therefore presented as a flexible 'innovation broker' who played different roles and allocated resources based on circumstances on the ground.

The thesis makes several contributions. It presents a case of how a public action can promote innovation in industries dominated by subsistence producers by playing the

[3] This number of producers which was needed to trigger and justify demand or supply varied from one situation to another. For example, the number of producers needed to produce sufficient demand for chicks (and therefore trigger supply) was different from the one needed to trigger and justify the supply of vaccines in a particular village. The number or capacity therefore varied from one commodity/input and geographical area to another.

role of an innovation broker to support a significant number of producers to change routines and interact with other actors. It also shows that rural growth can be achieved through linking rural enterprises with those in the urban instead of supporting rural actors in isolation. It basically makes it clear that African agriculture needs re-organization, so that technological changes can follow as a consequence.

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Abbreviations

ACGG	African Chicken Genetics Gains
ADRI	Animal Diseases Research Institute
AEZ	Agro-ecological zones
AGRA	Alliance for a Green Revolution in Africa
AI	Avian Influenza
AIDS	Acquired immunodeficiency syndrome
AIS	Agricultural Innovation System
ARI	Agriculture Research Institute
ASFG	Africa's Smallholder Farmers Group
ASDP	Agriculture Sector Development Programme
CC	Country Coordinator
CEO	Chief Executive Officer
COSTECH	Commission for Science and Technology
CPs	Country Programmes
CPC	Chemical Pest Control
CVL	Central Veterinary Laboratory
DADPs	District Agricultural Development Plans
DFID	Department for International Development
DALDO	District Agriculture and Livestock Officer
DLO	District Livestock Officers
DVO	District Veterinary Officers
DOCs	Day Old Chicks
EDI	Economic Development Initiatives Limited
FAO	Food and Agriculture Organisation
FGDs	Focus Group Discussions
FFS	Farmer Field Schools
FM	Fund Manager
GDP	Gross domestic product
HIV	Human immunodeficiency virus
IAEA	International Atomic Energy Agency
IFAD	International Fund for Agricultural Development
IPs	Innovation Platforms
JKT	Jeshi la Kujenga Taifa (National Service Army)
LGAs	Local Government Authorities
MAFSC	Ministry of Agriculture and Food Security

MATF	Maendeleo Agricultural Technology Fund
MLDF	Ministry of Livestock Development and Fisheries
MTR	Mid-Term Review
NAPOCO	National Poultry Company
NEPAD	New Partnership for Africa's Development
ND	Newcastle Disease
NGO	Non-Governmental Organisation
NIC	National Innovation Coalition
NMLC	National Monitoring and Learning Coordinator
NLRI	National Livestock Research Institute
NPF	National Process Facilitator
RIU	Research into Use
RLDP	Rural livelihood Development Programme
RNRRS	Renewable Natural Resources Research Strategy
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
TAFCO	Tanzania Feeds Company
TAFMA	Tanzania Association of Feed Manufactures
TALIRI	Tanzania Livestock Research Institute
TANU	Tanganyika African National Union
TASAF	Tanzania Social Action Fund
TCPA	Tanzania Commercial Poultry Association
TFDA	Tanzania Food and Drug Authority
TPBA	Tanzania Poultry Breeders Association
TPPA	Tanzania Poultry Professionals Association
UK	United Kingdom
USD	United States Dollar
USDA	United States Department of Agriculture
VICs	Veterinary Investigation Centres
VALEO	Village Extension Officers
VETA	Vocational Education Training Authority
WEO	Ward Extension Officers
WFP	World Food Programme
ZICF	Zonal Innovation Challenge Fund

Chapter 1 Introduction

1.1 Motivation

This thesis is based on an action research programme titled *'Research Into Use (RIU) programme'* which I coordinated for four years in Tanzania. It is an independent piece of work using data which I collected after the programme ended. The analysis presented here is therefore independent of everything else written about the RIU programme. As an attempt to distance myself from my relationship with RIU, I decided to go back and read programme reports, field diaries and watched videos to re-establish what happened. I also sat down with programme stakeholders, including ex-staff and validated what I came up with from the RIU artefacts. I also used new data which I collected through interviewing both programme and non-programme beneficiaries. The interviews captured perceptions and views about the programme which had not been reported before. Data from non-programme beneficiaries also helped me to establish the 'before commercialisation' situation which is more generalizable and which contrasts what RIU did in a manner specific to this study. I also collected data from other secondary sources e.g. from Government reports, budget speeches, etc.

In this study I am broadly concerned with what constrains innovation in subsistence agriculture, and how the public sector can intervene to promote transformative processes that guarantee inclusive growth. I particularly pay attention to the nature of high risk (Roll H. Kristin, 2006), and high transaction costs (Cadot, Dutoit, & Olarreaga, 2010) embedded in subsistence agriculture which are argued to affect the rate of technology use and innovation in such sectors. Grounded in innovation systems thinking, my focus is to establish how technological and institutional change can be deliberately promoted to increase productivity and profitability in agro-industries dominated by subsistence producers. By subsistence here I mean lack of scale, very little marketable surplus and erratic market participation-only rarely done to meet ad hoc cash needs (See Carr, 1997; p.291).

Increasing agricultural productivity and profitability is very important in reducing global poverty because about 70% of the poor live in rural areas where agriculture is the mainstay (Dixon, Taniguchi, Wattenbach, & TanyeriArbur, 2004; Rosegrant, Ringler, & Benson, 2006). This is emphasised in the rediscovery of agriculture in the international development agenda after 20 years of neglect (Anandajayasekeram, 2011; Dethier & Effenberger, 2012). Specifically, African agriculture is very important for global food security solutions as it has access to about 60% of the world's arable land (AGRA, 2013). Agriculture remains very important to Africa as crop and livestock farming continue to be the main source of livelihood for about 70% of her population (World Bank, 2007).

According to the World Bank report of 2010, more than 50 per cent of Africans live below the poverty line with agriculture as the main economic activity (World Bank, 2010[4]). This makes agriculture very important in addressing poverty in Africa because gross domestic product (GDP) growth from agriculture is known to be at least twice as effective in reducing poverty in Africa as non-agricultural GDP growth (Cervantes-Godoy & Dewbre, 2010). According to FAO's report[5] (2009), there are around 33 million small farms of less than 2 hectares, representing 80 per cent of all farms in Africa. This means subsistence agriculture[6] which is known to be less productive and uncompetitive, dominates the sector.

Notwithstanding its fundamental role for poverty reduction, economic growth and global food security, African agriculture is generally understood to have low capacity for growth and development (AGRA, 2013; World Bank, 2007; Rajalahti, 2009). The sector is said to be dominated by poor smallholders who use poor technologies to

[4] Global Economic prospects, 2010

[5] This was FAO's report to the High-Level Expert Forum on How to Feed the World by 2050 held in Rome in October 2009

[6] **Subsistence agriculture** is self-sufficiency farming in which the farmers focus on growing enough food to feed themselves and their families. The typical subsistence farm has a range of crops and animals needed by the family to eat and clothe themselves during the year. Planting decisions are made with an eye toward what the family will need during the coming year, rather than market prices. Tony Waters writes: "Subsistence peasants are people who grow what they eat, build their own houses, and live without regularly making purchases in the marketplace." This is a common misconception. In fact many "subsistence" farmers have important trade contacts and trade items they can produce because of their special skills or their access to resources not available to other "subsistence" farmers. (see Marvin P Miracle, "Subsistence Agriculture: Analytical Problems and Alternative Concepts, American Journal of Agricultural Economics, May 1968, p292-310.)

produce very little for the market (Collier & Dercon, 2009; Dixon et al., 2004). A disconnect is also argued to exist between the production segment of the sector, which is largely in rural areas, and the inputs, services and outputs markets predominantly found in urban areas (Collier & Dercon, 2009). The disconnect is argued to make agricultural production and marketing in Africa risky (Roll et al., 2006), unprofitable due to high transaction costs (Cadot, Dutoit, & Olarreaga, 2010) and less attractive for investment in innovation (Collier & Dercon, 2009; Kilelu, Klerkx, Leeuwis, & Hall, 2011).

African agriculture is also known for its failure to respond to broad economic reforms and to the past 50 years of agricultural aid (Eicher, 2003), although much of the blame on the latter is put on perceptions and choices of approaches rather than on how the agriculture sector functions. Therefore, despite previous significant investment in agricultural research and development, African agriculture still lacks the basic inherent capacity to jump the 'low investment-low output-low income' trap and gain the ability to adapt to global changes (Andy Hall & Clark, 2010; Klerkx, Hall, & Leeuwis, 2009a).

A growing number of agricultural development scholars consider the recent shift from linear to systemic thinking in tackling agricultural challenges a promising solution (Anandajayasekeram, 2011; Knickel, Tisenkopfs, & Peter, 2009; Spielman, 2005; High, 2004). This consensus stems from the understanding that unlike linear approaches, system thinking appreciates the complex nature of agriculture, and that this is a truer reflection of how the sector functions (Anandajayasekeram, 2011; Spielman, 2005). Therefore, agriculture is now widely appreciated as a sector to be approached with less determinism (Anandajayasekeram, 2011; Dixon et al., 2004; Klerkx & Hall, 2009a; Spielman, 2005). Essentially, this way of looking at agriculture opens up new horizons for theories that look at agriculture more holistically as opposed to reductionist (High, 2004). More critical however, is the ability to go beyond the conceptual understanding of these theories and derive practical frameworks for effective agricultural policy and practice (Hall & Clark, 2010).

This study therefore feeds into this line of thinking by examining and documenting the recent work of a DFID[7]-funded Research into Use (RIU) programme in the rural poultry industry in Tanzania as a case study, to empirically explain how structures and behaviours of rural agricultural systems can be externally influenced towards meeting pre-determined broad development objectives like poverty reduction. The study straddles economic development and innovation systems research to explain how innovation can be deliberately promoted in subsistence-based industries.

By analysing what RIU did, the thesis contributes to on-going research to understand how multiplicity and heterogeneity of actors in the agro-systems can be embraced and managed towards increasing agricultural innovation and performance in developing countries. The thesis makes it clear that a significant number of actors needs to change their routines in order to transform a subsistence industry. And to achieve that, there is a social cost of building minimal conditions for innovation in such industries. Building those conditions include 'creating a mental shift', stimulating demand for innovation, and building capacities to articulate needs, seek solutions and utilise them.

The research also gives an empirically based understanding of institutionalisation of the innovation broker role (Geyskens, 2012; Klerkx et al., 2009a; Klerkx & Hall, 2009; Preissing, 2012) in building innovation networks that involve rural producers. It explains that it is possible for the public sector to build innovation networks that promote learning in rural-based industries. The thesis makes it clear that, rural development programmes can play a facilitation role where the entire industry is supported to change as a system. The facilitator thus requires capacity and resources to embrace agricultural complexity by allowing interventions to be shaped by the context instead of being fixated on predetermined plans of activities. In fact, by analysing the complex process of changing mentalities, building linkages, managing multiple actors, synchronising processes, and building system capacities which was done by RIU in Tanzania, the research, in its own right provides an alternative approach to rural development.

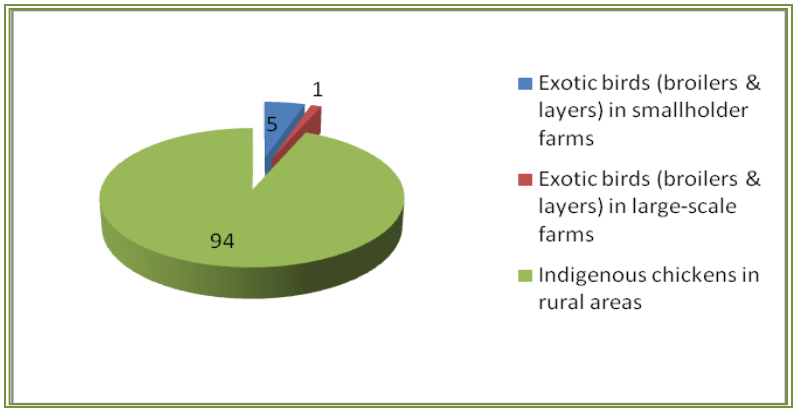
[7] DFID is the UK Department for International Development

1.2 Introducing Tanzania rural poultry production

Poultry keeping is widely practiced in Tanzania as part of income diversification strategies adopted by most households in the country. In rural areas the activity is largely subsistence-based and often managed by women and children (Kitalyi, 1998). To rural households, keeping poultry birds is both an additional source of household income and a cheaper source of animal protein.

There are two major poultry production systems found in Tanzania, namely the semi-intensive or intensive system which is normally practised in peri-urban and urban areas on a commercial basis and the dominant backyard traditional system (indigenous chicken production system) practiced in the rural areas (URT, 2006). The government of Tanzania estimates that more than 94% of the rural households[8], which is about 66% of all households in the country, keep indigenous chickens under the traditional system. These indigenous breeds form over 90% of the entire poultry population in Tanzania (Msami, 2008a) and are supplying 94% of the poultry meat and eggs consumed in rural areas (URT, 2015), and about 20% of the urban and peri-urban consumption (Match Makers Associates, 2010; FAO, 2008).

Figure 1: Proportion of chickens kept under different poultry management systems in Tanzania



Source: Tanzania National Sample Census of Agriculture, 2002/2003

Prior to independence in 1961, there was no policy for poultry development in Tanzania. The poultry sector was entirely dominated by indigenous breeds of chickens kept in the rural settings for the purpose of meeting social obligations, such

[8] Nearly 8 out every 10 Tanzanians live in rural areas and mainly depend on agriculture as their source of livelihood.

as rituals, meeting dowry obligations and offering gifts in terms of eggs and live chickens to colonial masters. The scenario remained the same after independence up to 1967 when the Government started to regulate the poultry sector with a strong bias towards promoting commercial production of exotic breeds through semi-intensive and intensive production systems in urban and peri-urban areas (Kaijage in: RIU, 2011a; p.7). Therefore, two poultry production systems exist in Tanzania with the traditional system specifically reserved for the rural areas and the commercial one promoted in the urban and peri-urban areas (FAO, 2008; Msoffe et al., 2010). The commercial system which involves keeping improved breeds of chicken, use of specific technology packages and application of improved practices, is reserved for the relatively wealthier producers who can interact with actors in poultry supply chains mostly found in urban areas, and whose behaviour and institutions are oriented towards the market.

The Tanzania National Livestock Policy of 2006 is very clear on the government's desire to develop a commercialised and competitive poultry subsector by 2025. However and despite the significance of the contribution the indigenous poultry makes in the subsector and in the general livelihood of most Tanzanians, the Government is inclined towards promoting commercialization of improved breeds. This inclination is informed by research on socio-economic benefits of large-scale commercial production of exotic chickens. Exotics breeds are argued to have higher genetic potential, specifically for fast growth and for egg production than indigenous breeds (Grobbelaar et al., 2010; Rodríguez et al., 2011). Advantages of vertical integration are also documented as a contemporary poultry management system where the entire value chain is managed under one or few distinct firms to minimize production costs and risks. In such a system, quality control is relatively easier and efficient (Momoh et al., 2009). However, the approach increases monopoly in the sector and therefore does not promote equity.

Therefore, for close to five decades, the traditional poultry production in Tanzania remained a backyard activity with insignificant commercial value and was not viewed as a commercial activity that could improve rural livelihoods (RIU, 2011a). In 2009 the traditional industry was estimated to worth only 140 million Tanzania

Shillings (USD 117,000). The reasons for the low commercial value included the fact that; the total number of indigenous chickens raised was very small as most farmers kept between 5-10 birds each, some for over a period of 12-18 months; transactions on poultry inputs and services were limited, informal and not recorded because breeding was natural, chickens were free ranged, and hardly ever treated or vaccinated; and no formal output markets and value addition existed (*Ibid*).

The low commercial value made the sector neither important to the government nor attractive for private sector investment. Agribusiness companies especially input suppliers and other service providers found no business to transact with the rural poultry[9] producers hence did not invest in the industry. Likewise, regulation of the subsector by the government was minimal due to the subsistence nature of the subsector and lack of a functional value chain (Match Makers Associates, 2010). Consequently, the overall investment in the industry remained very low. Moreover, research argued that indigenous chickens have low genetic potential thus unfit for commercialization (Malago, 2009; Ngeno, Vander Waaij, & Kahi, 2014). This perception was sustained even as studies continued to demonstrate that productivity of indigenous chickens can be significantly increased by improving nutrition, disease control, production methods for day old chicks and housing, among other recommended poultry management practices (Minga et al., 2001; Malago, 2009; Goromela et al., 2006; FAO/IEA, 2006).

For fifty years, government policy, research findings, NGO interventions and private investment decisions have been biased against commercialising the rural poultry production. Consequently, local breeds of chicken (which research tends to associate with low innovation levels) are now politically and socially embedded in rural life to the extent that most sources of poultry knowledge and technologies which are accessible to rural dwellers, do not favour commercialisation in rural areas. In turn this created a large group of rural poultry producers entrenched in traditional poultry husbandry practices. Having a large number of socially oriented producers in the industry has made it harder for knowledge, policy and investment providers to

[9] The terms ‘indigenous or local’ ‘traditional’ and ‘rural’ poultry industry are used interchangeably because all rural poultry producers kept indigenous (local) chickens under traditional system. So the indigenous chicken industry is traditional and rural, and vice versa.

change general innovation behaviours. Consequently, resources were pushed even further away from the industry and the rural poultry production became even more socially entrenched to the point where it has become harder for an individual to switch out of it.

Of interest here is the observation that most rural poultry producing households have other farming activities where they actively engage with input and output markets, but they deliberately keep chicken under the traditional low-input system which is not market oriented. Therefore, this thesis is an attempt to explain how a public initiative can alter such a dominance of low-intensity production system, and facilitate a switch to increased outputs.

1.3 Explaining RIU's work in the poultry industry

In July 2008, RIU started to intervene in the poultry industry. The purpose of this action research programme was to collect and share evidence-based lessons on how best to enable innovation in developing countries' agriculture. RIU was therefore designed to create partnerships at different levels in order to build capacity to promote innovation and adoption of research outputs (Mur & Nederlof, 2012).

In Tanzania, RIU sought to explore ways to improve local innovation capacity for increased use of research, new knowledge and technologies in developing profitable agribusinesses. It worked with four commodity chains, i.e. maize, rice, dairy and poultry. However, this study is only concerned with what was done in the poultry industry. RIU Tanzania reports[10] tell a unique story of how RIU transformed the indigenous[11] poultry sector in Tanzania from being a backyard activity that no one took seriously, into a commercially viable sector now attracting significant private sector investment. Government attention to support and regulate the industry is also observed to have increased.

In 2008 FAO categorized the indigenous poultry production system in Tanzania under Sector IV (village or backyard production) which is the lowest category

[10] Visit www.researchintouse.com for programme documents, reports, policy briefs and news.
[11] Note the RIU programme uses the term 'indigenous poultry industry' with a focus on the breed of chicken raised by rural producers. However, I have used the term 'rural poultry industry' because in my analysis I have gone beyond the breed of the chicken.

representing actors with very minimal biosecurity measures and with no commercial orientation (See Table 1-0: below). RIU transformed the industry to Sector 3 which represents a significant commercial orientation and relatively higher bio-security measures (RIU, 2011a). This study explains how the transformation happened.

Table 1-0: Status of the poultry sector in Tanzania: FAO categorization

Table 1: Status of the Poultry Sector in Tanzania	
FAO Classification of Poultry Production Systems	**Status in Tanzania as of 2003 according to FAO**
Sector 1: Industrial integrated system ▪ High level of bio-security and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for bio-security).	Sector 1 is non-existent in Tanzania, bearing in mind the fact that Grand Parent Stock (GPS) operations are not conducted. (FAO, 2008:11)
Sector 2: Commercial poultry production system ▪ Moderate to high bio-security and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife).	Sector 2 represents high levels of commercial poultry production in Tanzania, mainly involving Parent Stock (PS) and hatcheries, but also raising commercial poultry (layers and/or broilers). The operations are medium-scale, embracing different levels of integration. (FAO, 2008:11)
Sector 3: Commercial poultry production system ▪ Low to minimal bio-security and birds/products entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl).	Sector 3 represents farms involved in the intensive commercial egg and broiler production from hybrid chickens. Small-scale (urban & peri-urban) commercial production farmers raising commercial layers and broilers were classified in this category. (FAO, 2008:11)
Sector 4: Village or backyard production ▪ Minimal bio-security and birds/products consumed locally.	The Tanzanian local chicken production system fits well into Sector 4

Source: Adapted from FAO classification,(FAO, 2008; p.11)

After RIU facilitation, both public and private sector actors now consider poultry production in rural areas a viable economic activity. The activity is now boosting household incomes and building business networks which involve rural producers. Such networks involving urban and rural businesses in poultry did not exist before. The volumes traded have increased and triggered investment in innovation and technologies to expand supply, meet quality and standards, and increase efficiency in logistics. These changes have attracted government regulation and public investment

to support the industry. For example, the government has invested in a vaccine plant, poultry breeding research and more donors are funding programmes to develop the supply chains. Table 1-1 below summarises the changes.

Table 1-1: Changes in the rural poultry production after RIU interventions

What changed	From	To
Production scale	No scale (subsistence)	Small-scale commercial
Number of birds kept	1 to 10	100-300+
Type of breed	Local	Cross-breeds
Production system	Traditional (extensive)	Commercial (semi-intensive)
Use of commercial inputs	Zero-to-low use	Significant use (80% increase)
Growth rate	1.5Kg in 12-18 months	1.5Kg in 3-4 months
Production cycles	once a year	three batches a year
Mortality rate	High (80-90%)	Low (between 2 to 4%)
Housing	None	Improved. I.e. building shades and fencing
Use of veterinary services & bio-security measures	None	Improved; I.e. full vaccination, treatment, disinfection, nutrition, sanitation, traffic, etc.
Commercial chick production	Very low (total capacity 500-2000 chicks/week and not registered)	Established and formally registered fourteen[12] medium-scale hatcheries (total capacity of 250,000 chicks per week.
Market for poultry products	Irregular and informal Most products were consumed locally	Regular and party formal; An integrated marketing system for live chicken emerged. Most products are sold outside the villages.
Value addition	None	Formal screening, packaging and branding.
Service delivery model	Through government projects, NGOs etc.	Contract farming to produce table eggs, broilers, and fertilised eggs for hatcheries
Government regulation	Low	High (Hatcheries, feeds, drugs, vaccines, transportation of chicks, eggs, etc. are regulated for quality and consumer safety)

Source: RIU end of project report (RIU, 2011b)

Basically, RIU linked rural producers with urban organisations and increased their opportunities to learn, do business and innovate. Producers' behaviour changed that made them attractive for partnership with upstream actors. Significantly, even without adopting pure exotic breeds rural producers managed to change from traditional (extensive) to commercial (semi-intensive) production system. This thesis explains how RIU's external facilitation supported rural producers to switch from a

[12] Data on poultry for 2015 show the number of hatcheries for local chicken has increased from 14 in 2011 to 26 in 2015. See unpublished Country report at; http://www.sapoultry.co.za/pdf-statistics/tanzania-country-report.pdf

socially entrenched traditional production system to a commercially oriented one which entails higher levels of innovation. It explains the underlying process towards this shift as an alternative approach for promoting innovation in industries dominated by subsistence producers.

1.4 Research objective and questions

The main objectives of this research are to describe, understand and explain innovation behaviours in subsistence based industries, what influences them, and how they can be externally influenced as a system through a pubic initiative towards meeting broad objectives such as poverty reduction.

In order to meet the objective, the study investigates the Research into Use (RIU) programme's work in the rural poultry industry in Tanzania as a case study. It analyses the behaviour of the industry before and after the programme intervened. This implies understanding how producers behaved before RIU, what was actually done by RIU and how the industry responded (i.e. what changed).

Therefore, the main question on the RIU experience is, 'what actually happened and how?' However, the study is guided by three research questions presented below.

Q1. Describe: *What drives or constrains innovation (in terms of demand and utilization of new knowledge) in the rural poultry industry?*

- Focusing on system structures and actors' behaviours (including perceptions, expectations, routines and interactions)

Q2. Understand: *Why is innovation generally low in the rural poultry industry in Tanzania?*

Why are interactions low in the industry in question? What determines (promotes/limits/blocks) interactions in the industry? What sustains low innovation behaviours (in terms of demand and utilization of new knowledge) in the rural poultry industry in Tanzania? Why was innovation low despite the growing market demand for poultry products, existence of a large body of poultry innovations (i.e. husbandry practices, technologies, etc.), and the public interest to reduce rural

poverty through funding a range of agricultural and poultry development programmes? This question is linked to the first question on what drives or constrains innovation in the poultry industry.

Q3. Explain: *How can innovation behaviours and structures be influenced towards a shift to higher innovations levels in industries dominated by subsistence producers?*

That is, how did RIU promote and establish interactions? And how did the industry respond? How did RIU increase the demand for innovation and investment in the industry, and how were multiple interactions and learning promoted among heterogeneous actors in the industry? An industry which was subsistence-based and dominated by many players where majority were small and with limited capacities? What was constraining innovation in the industry in the first place? And how did the programme overcome it? What support mechanisms, institutional arrangements and configurations of actors were established to facilitate and support the innovation process? And how did this succeed despite the strongly held view among policy makers and scientists about the low genetic potential and productivity of indigenous chickens? And more importantly, what was the role of the public investment in all this?

1.5 Study arguments and contributions

The main study argument is that external facilitation to stimulate and establish multiple interactions and learning can significantly promote innovation in industries dominated by subsistence producers. And this is achieved through the following:

First, by facilitating *'a mental shift'* among a significant number of producers to change how they manage their enterprises. Specifically, this study refers to making rural producers produce for the market in order to justify use of new knowledge and technologies. This means re-organising farm activities (or enterprises) beyond self-sufficiency and become '*self-insufficient'* in inputs, knowledge, etc. and therefore create affinity for other enterprises as sources of inputs and knowledge, etc.;

Second, by creating a *'demand shock'* where a significant number of producers gets supported to demand and procure significant (aggregate) amounts of knowledge, materials (e.g. inputs and technologies) and other services. The intention here is to create mechanisms that make poor producers gain the financial and organisational ability to send 'considerable noises' or 'demand signals' to the markets (e.g. poultry inputs, service and knowledge markets) to justify a reorganization of the markets to accommodate rural producers' needs. This means supporting poor producers to gain what they currently lack in order to operate in input and output markets; then,

Third, using a '*bottleneck approach'* to build *system capacities* for actors to respond to the shock and gain the ability to respond to the demand signals. This includes building suppliers capacity to supply quality inputs and services; and building producers' capacity to utilize what is being supplied (e.g. train producers how to administer vaccine, feed chicks, etc.). Basically, it is to build the entire system's capacity by synchronising actors and their operations until the system adapts a new equilibrium. This involves building sustainable partnerships for efficient input and service delivery (i.e. inputs, extension, regulation etc.), and product marketing.

Basically, what is described above is a set of processes that trigger a significant demand (from a significant number of producers) for knowledge, innovation and investment, then enhance capacities (i.e. of all actors) to satisfy this demand. In making this argument, the study contributes to knowledge in three ways:

— The first is to demonstrate that subsistence industries are actually experiencing forms of *'lock-in'* caused by entrenched practices that extend far beyond the behaviour and choices of individual producers.

— Second, the study demonstrates that the process of facilitating and promoting innovation in industries dominated by subsistence producers gets shaped by the context as it shapes it. Thus facilitators require the ability to change and act from, and on a constantly changing context while at the same time maintaining the ambition to meet a shared vision.

— The third contribution is methodological. By studying and describing processes as they happened in detail, and as much as possible in their original chronology helps to analyse why and how innovation decisions are made by actors, their response (both individual and collective), and how the system changes as a response to facilitation.

— The fourth contribution is theoretical suggesting a multi-disciplinary framework in analysing agricultural innovation. Specifically, the following theories are explored in this study: (i) the Path Dependency theory and concepts of lock-in, organisational thinness and fragmentation are used to explain why low innovation persists in subsistence agriculture. The concept of 'exogenous shocks' from Business Cycle and Economics theories is used to explain how externally driven disruption can be facilitated to break path dependency; and (ii) Demand Shock theory is explored to predict if an AIS can be subjected into a 'demand shock' and trigger innovative responses from heterogeneous actors; (iii) Analysing the role of agricultural commodities using the Actor Network Theory (ANT) in determining interactions in agro-industries is also found very useful. ANT emphasizes the fact that, the nature of commodities influences choices of technologies, routines and knowledge to be demanded and supplied, thus determining which actors should interact.

1.6 Linking with wider debates on subsistence agriculture

The question of why innovation is generally low in the rural poultry industry in Tanzania can be linked to a much broader question of why subsistence agriculture which is known to operate at low innovation levels, and offer less gains, dominates the agriculture sector in sub-Saharan Africa by almost 80 per cent. It is also linked to the continuing debates on how to increase agricultural performance in the continent.

Defining subsistence agriculture is not straight forward although the most preferred definition relates to the share of marketed produce where the lower this share is the higher is the degree of subsistence orientation (Abele & Frohberg, 2003). Sometime the nature of crops is also used to define subsistence farming where crops are

characterised as “cash or food crops”, with the former being unlikely to be predominantly grown under subsistence mode. In situations where the farm household neither sells nor buys, but consumes everything it produces, lack of access to inputs is expected to constrain production to particular techniques and in most cases to entail low productivity levels (Cadot et al., 2010).

However, this is a relative definition because the share of outputs sold on the market and the share of consumption bought from it vary. Hence where to draw the line between a ‘subsistence farm’ and a ‘market farm’ is a matter of judgement (Ibidi). Cadot and his colleagues suggest that a proper understanding of subsistence agriculture is needed based on identification of which markets exist and which don’t because where labour markets function better than outputs markets, households can supply labour for off farm employment and gain cash which is in turn used to procure agricultural inputs and therefore break the key analogy of subsistence households not being able to buy inputs because no output is sold. In all these attempts to define subsistence production one finds similarities on issues related to smallness of the market share, low input use and lack of consistent response to market needs and opportunities. This means subsistence production is not driven by market but rather by household needs, be it food, cash or leisure. It is also evident from the literature that subsistence producers deliberately choose low-return strategies to manage production risks (Abele & Frohberg, 2003; Cadot et al., 2010).

According to Heidheus and Bruntrup, cited in Abele & Frohberg (eds), (2003; p.2), subsistence agriculture is closely linked to a low level of economic development also seen as synonymous with backwardness and inefficiency, holding down economic growth and economic performance. It is mostly found both in today’s less developed countries and in the early stages of industrialised countries. Typically, subsistence agriculture is characterised by a low-external input level and low productivity (per land and /or per labour) and a general lack of efficiency of resource use. In economic terms, subsistence agriculture is argued to be a low production sector, whose actors seem to behave irrationally and therefore found to be resistant to change and innovation (ibid). Subsistence agriculture is also argued to display low

responsiveness to policies and is therefore difficult to influence through developmental policies (Seavoy, 2000; cited in (Abele & Frohberg (eds), 2003).

Contrary to the above arguments, some analysts see subsistence agriculture as a sustainable economic system because of its autarchy (Doppler 1991; in Abele and Frohberg (eds.), 2003). Others see its continuing existence as a proof of efficiency while others see it providing a relief from curses of globalisation and modernisation (Abele & Frohberg, 2003). These arguments are challenged by Abele and Frohberg (2003) who argue that autarchy is prone to production risks that cannot be buffered by functioning markets. Moreover, subsistence agriculture yields lower incomes than market-oriented agriculture. And since it has been proved that the lower the national income is, the higher is the number of subsistence plots, then it is possible to conclude that subsistence farmers are overall disadvantaged, and that subsistence agriculture is really a problem. As Braun and Lohlein (in Abele & Frohberg, 2003) correctly put it, in a global sense, subsistence production is becoming less and less viable as it misallocates such a significant labour and natural resources to unrealised gains from trade and specialization.

Reading African development reports, strategies and plans, it is evident that altering the existing high prevalence of subsistence agriculture in Africa is very important. The reports argue that, in order to end poverty in Africa, the continent's agricultural sectors must transform into becoming more knowledge-based and more market-oriented (Juma, 2011; NEPAD, 2006; Yee-Cheong, 2005). Specifically, Africa is said to need rural enterprises which are profitable, competitive, and well linked with the urban dynamics for services and markets. At this point it is important to note that sustainable economic change in poor countries is influenced powerfully by science and technology, and in particular, technology development in African agriculture is of key importance for welfare reasons. Therefore, meaningful agricultural transformations and poverty reduction in Africa will have to be anticipated from growth in smallholder agriculture brought in by their ability to innovate through increased utilization of new knowledge and technologies. This is in essence overcoming subsistence agriculture which is currently dominating the sector by 80%.

Numerous attempts to develop subsistence agriculture were previously made but failed (Abele & Frohberg, 2003). These were mainly done through agricultural development policies that aimed at making farmers produce more for the market. However, the focus was on introducing new technologies and innovations without addressing other numerous factors surrounding the subsistence producer. As a result about 80% of farms in developing countries are still under subsistence production despite the markets brought by global technological change, urbanisation, industrialization, improvements in infrastructure and transport, and international trade. It also happens despite the over 50 years of development efforts which actively supported the switch from subsistence to market production (Eicher, 2003).

Existing literature lacks empirical evidence of how innovation can be promoted in subsistence-based industries to achieve sustainable industry-wide transformation. This happens at a time when it is increasingly becoming evident that existing approaches currently used for farmer empowerment and agricultural technology transfer have failed to influence innovation behaviours of a significant number of African rural producers and to gain capacities needed to escape the *'subsistence trap*[13]*'*.

Generally, factors mentioned in the literature as causes of persisting subsistence based agriculture are mostly external to the producer. Very little is mentioned on internal dynamics surrounding the decision-making processes within such a household. This includes the role played by the continued exclusion of such a household from interacting with non-subsisting producers or actors in the same industry or production system in manners that challenge behavioural status quos. Where the external causes are mentioned, very little is mentioned about the institutional and cognitive factors causing them. This study contributes to the investigation on what causes the dominance of subsistence agriculture in sub-Saharan Africa achieved by interrogating behaviours, routines, attitudes and structures of the entire system where subsistence producers operate. The study also attempts to provide a practical approach to alter the dominance.

[13] The concept of 'subsistence trap' is used by Wouter Zant when discussing barriers to exist subsistence agriculture. See (Zant, 2005)

1.7 Linking with discussions in innovation systems and path-dependency

In this section I am going to talk about innovation and innovation systems approach to demonstrate how these are linked to the analytical framework chosen for this study. The discussion departs from the national systems of innovation (NIS) framework, and since the NIS is too broad for this study, I will focus on the agricultural innovation systems (AIS) and not the regional, sectoral or the technological systems of innovation.

1.7.1 Linear vs. systems-oriented innovation process

Literature classifies theories of the innovation process as being linear or systems-oriented. A linear view of the innovation process means that "science leads to technology and technology satisfies market needs" (Gibbons et al., 1994). It thus envisions a smooth, unidirectional flow from basic scientific research to commercial applications. In this model there is no feedback from the several later stages of the innovation process (i.e., product development, production, and marketing) to the initial stage of research, nor is there feedback between any of the other stages. The linear view is very simplistic and unrealistic. It is also highly consistent with neo-classical economic theory's "market failure" which calls for both direct and indirect public support (Edquist & Hommen, 1999). However, in practical terms these theoretical formulations do not assist the development of specific innovation policies because they do not indicate the amount of government intervention required, the particular fields in which it is required, or the type of intervention required (Ibid).

Whereas, the systemic view of the innovation process which led to the emergence of systems of innovation (SI) approaches which theorize non-linearity and interdependence (Edquist & Hommen, 1999) explicitly recognizes the potentially complex interdependencies and possibilities for multiple kinds of interactions between the various elements of the innovation process. Nine characteristics of SI approaches have been identified by Edquist and Hommen (1999) and are crucial to this study. Those are; (1) they place innovation and learning processes at the centre of focus. (2) They adopt a holistic and interdisciplinary perspective. (3) They employ historical perspectives. (4) They stress the differences between systems, rather than

the optimality of systems. (5) They emphasize interdependence and non-linearity. (6) They encompass product technologies and organizational innovations. (7) They emphasize the central role of institutions. (8) They are still associated with conceptual diffuseness. (9) They are conceptual frameworks rather than formal theories.

1.7.2 Evolution of systems of innovation (SI) theories

The theory of innovation can be traced back to the works of Adam Smith (1776) and Ricardo (1821) who noted the influence of innovation (i.e. new production techniques and new division of labour) on output and society and started the discussion on innovation and technological change in agriculture (Spielman, 2005). Ricardo's analysis introduced factor bias as a determinant of the technological change on productivity, income and welfare. He therefore distinguished technologies which increase productivity and those reducing the cost of production. It is Ricardo therefore who provided an early analytical framework for studying the form and nature of innovation and its impact on social and economic wellbeing (Ibid).

Following Ricardo's analysis, other classical political economists like List (1841), Mill ([1848] 1965), and Marx ([1894] 1990) developed interest in the social and economic effects of technological change. Particularly, List is credited with the earliest description of a 'national system of political economy which was further developed by Lundvall and Freeman into the innovation system concept in which production results not only from the activities of the firm but also from those of the social and economic institutions(Christopher Freeman, 1982; B. Å. Lundvall, 2007). Later Leontieff (1941) contributed further and introduced the input/output analysis that established the industry level 'system' approach to production later used to explain innovative processes (Spielman, 2005).

In 1934 Schumpeter laid the corner stone of the modern innovation systems approach by distinguishing between invention, innovation and diffusion. He also distinguished between product, process, and organizational innovation (1939, p.87 cited in; Spielman, 2005; p.4). Schumpeter analysed the market and institutional conditions that generate innovation. According to Nelson and Winter (1982), in the Schumpeter's system, innovation is endogenously determined by the behaviour of

the entrepreneur and his or her financiers and by the institutions of private property, business traditions and capitalist competition

The development of SI approaches has therefore been influenced by different theories of innovation such as interactive learning theories and evolutionary theories (Edquist, 1997). The main theoretical origins of SI approaches also include a sectoral or technological system approach (Carlsson, 1995), and both broad (B.-Å. Lundvall, 1992) and narrow (Nelson & Rosenberg, 1993) versions of a national systems approach. Lundvall's views exemplify the broad national approach which relates the national context to interactive learning theories of innovation (B.-Å. Lundvall, 1992). Using previously developed innovation theories within a conceptual framework of "national systems of innovation" a framework stressing processes of learning and user–producer interaction was developed. In Lundvall's view, some kind of SI approach is arguably inherent in any perspective that sees the process of innovation as interactive (Lundvall 1992: p.8). The notion of interaction paves the way for a systemic approach. The focus on interaction within national systems also highlights the importance of institutions and organizations beyond the market. Several innovation theorists have convincingly argued that the model of the isolated, profit-maximizing firm is an inappropriate tool for interpreting certain important aspects of innovation processes. Many of the actors and organizations involved, such as governmental or private non-profit organizations, are not primarily governed by profit-seeking motivations. Legal conditions, rules, and norms will also significantly affect an organization's inclination and possibility to innovate. Both non-profit and profit-oriented organizations, like firms, also interact with each other in complex ways when pursuing learning and innovation (Edquist and Hommen 1999: p.67). How firms interact and why they do so is also analysed in this study as a pathway to understand what can trigger interactions among different actors in agriculture.

Interactive learning theory's strong emphasis on institutional analysis led to the identification of a broad realm of economic relationships and innovative activities that belonged to "neither market nor hierarchy". This, in turn, allowed for another important influence on SI approaches—namely, emerging theory and research on networks of innovators (C. Freeman, 1991). A significant literature exists on

networks as a special form of economic organization between markets and hierarchies, and much of this work has dealt in various ways with themes such as learning and innovation. In particular, Håkansson's work on industrial networks (Håkansson 1990) has been cited as an important influence on SI approaches. Due to its interest in studying patterns of linkage structure among firms and other organizations within fragmented markets, a major theme in this exploration of industrial networks devoted to collaborative development of new technologies has been the investigation of vertical and horizontal relations within networks. In this approach, it is recognized that all user–producer (or customer-supplier) relations constituting inter-firm networks must, by definition, involve some degree of vertical integration (although, by definition, vertical integration can never be complete in an inter-firm network).

Conceptualizing systems of innovation as evolutionary systems in which institutions matter and learning processes are of central importance has significant implications for influencing agricultural innovation in developing countries. In particular, SI approaches provide for a much more detailed analysis of innovation processes than the linear approach discussed above. From an SI perspective, analysing innovation involves analysing interactions, and which in turn requires analysing intensity, typology and behaviour of actors involved within a particular system. It also provides for the analysis of other factors i.e. technological, institutional, economic, social, environmental etc. which also tend to influence innovation as a process.

In this study innovation is seen as a co-evolutionary process combining technological, social, economic and institutional change. This makes production and exchange of technical knowledge not the only prerequisites for innovation but a balance amongst new technical practices and alternative ways of organizing, beyond technology adoption. It is therefore seen as a complex process resulting from multiple interactions involving different actors. Specifically, agricultural innovation is broadly viewed as an outcome of agricultural innovation systems (AIS)(Klerkx, Van Mierlo, & Leeuwis, 2012).

1.7.3 Innovation systems perspective in agricultural research

The innovation systems perspectives on agricultural research and technological change present a significant change from the conventional linear approach to providing an analytical framework that explores complex relationships among heterogeneous agents, social economic institutions, and endogenously determined technological and institutional opportunities. This is to extend the innovation systems approach from studies of national innovation systems in industrialized-country manufacturing to developing country agriculture, and shift the emphasis from a unidirectional technology transfer approach to a more complex, process-based systems approach (Spielman, 2005: p.ii).

According to Klerkx eta al, (2012: p.459), a wide range of approaches to agriculture has emerged over the past 40 years and some of the well-known examples include the Transfer of technology approach (Jarrett 1985), Induced Innovation (Ruttan and Hayami 1984), Training and Visit System (Hulme 1992), Participatory Research and Participatory Technology Development (Farrington am Martin 1988; Neef and Neubert 2011), Farmer First (Chambers et al. 1989), and Agricultural Knowledge and Information Systems (AKIS) (Rolling 2009). The authors explain that while agricultural innovation studies appear to have developed in relative isolation of generic innovation studies which focus on industrial innovation, there has always been a degree of cross-fertilization. That generic systems studies have influenced systemic thinking in agricultural innovation studies, and vice versa (p.459). For example, the works of Checkland (1981) and Kline and Rosenberg (1986) have influenced AKIS thinking (Ibid, p.459).

In their paper titled *'strengthening agricultural innovation capacity: Are innovation brokers the answer?'* Klerkx, Hall; and Leeuwis (2009) summarise that, systems thinking in agricultural innovation has evolved over the years, through several approaches such as agricultural knowledge and information systems (e.g. Engel 1995; Roling 2009), Farmer Field Schools (e.g., Tripp et al., 2005), the Australian Landcare movement (e.g., Wilson, 2004) and the Farmer First movement (e.g., Scoones and Thompson, 2009). Recently, a blending of insights from the agricultural innovation literature and industrial innovation literature has resulted in the concept of

agricultural innovation systems (AIS) (Andrew Hall, Bockett, Taylor, Sivamohan, & Clark, 2001; Pant & Hambly-Odame, 2013; Roling, 2009). A national AIS is defined as: "a network of organisations, enterprises and individuals focused on bringing new products, new processes and new forms of organisation into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge" (Rajalahti, Janssen, and Pehu 2008; p.6-7).

Beyond researchers, extension agents and farmers, an AIS consists of all types of public, private and civil society actors, such as inputs and processing industry actors, agricultural traders, retailers, policymakers, consumers and NGOs. For specific innovation processes, flexible and dynamic innovation networks are formed from the network of actors present in national AIS or across different national AIS. These networks have been referred to as innovation coalitions by Biggs and Smith (1998), multistakeholder platforms by Röling (1994), innovation configurations by Engel (1995) or as public-private partnerships (PPPs) (Spielman and Von Grebmer, 2006; Hartwich and Tola, 2007; Hall, 2006). Besides stressing the fact that innovation requires involvement of many actors and effective interactions amongst these, the AIS approach recognises the influential role of institutions (i.e., laws, regulations, attitudes, habits, practices, incentives) in shaping how actors interact (Andrew Hall et al., 2001; Riikka; Rajalahti et al., 2008). Although there is much emphasis on knowledge creation, exchange and use in the above definition of AIS, innovation systems need to fulfil several other functions that are essential for innovation. These functions include fostering entrepreneurial drive and activity, vision development, resource mobilisation (e.g., capital), market formation, building legitimacy for change and overcoming resistance to change by means of advocacy and lobbying (Hekkert et al., 2007 cited in Klerkx, Hall, and Leeuwis 2009: p.411).

1.7.4 Linking path-dependency with innovation systems perspectives

The study also adopts the Path-Dependency Theory (PDT) to analyse the persistence of traditional-low innovation poultry production system in rural Tanzania. The theory emerged in the 1980s to counter neoclassical assumptions about the reversibility of economic decisions (Nelson and Winter, 1982; Magnusson and Ottosson, 1997). Frequently used to analyse trends in innovation (Patel and Pavitt, 1997; Coombes

and Hull, 1998), the theory is best known for the notion of 'lock-in' which argues that, a technology or technological regime may be quite flexible when it first develops, but over time steadily more fixed pathways become established. The theory assumes that different pathways could have been taken (i.e. there is no single equilibrium), thus highlighting the influence of (possibly minor) historical events on the emergence of a particular pathway (Ruttan, 1996; Hogg, 2001). Once one option gained advantage (i.e. market share), other factors provided positive feedback to reinforce its pathway. These factors can include: capital or learning investments sunk in one option, which inhibit change; increasing returns to scale or information, which reward dominance; network externalities, when interests of different actors converge on an option; and familiarity, which reduces risks from uncertainty (David, 1985; Wolff and Recke, 2000). Besides such structural factors, a pathway may also be reinforced by norms or routines associated with a particular technological regime, similar to how Kuhnian paradigms influence scientific research trajectories (Dosi, 1984; Coombes and Hull, 1998). Thus, while choices are rarely completely fixed, innovation often follows established pathways due to the cost of changing pathways, or because the norms or routines of a technological regime preclude alternative approaches from being considered. This literature on path-dependency therefore, emphasises system-level analysis, focusing on technological regimes (Berkhout, 2002). Analysing the rural poultry industry with such a broad, historical perspective is expected to uncover other factors for low innovation tendencies in rural poultry production besides producers' poor resource base or lack of production skills and technologies.

Wolff and Recke (2000) and Hogg (2001) highlight the difficulty of inducing change in innovation or practices, as technological regimes can be well-established. ''At the institutional level, professional bodies, career structure, and education and training programmes anchor the mode'' of research (Hogg, 2001, p. 101). Exploring the norms, routines, and policies affecting production can help address this question, suggesting possibilities for changes. Path-dependency takes a somewhat aerial view, saying relatively little about why certain pathways get selected. Theories from science studies, particularly on the social construction of technology (Pinch and Bijker, 1984; Mac-Kenzie and Wajcman, 1985; Bijker et al., 1987) and actor

networks (Knorr Cetina, 1999; Latour, 2005) address this. While these theories are often portrayed as incompatible with each other, and with path-dependency, it is possible to integrate some of their elements to provide a deeper analysis of technological change (Shrum, 2000; Bruun and Hukkinen, 2003). Social construction theories argue that technologies can have interpretive flexibility, especially during their early development, with different social groups (e.g., farmers, scientists) having their own perspective on whether a technology 'works' for them. Closure occurs when one social group's perspective dominates, or when a technology changes enough to work for all relevant groups; this helps stabilize technological pathways (Bijker, 1992; Bijker, 1993). Actor-network theories (ANT) can shed further light on the process of closure, showing how power works through the interaction of social actors with networks (of other actors, but also inanimate actors such as policies, funding rules, infrastructure, or other technologies) (Latour, 1987; Latour, 2005). Integrating economic and social theories on technological change can enrich our understanding of how technological pathways become established and fixed (Bruun and Hukkinen, 2003).

Therefore, PDT opens up the black box of technology development, giving a better understanding of current practices, and how sunk investments, network interactions, and normative discourses underpin these practices. It is useful for analysing the scope for institutional change – as its historical approach places research choices, and their implications, in a wider context. Path dependency basically refers to processes or systems whose outcome evolves as a consequence of the process' or system's history (Martin and Sunley, 2006, p. 399). While path dependency denotes a more general view of systemic characteristics, three particular concepts have emerged from the path dependency literature, i.e. organisational thinness, fragmentation, and (negative) lock-in (Grabher, 1993, Isaksen, 2001, Asheim et al., 2003, Martin and Sunley, 2006). These concepts emerged because of their relatedness to particular problem regions such as peripheral regions (organisational thinness), metropolitan regions (fragmentation), and old industrial regions (lock-in) (Isaksen, 2001, Tödtling and Trippl, 2005). Organisational thinness refers to a scarcity of relevant actors (key organisations, firms and institutions) which possess resources that can facilitate innovation activities (Tödtling and Trippl, 2005). In this thesis, the PTD's concepts

of lock-in, organisational thinness and fragmentation are used to analyse the intensity of different actors within the rural poultry industry (as the AIS under study), their individual and collective behaviours, and how they interact. The information is then used to establish how the outcome and evolution of these factors are a consequence of the industry's history. In addition, the Actor-Network Theory (ANT) is also used to explain the role of agricultural commodities e.g. chicken (as *'non-human actors'*) in determining types and levels of innovation processes within an agricultural innovation system.

1.7.5 Scaling 'up and out'

The idea of 'scaling up and out' is increasingly becoming important in analysing innovation processes within systems. Literature presents different dimensions, types and implications of scaling process in terms of approaches and strategies to achieve scaling (Wigboldus & Leeuwis, 2013). Conceptually, literature distinguishes between scaling up and scaling out, and between horizontal and vertical scaling, and more. According to Wigboldus and Leeuwis (2013), scaling out involves replicating while maintaining same attributes while scaling out leads to new attributes (p.6). These processes happen all the time with or without human intervention and work differently for different scale levels. In their opinion, any intervention involves scaling processes from beginning to end and what is important is to understand our scaling efforts in relation to other on-going scaling processes– *'many of which cannot be or will not be affected through the intervention'* (Wigboldus & Leeuwis, 2013; p.iii). The authors argue that, neglecting such dynamics may result in failing to see things go to scale (p.iii).

In their book, Wigboldus and Leeuwis (2013) compare the complexity and mechanisms for scaling out and scaling up processes. They conclude that scaling up involves a change in qualities and properties of the object of scaling and therefore involves more complexity. On the other hand scaling-out essentially involves replication of an existing 'prototype' which makes the process relatively less complex. However, both processes require understanding of the scaling up mechanisms that led to the phenomenon at hand. According to Creech (2008; Wigboldus & Leeuwis, 2013), the scaling up process requires negotiations,

diplomacy, patience, flexibility, time and resources to be successful. This is linked to this study's interest on understanding how innovation can be facilitated externally to promote technological and organizational changes within industry/AIS and meet broad objectives like poverty reduction (for example). This attempt to steer and control scaling processes is of great interest when it comes to understanding how innovation can be promoted for wider impact. Linn (2012) introduces the concept of 'scaling up pathways' as tools to best learn strategically how change happens (Linn, 2012). He basically interprets scaling as 'ensuring the quality of development impact, reaching out to those left behind and ensuring sustainability and adaptability of results beyond replicating successes to cover large groups or populations' (Linn, 2012, cited in; Wigboldus & Leeuwis, 2013; p.13). In this thesis, and without getting into details, both scaling up and scaling out are explored as indirect (almost unconscious) scaling mechanisms achieved through playing facilitation and brokering functions.

1.8 Context of investigation

The empirical data on which this analysis is based come from three main sources. First I interviewed ex-RIU staff to understand how the programme was run and to access the programme database and reports. Thus most data on RIU processes came from RIU archives and from discussions with ex-staff. This information was later crosschecked by interviewing producers who engaged with the programme. The second source was interviews carried in Songea and Njombe districts where RIU programme was not implemented and commercialisation had not taken place. This group acted as a control and data collected explains current innovation behaviours in rural poultry production. The third source of data was interviews with RIU target group. These included producers, input suppliers, extension service providers, etc. This group provided information on perceptions, outcomes and impact of what transpired during the programme. Basically, they explained what was done by the programme, what changed in the industry and how they perceive it.

The data was collected at different times between September 2012 and March 2014 using a variety of ethnographic methods combining observation, focus group discussions, and semi-structure interviews. Data from RIU reports and databases

were first interpreted to capture the sequence of events. Then a meeting was organised with ex-RIU staff and selected producers to comment and approve the sequence before more data was collected to explain each event. After sufficient data was collected for each event, another meeting was held with a different group of selected producers to validate the information.

Therefore, the study examines both the RIU programme and community in which it intervened. This helps to understand how the two shaped each other towards the observed transformation. Studying the RIU programme provides a true reflection of cause and effects of the facilitation process, while interviews provide a true explanation of community's response to the facilitation. Since data were collected from real events, triangulation and validation was relatively easier especially during focus group discussions where I used to cross check most of the general responses.

Being an ex-RIU staff was both an advantage and a problem especially when interviewing RIU target group. It is possible that I might have influenced some respondents, either positively or negatively. However, triangulation through asking similar questions during focus group discussions and allowing long discussion around questions proved to be useful. Most data collected happened to be consistent across the different sources, and with very few gaps. Furthermore, RIU happened to have a thorough documentation of events and reflection and it made data collection much easier. All ex-RIU staff were also available for interviews and their memories of the programme were still fresh.

In the analysis I am not trying to evaluate the performance of RIU. I am also not pretending to argue that their approach is the best for improving productivity in subsistence agriculture. However, what I seek to explain is what the programme did, how it was done, what eventually happened, then elaborate on the lessons that emerge for policy and practice, and for future research. Therefore, my analytical focus is to a large extent biased towards describing what is reported to have transpired on the ground as explained by interviewees, written in RIU reports and what I personally observed. Therefore, since I have not dwelt on critiquing the programme with the intention to argue what was wrong or right about it, or what should or shouldn't have happened etc., my expectation is that I have not put myself

in defensive positions that could trigger data manipulation. Therefore, in the analysis, what the programme did and what happened on the ground is 'the reality', on which I have built my interpretations.

1.9 How the thesis is organised

The thesis is organised in ten chapters. I began by introducing my motivation for, and the significance of the topic, introducing the rural poultry industry and the RIU work in the industry, the research gap, the research questions and study contributions. I explain the broad concern of the study which is to understand what constrains innovation in subsistence agriculture, and how the public sector can intervene to guarantee inclusive growth. I also explain that the overarching question of this study was developed from observation of the challenge of low agricultural performance in Africa caused by the dominance of subsistence production even after 50 years of investment in agricultural R&D. Linked to this is the theoretical challenge that even with the newly embraced systems thinking and theories in tackling agricultural challenges, the ability to go beyond the conceptual understanding of these theories and derive practical frameworks for effective agricultural policy and practice is still limited.

Addressing these theoretical challenges, is now explored through the 'innovation systems' research which considers innovation a product of multiple 'interactions' and 'learning' among heterogeneous actors; and that innovation processes can be 'induced', 'facilitated' or 'brokered' to increase productivity and performance. The RIU case study is suggested as the suitable research design which will allow answers to the research questions regarding the observed dominance and persistence of low innovation /subsistence tendencies, and how that can be deliberately changed.

In Chapter 2, I establish the link between the RIU programme as the case study and the main research questions. I clarify the study situations that emerge from the RIU experience, and use them to guide the choice of theories. Three study situations are identified as; the Tanzania rural poultry industry as the system which was influenced by RIU; the 'commercialisation process' as an iterative process of introducing new knowledge, new ways of managing poultry farms, new inputs, new technologies,

new innovations, new mentalities, etc. to produce poultry for the market; and the RIU programme as a 'deliberate action that induced and promoted changes in the industry. I then explain my choice of theories to analyse the three situations. I also describe the main study characters based on the roles they played in the RIU programme. I further clarify my focus on the collective behaviour of the heterogeneous rural poultry producers, from which their power to influence the system is derived. I then explain how I re-constructed this 'collective actor' from being viewed as a 'victim' of market failures and bad policies, into an actor with powers to 'choose, to 'interact' and 'relate' in order to learn and influence behaviours and structures in a network or a system.

In Chapter 3, I build on the discussions in Chapter 1 to articulate the research design and methodology for the study. I explain how study questions will be answered using the single case study research strategy and elaborate how data was collected and analysed. I describe the process of designing and conducting the research and justify my choices, including reviewing the strengths and weaknesses of the proposed design. In the chapter, I explain how the challenge of generalization from a single case study is approached by clarifying how the case study produces theoretical propositions (not statistics) usable in future contexts and organisations. I also explain how the 'Framework Approach' is used to analyse and interpret data.

In Chapter 4, I review the literature on rural poultry industry in Tanzania and highlight the industry's value chain and its characteristics. My intention is to present a brief background to the industry under study, and describe behaviours and structures that existed before RIU intervened as seen by 'others'. This sets the stage for answering the three research questions. I therefore describe the value chain and the dominant breeds, and how these influenced how the industry behaves today. I also explain how the research findings regarding the genetic potentials of the local breeds influenced policy decisions on how to support the industry. I also review the dynamics of the industry before and after the Tanzanian independence in 1961 which puts to light the existence of a dual production system and biases in the poultry industry. I explain the existing bias towards maintaining poultry production in rural

areas under the traditional system (where innovation is low), while promoting the commercial system in urban and peri-urban areas using exotic breeds.

Chapter 5 is my first empirical chapter where I present findings from the field, particularly pertaining to the first research question. In the chapter, I show how the Path Dependency theory, using the concepts of 'lock-in', 'organisational thinness' and 'fragmentation' explain the observed prevalence and persistence of traditional poultry production system in rural Tanzania, and thus explain the observed low innovation tendencies. By categorizing the lock-in further into 'cognitive lock-in', 'structural or resource lock-in' and 'political lock-in', I present my findings to show that the industry under study is actually experiencing a lock in. I also analyse the industry's innovation context and explain how actors in the five domains of the Agricultural Innovation System (AIS) have promoted low interactions and therefore low innovation tendencies in rural poultry. I also describe how interactions in the industry were low because of 'biased mental frames' which promoted fragmentation.

In Chapters 6, I present empirical findings explaining how RIU unlocked the industry from the situation described in Chapter 5. The analysis describes how RIU deliberately embarked on unlocking the Tanzanian rural poultry industry from the path dependency situation established in Chapter five. I therefore present RIU as an external actor facilitating processes to create new thinking and promoted interactions among different actors. These processes stimulated investment and therefore reduced the organisational thinness and fragmentation that existed. Using data from RIU reports and interviews with ex-staff and programme beneficiaries, I analyse the initial processes and contextual negotiations that took place at different levels of implementation. By recreating the RIU programme processes, the chapter sheds light on how interactions and learning were practically facilitated to transform an industry which was dominated by subsistence producers.

Chapter 7: This chapter describes the RIU process of influencing innovation behaviours and structures in the industry under study. It explains how ideas and interventions gradually got shaped by what was happening on the ground. In the chapter, I explain the RIU's complex process of stimulating interactions among actors and the process of building networks and relevant systems capacities to

innovate. I explain how actors were mobilised to analyse the system and visualize the envisaged network. I also clarify how commercialisation was chosen to drive processes and how producers were facilitated to internalise it. I then discuss the negotiations that took place to build trust before business interactions started and before the network emerged. I specifically make it clear that, before interactions could start the network was first sketched.

In Chapter 8, I introduce the use of concepts of *'exogenous shocks'* and *'demand shocks'* in explaining the process of disrupting path dependency. I also use the concepts of *'unlocking'* and *'path creation'* to describe what RIU did to overcome the dominance of the traditional poultry production systems. Using empirical data, I explain how RIU acted as an exogenous shock to change the existed situation and pushed actors to initiate the process of unlocking or creating a new development path. I therefore describe how RIU facilitated internal processes towards re-organisation. The main argument in the chapter is that, promoting innovation in an industry dominated by subsistence producers means unlocking it from path dependency, and from multiple 'demand-and-supply deadlocks'. And to achieve that, a 'mental shift' needs to be created in a significant number of actors, followed by inducing 'system shocks' sufficient to stimulate co-movements and multiple interactions. Then respond to 'after-shock capacity problems' as discussed in the next Chapter 9.

Chapter 9 presents the empirical analysis of the RIU process of building innovation capacities after the increase in demand for inputs and services from rural producers. In this Chapter I explain how different problems emerged in different subsystems and how RIU supported actors to solve them. I specifically focus on analysing problems that emerged in chicks and feed supply, provision of extension services, in managing poultry diseases, building business skills, and in marketing and regulation. The discussion makes it clear that areas to intervene emerged as actors continued to interact and therefore they could not have been predicted. I also show how needs articulation and solutions seeking were continuous processes. This is because every growth achieved after innovating to solve a particular problem demanded new skills and capacities. In turn the demand for new skills created new problems, and so on.

The chapter also highlights how an innovation facilitator needs to work with heterogeneous actors, handle multiple processes, be flexible and be able to play different roles.

Chapter 10, summarizes the findings, links them together and locates them in the wider academic discourse on promoting agricultural innovation in developing economies. It also addresses the practical and policy implications of the findings for international development in promoting rural development, agricultural development and poultry development for poverty reduction. Finally, it explains the limitations of this research and presents some suggestions for future studies.

Chapter 2 Emerging issues and theoretical choices

2.1 Introduction

This chapter establishes the link between RIU as the 'case study' and the analytical framework chosen for this research. Specifically, it elaborates the RIU claims regarding its processes, outcomes and impact and then identifies three study situations on which the analysis is based. By doing this, the chapter establishes a theoretical framework based on RIU as the case under study. It also describes the main actors who drove the RIU programme.

RIU claims to have used the innovation systems perspective to build networks and promote learning, which transformed the industry from being dominated by subsistence-based backyard activities, into a commercially viable one. The industry now attracts more actors and investment (Mur & Nederlof, 2012; RIU, 2011a). The above claim is interesting because agriculture is known to be a complex socio-economic system influenced by multitude of factors and circumstances and whose behaviour creatively evolves from complex interactions between that which is technological and that which is social, and together they relate to what is physical (i.e. rainfall, rivers, soil, air, etc.). This fact makes the behaviour of the sector dynamic and therefore indeterminate. On the other hand, innovation is also known to be a complex process involving multiple interactions (Kline, S. and Rosenberg, N (1986); Lundvall, 2007; Sunding & Zilberman, 2000). If the agricultural context is temporary and therefore unpredictable over time, and if innovation emerges from a complex web of interactions, then how does the human intention to initiate and manage innovation processes in order to achieve broad objectives like poverty reduction fit in?

What emerges from the analysis of RIU interventions is that, despite their indeterminate and unpredictable nature, complex agricultural systems can be deliberately influenced to produce desired behaviours. There is space within complex systems through which human intent is embraced to become part of the complexity that forms system behaviours. This means that short-term human determinism is allowable when influencing complex systems, though only as one of many inputs and

possibilities that produce systems behaviours. The question is therefore, how does one identify this space and make the human intent *'dominant'* so as to shape the ultimate behaviour towards a certain vision?

In the case of RIU, the question is how did the programme manipulate processes until the commercialisation behaviour emerged as desired? RIU answers this question by posing a second claim that the programme facilitated producers to change their *'expectations'* and their *'relationship with poultry keeping'*, then induced the system into an *'input demand shock'*, followed by adopting what they call a *'bottleneck approach'* to articulate needs emerging from the shock and sought solutions to specifically build actors' capacity to satisfy the new demand. And in the process of doing that, a new economic equilibrium was achieved and adapted by the system. The programme also claims to have used *'business culture'* during commercialisation to shape most decisions made by all actors, including rural producers (For details on these claims see RIU, 2011a).

Therefore, by analysing what RIU did and how the system responded, this study verifies the three implicit claims which are; (i) use of the innovation systems perspective to build networks and promote learning; (ii) following a three steps process, i.e. changing mentalities, inducing system shocks, and adopting a 'bottleneck approach' to build capacities after the shocks; and (iii) use of 'business' (commercialisation) to shape decisions and processes. The analysis makes it clear that RIU influenced actors' behaviours and processes as a system and not as separate individuals. RIU stimulated and facilitated multiple interactions to do business together and exchanged goods, technology, skills, knowledge, etc. (as a proxy for learning) among different actors including the rural poor. And consequently, new innovation behaviours and structures emerged. Therefore, RIU interventions involved a system, a commercialisation process and a facilitator.

In order to link RIU as a case study with the main research questions, I have identified three study situations which emerge from the RIU experience, and used them to guide my choices in research design and theories. Those are; (i) the *Tanzania rural poultry industry* as the system which was influenced by RIU; and (ii) the *'commercialisation process'* as an iterative process of introducing new knowledge,

new ways of managing poultry farms, new inputs, new technologies, new innovations, and mentalities, etc. in order to produce chickens for the market. According to RIU reports, the process was shaped and being shaped by 'the context' at which it occurred; and (iii) the RIU programme as a *'a deliberate action'* set out to induce and promote innovation, and thus acted as a force arriving from outside to influence the industry. The RIU programme recruited an 'innovation broker' (a facilitator) to implement this deliberate action.

2.2 Structure of the chapter

The chapter is organised in seven sections. The next section (3) explains how the generally low innovation in the rural poultry industry acts as a lock-in. It elaborates how path dependency theory is used to analyse behaviours using the concepts of lock-in, organisational thinness and fragmentation. The section identifies three types of lock-in i.e. cognitive, structural (or resource) and political lock-in(s), and explains how they are analysed.

Section four explains the commercialisation process which was facilitated by RIU to transform the rural poultry industry to be the 'prime mover' of processes. It presents the study's assumptions that commercialisation triggered interactions between rural producers and other actors in the industry, by encouraging producers to produce for the market. It basically explains that commercialisation justified the demand for new knowledge and technologies at all levels, and consequently promoted innovation within the entire sector. It also explains how the AIS framework is used to analyse the commercialisation process from *'network building'* and *'business'* perspectives.

Section five discusses how RIU is looked at by the study as a deliberate public action which influenced innovation behaviours in the industry under study. It then explains how the concept of 'an innovation broker' and 'exogenous shocks' are used to describe what RIU did. Then section six describes the main study actors while section seven draws conclusions from the chapter.

2.3 Explaining low innovation in the rural poultry industry

The first study situation is the Tanzania poultry industry with a particular focus on the *rural poultry industry* where small producers keep local or indigenous breeds of

chicken. The Tanzania poultry industry is dominated by the traditional sector which contributes more than ninety per cent of the entire national flock (Msami, 2008a, 2008b; United Republic of Tanzania, 2006). Therefore, the study looks at the nature of the industry, the behaviour of actors, and institutional and organisational arrangements that make the sector what it is. I specifically pay attention to the consistent nature of low innovation tendencies portrayed by most actors, and establish their causes.

Understanding innovation behaviours and processes in subsistence agriculture is core to this study because according to FAO's report[14] of 2009, about 80 per cent of all farms in Africa are small farms of less than 2 hectares. Literature shows that by operating at subsistence levels, the agriculture sector does not experience economically significant innovation because existing technologies, practices and arrangements (both institutional and organisational) are often adapted to conditions of low production and marketing. As a result, and in the absence of rapid change of scale to trigger higher market demand, an endogenous alteration of current techniques and arrangements is neither desirable, nor feasible. This implies that the technical, organisational and institutional conditions embedded in subsistence agriculture are incapable of generating sufficient response to innovation triggers (Abele & Frohberg, 2003; Aliber & Hart, 2009; Kostov & Lingard, 2002; Takeshima, 2008). The main question remains as to what sustains the subsistence nature so strongly? And what can possibly alter the situation to create a new path?

In my analysis I assume that nobody wants to be poor and therefore the choice to not produce for the market is the only rational choice available to subsistence producers. Otherwise they would have responded differently. Abele and Frohberg wrote:

> ['..subsistence agriculture is applied because there are no alternatives (Abele & Frohberg, 2003; p.iv).]

Therefore it is my argument that, as part of their livelihood strategies, poor subsistence producers may desire to commercialise their enterprises but from where they stand both as a group and as individuals, the transition seems too complex,

[14] This was FAO's report to the High-Level Expert Forum on How to Feed the World by 2050 held in Rome in October 2009

costly and unjustified. Linked to this argument, is my choice to use the '**path dependency'** theory and the concepts of '**lock-in'** to explain the observed prevalence and persistence of subsistence agricultural production in rural Africa, and of **'path creation'** to explain how changes in rural agro-industries can possibly be approached.

The path dependence theory provides a theoretical concept for analysing the competition between two paradigms and explains what makes one dominate over the other (Wolff & Recke, 2000). The theory also explains if dynamic increasing returns exist, a path once chosen will become entrenched (Colombelli & Von Tunzelmann, 2010; David, 2000; Niosi, 2011; Ruttan, 1997). Thus building on the argument that there is a technological dimension of development paths (Dosi 1982) and organisational arrangements which tend to persist for a long time (Kogut 1991), I have used the theory to examine both organisational and technological reasons for the traditional (extensive) poultry production system to persist over commercialisation (semi-intensive or intensive system) despite the known benefits and superiority of the later in reducing poverty.

According to Gerd Schienstock (2004), path dependence embodies a strong prescription about which direction of technological change should be pursued and which should be neglected (Schienstock, 2004). In addition, Hamalainen (in *Ibid*) introduces the idea of mental paradigms which are shared by most economic actors in a system and which create path dependence. Hamalainen argues that there tend to be internally consistent and shared 'mental sets' (emphasis reproduced) which result from prevailing norms, values and policies continuously reinforced by the positive experiences and feedback stemming from the evolutionary phases of technological, organisational and institutional development (Schienstock, 2004). Therefore, examining the presence of these mental sets provides an explanation of why certain development paths stick more than others.

In the analysis, I specifically pay attention to the dual production systems found in the poultry industry in Tanzania, namely; (i) the intensive or (semi-intensive) commercial production system mostly found in urban areas and which is well integrated in the poultry input and output markets, and (ii) the extensive traditional

system which is predominantly rural and which is more socially embedded, and which has no links with input markets. I also consider the two systems to be technologies in the sense that each of them embodies a specific breed which is linked to specific management routines and technologies. For example, in the commercial system producers keep patented pure breeds of broilers and layers which are regarded as improved technologies resulted from systematic genetic selection and manipulation or different crossbreeds. In addition, the commercial system also uses a specific technology package of vaccines, feeds (sometimes fortified with enzymes, vitamins, minerals and other additives), industrially hatched chicks, biosafety measures and other management practices. Basically, I have treated the two poultry production systems as 'composite technologies' where multiple technologies are amalgamated and constructed to function as a package. Additionally, I have treated the two production systems as competing technologies in the context of poverty eradication, where the commercial system is argued to provide more benefits in terms of increasing opportunity for learning, productivity and income gains.

Therefore, in order to explain why the traditional system persists in rural Tanzania (as a relatively inferior technology for reducing poverty in those areas), I use the concept of lock-in developed by Arthur (1989) which Castells described as the situation where;

> [… 'an old technology, but also a traditional organization model locks a national economy into an inferior option of development and may in the long run result in a loss of competitiveness and the retarding of economic growth' (Castells, 1997; cited in Schienstock, 2004; p.xx).]

Literature, identifies three types of lock-in which I also explore in my analysis, namely; '**Structural lock-in'** which exists when most resources are bound to a specific technology and existing organisational and institutional settings are tied to this technology, leaving no room for diversification and the development of new technological paths; '**Political lock-in'** which exists when the dominating power structures have a vested interest in the dominant techno-organisational path and resist changes; and '**Cognitive lock-in'** which exists if economic actors, continue to adhere to the existing development path, even if it can no longer ensure competitiveness and economic growth (Grabher, 1993; cited in Schienstock, 2004).

Therefore, using data from rural producers and from other secondary sources I examine and illustrate how several of the properties highlighted in the recent theoretical literature on technology choice - positive feedbacks, and self-reinforcing mechanisms can be used to explain the persistence of low innovation levels in subsistence-based agro industries. The analysis also highlights the importance of facilitating or inducing certain events to push the system in a particular direction and which is the focus of my next study situation discussed below. Therefore, by identifying the self-reinforcing mechanisms and factors possibly leading to the types of lock-in above, I am challenging policy makers to focus on unlocking African agriculture and create new technological and organisational paradigms.

The decision to use the path dependence theory does not imply that it is the only theory which explains why subsistence production persists. Other theories like transaction cost theory have widely been used to explain the barriers to exit subsistence production (see Berkeley, Vakis, Sadoulet, & Janvry, 2003; Cadot, Dutoit, & Olarreaga, 2010; Henning & Henningsen, 2007; Pingali, Meijer, & Khwaja, 2001). Using the transaction cost theory, Wouter Zant (2012) introduces the concept of *'subsistence trap'* which bore some similarities with the *'lock-in'* concept but focusing on effects of costs and markets – i.e. on economic factors. Zant argues that high costs of both production and transaction, and high risks of output and input prices often make subsistence farming the optimal choice over others. He therefore looks at 'the sector level trap' where the widespread subsistence farming leads to low productivity and low growth in agriculture, which in return leads to economy stagnation (possibly second trapping) because of the large multiplier effects from agriculture to the remaining sectors of the economy (Zant, 2012). Basically, unlike the path dependency theory the transaction cost theory fails to capture factors beyond the market e.g. organisational, institutions or technological which reinforce subsistence tendencies, and which are important in my analysis. Moreover, by analysing the self-reinforcing feedback loops in a system the path dependence theory also allows for economic factors like transaction costs to be captured as well.

Therefore, path dependence theory and the concept of lock-in are used to explain why the traditional system of producing poultry has persisted over commercialization

in rural Tanzania despite the growing market demand and existence of commercialisation knowledge, inputs and technologies needed to produce intensively (or semi-intensively). I also use the theory to explain why rural producers continue to use low poultry technologies to produce not for the market despite their significant desire to earn more income and reduce poverty. I have analysed existing self-reinforcing mechanisms and factors leading to the types of lock-in mentioned above, and explain what ties the rural poultry industry to the observed low levels of innovation, and how to intervene. And by doing that, the analysis answers the first question posed to the RIU interventions and to the first two research questions on what constrains innovation in the rural poultry industry and why innovation is general low in the industry.

2.4 Analysing commercialization as a 'trigger' of innovation

The second study situation is the *'commercialisation process'* which was facilitated and coordinated by the RIU Tanzania programme whose objective was to transform the indigenous chicken industry to be both commercially viable, and inclusive of small rural producers. The programme supposed that commercialisation of the rural poultry enterprises would justify and trigger demand for new knowledge and technologies at all levels, and consequently promote innovation within the entire sector. The target here was therefore, to make the industry which was dominated by subsistence activities attractive for investment, including investment in innovation. In this case, poverty was used as the opportunity to justify the business motive which became the point of departure towards commercialisation. Apparently, to rural producers, and to other actors who joined the programme, RIU was not about promoting innovation, but about improving incomes, and 'business' was their motivation.

The programme used poverty as the entry point to convince rural poultry producers to commercialise their enterprises in order to gain economies of scale. Consequently their demand for new knowledge and innovation increased (RIU, 2011a). The study therefore looks at commercialisation as the *'prime mover'*[15] to which different actors

[15] The term 'prime mover' is used by Charles Dhanasai and Arvind Parkhe (2006) to describe the leading function of a hub firm in orchestrating innovation in networks

in the industry responded to in manners which caused complex shifts of different dimensions at different levels of the industry. It is also the force that held actors together as the system disconnected itself from the subsistence equilibriums and when it was on transit to the new path. This is explained in findings which demonstrate continuous moments of discrete and transient states being attained before the industry gets to selected equilibriums.

I will therefore analyse the commercialisation process in two perspectives, i.e. from the *'network building perspective'* and from the *'business perspective'*. The two perspectives emerge from the RIU's decision to operate within a network of actors and use business as the driving force. This was like agglomerating small firms and actors to gain a cohesive ability needed to make the shift. And thus a significant number was needed, especially of producers. This got RIU involved in handling both technological and organisational issues, i.e. organising and coordinating actors as well as promoting use of new knowledge and technologies. Appropriately therefore, I have separated the 'orchestration' which is the continuous process of coordinating, directing and managing members (structure) to interact and learn, from 'commercialisation' which is what emerges after actors have interacted (with that which is social, economic, technological and environmental), to produce for the market (which becomes their new way of keeping and producing chickens).

To analyse how RIU used commercialisation to build networks (i.e. to understand how interactions were practically promoted), I have used the Agricultural Innovation System (AIS) framework to analyse the role of 'business' as the motive, 'culture' (or 'way of doing things') and 'incentive' towards shaping interactions in the industry. The understanding is that, in order to commercialise the industry, the first thing RIU did was to encourage producers to produce for the market. This turned rural poultry farms into 'enterprises' (or 'firms'), and producers into 'managers'. And from these changes, the following happened;

One, as firms with business motives to produce and sell at a profit, rural farms became viable for partnerships with other actors in the industry. Apparently, these were already interacting with commercial producers in the input and output markets (i.e. in the commercial poultry production system). Therefore, when rural producers

decided to produce for the market they found reasons to interact with commercial input suppliers like feed and chick producers, etc. So, as discussed later, the decision to keep chickens as a 'business' moved rural producers into a new interaction space where it became possible for them to meet and be met by other actors– who were essentially already operating from that space. This means producers were 'new comers' to the market where business is the language. So they needed RIU (the broker) as a mentor and interpreter. The key question here is whether it was possible to transform the rural poultry industry without moving rural producers out of their comfort zones into new places where naivety and vulnerability increased. From RIU experience, business[16] was the new culture which producers had to learn before they could interact, and the resulting naivety and vulnerability is in fact what triggered learning and innovation.

Two, as managers with profit motives, producers' attention was directed towards regulating 'stock flows' and increasing efficiency to maximise gains. Specifically, it became imperative that: they determined the scale of production by buying chicks and not relying on natural breeding; they controlled losses (i.e. reduce deaths, theft, accidents, etc.) in order to ensure most birds survive to maturity; and they managed the flock properly especially through proper feeding and hygiene in order to gain the most value in terms of weight, size and volumes. And in order to achieve that, they needed new skills, tools, techniques and facilities. Thus, the business motive created a sense of *'self-insufficiency'* in terms of skills, tools, technologies etc., which triggered the need to interact. Therefore, RIU used business to justify the desire for technological and organisational changes especially among the economic actors. Hence, I use the situation to explain how business can promote learning and innovation in subsistence agriculture better than science. Actually, the study elaborates that 'business' is what was missing, to make producers interact with other actors in the industry.

Understanding the relationship between RIU's focus on building profitable poultry businesses and how other actors responded to the commercialisation process by

[16] These producers are already producing other agricultural commodities for the market. Hence they are conversant with doing those particular businesses. However, they lack poultry business skills hence reinforcing the argument that every commodity operates in a different systems.

continuously increasing their demands for new knowledge and technologies is of great interest in this study. Therefore, I have analysed in detail how production scales, marketable volumes and the typology of actors contributed in building business partnerships which promoted learning and innovation. As a matter of fact, the analysis explains how economic changes can be deliberately promoted to trigger technological and organisational changes, with the intention to make subsistence producers experience higher levels of economic development. Therefore, I have specifically provided an explanation of how subsistence rural poultry producers responded to the RIU facilitation process towards commercialization, which I achieve by assessing the extent to which producers' demand for innovation shifted towards embracing new routines to meet their own goals of increasing income and tackling household poverty as a result of facilitation. This includes explaining the dynamics that took place within individual poultry producing households which resulted from the commercialization process.

The information obtained from the above analysis is used to further explain how dynamics that took place with the poultry farms influenced processes and structures in the remainder parts of the industry (or value chain) to transform the entire sector. To some extent, the analysis investigates claims put forward by Pingali et al., (2001), that commercialisation of agricultural food systems may cause significant structural changes that may increase transaction costs and therefore reduce small farmers' participation in the market. This study shows that structural changes resulting from commercialisation provided the opportunity to transform the poultry industry through rigorous competence building, including creation of support mechanisms and moderating corresponding organisational changes. Thus the situation described by Pingali can be an opportunity if support mechanisms are also established to lower transaction costs and cushion risks.

Therefore, using the innovation system frameworks and the innovation network concepts and theories, the study analyses the commercialisation process as an attempt to explain how innovation networks are built involving subsistence producers and how they are linked with the urban service providers and markets. The analysis provides the argument that it is not only about linking actors but rather about

building necessary capacities needed to make relevant partnerships possible. Furthermore, the study argues that apart from linking rural producers with different actors in the poultry value chain, the commercialisation process also involves linking actors with non-human '*actants'* like chicks, inputs and systems, as well as linking different enterprises. The former embraces the ideas put forward by the 'actor-network theory and therefore helps to explain how commercialisation creates networks within networks. Finally, the study introduces the concept of *'network sketching'* to explain how commercialisation of subsistence agriculture relies on pre-negotiations among actors to build cognitive trust before actual interactions happen. The *sketching* is also done as mechanisms to manage uncertainties among actors before they commit resources towards the partnership.

2.5 Describing RIU as an innovation 'broker' (facilitator)

As the last study situation I loot at the RIU programme as a *'deliberate public action'*[17] set out to induce and promote innovation in the rural poultry industry in Tanzania. The action is publicly funded (which makes it 'a public action') and has both social and economic interests. At start the action is external to the indigenous poultry industry and assumes the power to transform the industry in question. Although started externally, the programme later on did temporarily put itself at the centre of the processes within the industry before exit. The point of analysis here is therefore its *'self-proclaimed power'* and motive to influence the 'other'.

RIU is typical of most rural development programmes designed and implemented to bring about positive changes in specific target areas or industries. It had targets and a definite life span. It had a background of pre-constructed meanings and forms of what is expected to change. It had its own expectations and some sort of a 'blueprint' of how to achieve those expectations. RIU staff were expected to be skilled and expert in managing whatever the programme would have initiated. In addition, the programme had a legal backing and financial power which empowered staff to act, and which created the basis for actors to cooperate and even trust the programme.

[17] By 'Public action I mean collective, purposive manipulation of the public environment

What I mean here is, both the credibility of DFID (a known big donor) and Muvek (a locally registered implementing agency, with a network or relationships built on accumulated trust from years of working in the sector), coupled with the local knowledge and perceptions of a 'donor-funded programme' made the RIU programme worthy of response from actors in Tanzania. It is thus not just anybody who could initiate such a process involving multiple actors and get their response. In this study I have not gone deep into analysing RIU's internal structures and characteristics as the actor, but limited myself to analysing the process (i.e. what was done/happened) and how the industry responded. However, for a detailed description of the RIU programme see (Norman; Clark, Frost, Maudlin, & Ward, 2013; Mur & Nederlof, 2012); or visit www.researchintouse.com.

Cogently, by considering RIU to be a 'deliberate action' that initiated an innovation process involving multiple actors, I am logically thinking in systems. Therefore, I have grounded my analysis within the general Innovation Systems Theory and specifically in the Agricultural Innovation Systems (AIS) perspective which is known to provide a comprehensive view on actors and factors that co-determine innovation in agriculture (Klerkx et al., 2012; Spielman, 2005). Linked to that, I have therefore analysed the role played by RIU in the poultry industry in Tanzania in the light of the innovation broker concept elaborated by Winch and Courtney (2007, p.751; cited in Klerkx, Hall, & Leeuwis, 2009, p.413), and which defines an innovation broker as an organisation acting as a member of a network of actors that is not focused on the implementation of innovations, but on enabling other organisations to innovate, and which performs this role as a core function.

In addition to that, I have also analysed the RIU programme as an **'exogenous shock'** which gave the system 'a kick' to end the current state of innovation 'inertia'. My supposition here is that, without the arrival of RIU, the industry would have continued along the same path. This makes RIU interventions externally driven alterations described by Newey and Zahra, (2009; cited in Salamonsen, 2014, p.6) as external events with the potential to significantly influence the destiny of the firm. According to Salamonsen (2014; citing Grabher, 1993; Narula, 2002, and Doloreux and Dionne, 2008) exogenous shocks function as a powerful mean for reduction or

disruption of lock-in; and are even a requirement to shake the system free of its history (Vergne and Durand, 2010, p.752; in *Ibid*, p.6).

Analysing RIU interventions in the perspective of an 'innovation broker' and of an 'exogenous shock' requires a dynamic system analysis rather than a static one. According to Klerkx, Mierlo and Leeuwis (2012):

> ['… a static analysis provides an infrastructural view of AIS which is 'a mechanistic hard view whereby systems are assumed to exist independently from the observer and can be analysed, understood and engineered towards an unambiguous goal' (p.463).

However, in my perspective, the system and its boundaries seem to emerge and unfold as the broker functions, and as actors define and re-define their goals. Therefore, neither the system nor its boundaries and goals could have been pre-determined by RIU from the start. This is because the process of inducing and brokering innovation is a continuous one, and which tends to be defined by emerging contexts. Features like boundaries, goals and the structure of the system itself tend to co-evolve, and hence allow the system to self-organise. Essentially, the dynamic analysis is more relevant for this study because it provides a process view of AIS, which allows me to see the 'deliberate action' in action. According to Klerkx and his colleagues (in their own words):

> "…the dynamic analysis sees innovation systems as self-organizing growing networks of actors connected to the development of a certain novelty,… so it sees them as 'systems in the making'….this view on agricultural innovation systems as self-organising entities with increasingly systemic properties bears some resemblance to work which does not explicitly use an innovation systems approach, but rather a system innovation approach to study (radical) agricultural innovation (Roep et. al. 2003; Knickel et al. 2009; Elzen et al. 2011; lamine 2011; Elzen et al. 2012...)" (Klerkx, Hall, & Leeuwis, 2009, p.465)

In this study therefore, I have analysed the *'innovation history or journey'* of the RIU programme in Tanzania to analyse the situated 'deliberate action within the AIS framework. As one of the methods for researching AIS, and which shows affinity with the process view of AIS, innovation histories or journeys use timelines to record important events of an innovation processes and identify relationships and activities

defining the events, and those which influenced its outcome (Douthwaite and Ashby, 2005; cited in (Klerkx, Laurens, Barbara van Mierlo, 2012; p.470). Therefore, by following and analysing the chronology of RIU interventions, which include decisions and activities, I established what RIU did, why, how, who was involved and what was the outcome. Then, as we will see later in the empirical chapters, I was able to plot these outcomes, describe the process and then elaborate on the consequent systems response.

Therefore, by situating the interventions of the RIU Tanzania programme in the context of a deliberate action, and thus analysing what RIU did as the manifestation of the 'action', this study explains how a deliberate public action can induce an exogenous shock to build innovation networks that involve the rural poor, and which helps them to transform their subsistence enterprises into profitable businesses which are more open to innovation and to uses of new technologies. The analysis also provides an opinion of how public funds can be used to meet the social cost of sketching, knitting, incubating and building the basic 'innovation-capacity' through which the rural sector becomes viable for innovation partnerships and linkages.

Specifically, analysing this study situation answers the second research question on RIU interventions which is to understand how the demand for innovation, investment and learning were promoted in the industry. This information helps build a response to the third research question by explaining how the public sector can deliberately influence innovation behaviours and structures to transform industries dominated by subsistence producers.

2.6 Study characters: Who drove RIU?

In this section I will describe the main RIU actors involved in shaping the commercialisation process, and who were therefore the main actors in the poultry network that emerged. The description provided here is mainly from the RIU literature and how they were described to me during the interview. The purpose of the description is mainly to clarify their position in the study as well as to shed light on their basic characteristics.

But first, I describe the 'rural' context where RIU intervened as used in the study.

2.6.1 The subsistence rural poultry producers: 'The producer'

These are the main focus of this study and are referred to in this thesis as 'producers'. These are rural households keeping between one to three hundred poultry birds of local or cross breeds. Most of these depend on farming activities for their livelihoods, mainly growing crops as their main agricultural activity, and livestock farming is a secondary activity.

The interviewed producers came from Bagamoyo, Mkuranga, Rufiji and Kibaha districts where the RIU project worked. Others came from two districts in Songea and Njombe where commercialisation had not yet started, but the same organisation was on the early stages of sensitizing communities to join a similar programme now funded by USDA. Songea and Njombe districts were used as a control group for the study for triangulation since most producers in the RIU target area had already commercialised or seen a neighbour who had commercialised, and which could have influenced how they responded.

In the context of RIU, producers were also the main programme partners and focus. They were sensitized to change their poultry management system and produce more for the market. After they agreed, they acted as catalysts by sharing knowledge through talking to others, and by simply being observed by others. To join the programme each producer had to build a shed (even using locally available materials), contribute 40% of the price of chicks, buy feeders and drinkers and live with an extension officer (household caretaker) for a period of one month and learn from him/her. By the end of RIU, five thousand producers had joined the programme in the Coast, Singida, Dodoma and Morogoro regions. These producers were expected to commercialise their poultry production.

Focusing on the collective behaviour of producers and not as individuals

In this study I have paid more attention to the collective behaviour of producers than them as individuals. However, this does not mean I am denying their heterogeneity; rather I just focus on what emerges as dominant behaviour among them as a group. The collective behaviour of rural poultry producers is important in my analysis because the power of smallholders to influence and be influenced emerges from their

dominance, mobilization and aggregation. What I imply here is that, like ants, small producers' power and significance comes from their summative numbers. What draws attention to them is their dominance in the agriculture sectors of developing economies; their majority presence among the global poor; and their dominant presence in rural communities of Africa. Therefore, it is their dominance as a group that the development community identifies with and not as individuals.

Second, given the size of their individual production, small producers gain economies of scale to influence the economic and political environment by aggregating their resources, demands and supplies. For example, it took a group of sixty farmers to get a contract to supply tomatoes in one supermarket in Kenya (FRDS, 2010), and eleven cooperative associations of more than 3,150 small dairy producers to justify establishment of a private dairy processing plant in Tanga Tanzania.[18]

Additionally, agricultural researchers and development practitioners tend to analyse and target 'smallholders' (smallholder farmers) or 'small producers' as a group. Despite recognising their heterogeneity of the individual farming households, the development community is more concerned with what they are, do, and face collectively as a group. Their group identity is therefore constructed based on their size of production, resource allocation, farming techniques, practices, geographical location (i.e. remote or rural), and their circumstances. For example, literature describes smallholder farmers as vulnerable (to shocks like climate change), food insecure, risk-averse, uneducated and with less resources to invest which makes them use poor technologies (Ellis, 2005a; Mclntyre, Herren, Wakhungu, & Watson, 2009). Smallholders are also argued to have been marginalised both by markets and development policies and are therefore living in persistent poverty and chronic hunger (Dixon et al., 2004; Larson, Otsuka, Matsumoto, & Kilic, 2012; Lugalla, 2012). The above characteristics have created a 'victim-perspective' of the smallholder who evokes pity, sympathy and morally-justified interventions. For example, the Africa's Smallholder Farmers Group (ASFG) has called for official development aid for African agriculture, targeted at marginalised farmers to be

[18] See www.tangafresh.com for details.

increased significantly to reverse the impact of years of under-investment (Asfg, 2010:1).

Other authors identify smallholders as a unique group that needs specific development approaches and support (Nederlof & Pyburn, 2012; Shepherd, 2006). For example, in the book 'One finger cannot lift a rock' which analyses experiences from nine innovation platforms in West Africa, Nederlof and Pyburn (2012) explain that small farmers in Africa face many challenges in building livelihood for themselves and their families, that they often lack opportunities for growth and expansion, and even when opportunities arise they are unable to take advantage of them. So *'a concerted action'* is required where stakeholders come together to de-constrain smallholders and enable them to capitalize on opportunities (Nederlof & Pyburn, 2012; p.vi). The book emphasises that smallholders face problems collectively, and even solutions to their problems need a collective action or a 'concerted effort'– to use their term (Ibid, p.iv).

Situating the rural poultry producer (RPP) as an actor in the poultry network

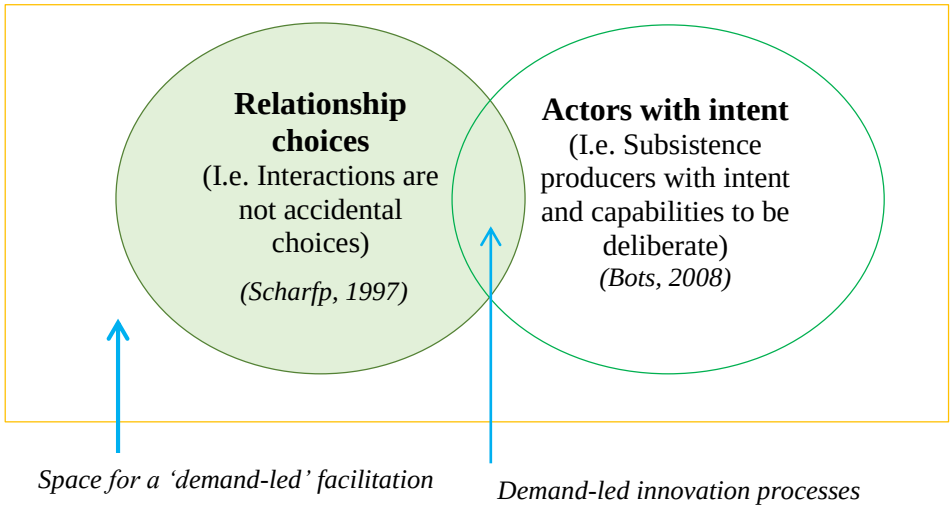
According to Scharpf, (1997: 52, in Bots, 2008, p.1), networks may have individual or composite actors. Scharpf defines a composite actor as "an aggregate of individuals, with capacity for intentional action at a level above the individuals involved", for example, organizations. The author (Ibid, p.54) also defines a collective actor as a composite actor who is 'dependent on and guided by the preferences of its members', and a corporate actor as a composite actor that has 'a high degree of autonomy from the ultimate beneficiaries of their action'. The activities of the corporate actor tend to be carried out by staff members whose own private preferences are supposed to be neutralized by employment contracts. Furthermore, the term actor may as well be considered for some analytic purposes to represent a group of unorganised individuals that share similar characteristics (Bots, 2008, p.1). In all these definitions the actors are assumed to behave intentionally, and have cognitive and deliberate capabilities (Ibid).

Therefore, in my analysis I have considered the SRPPs in two ways, first as a semiotic network actor representing heterogeneous individuals who share similar

characteristics but are not formally organised. That is, a group of rural households who keep chickens under a traditional system, and second, as an actor with powers accumulated from otherwise weak individuals, i.e. *'like ants, the power of smallholders to innovate is in their numbers'*. According to Aldrich and Whetten (1981; in Bolt, 2008) actors in a network are involved in a variety of relations which largely determine how they interact, and in turn these interactions create and sustain relation patterns. It is from this premise that I have chosen to reconstruct the **'actor RPPs'** (representing the African 'rural-poor-small producer/farmer/holder') from being a *'victim'* of market exclusion (or market failure), into a *'maker of relationship choices'* in a network. That makes RPPs (as group) an actor with '**inherent powers to choose'** and redefine relationships within the network.

The above perspective enables me to identify smallholder interactions (as an innovation proxy) as outcomes of *'relationship choices'* and not accidental occurrences which the actor has no control of. This is precisely what Scharfp assumes to be in an actor, i.e. *'intent'* and *'capabilities to be deliberate'* (Bots, 2008, p.1). Additionally, giving RPPs the power to intend and choose, coupled with the link I just established between 'relationship choices' and 'innovation processes' the analysis has provided the room for a 'demand-led' facilitation (See Figure 2-0, below).

Figure 2: Pillars of demand-led facilitation in subsistence-based industries



*Therefore: For a **demand-led facilitation** to occur there must be; (i) choices of **whom** to interact with; (ii) choices of **how** to interact; and (iii) presence of **actors** with intent and ability to interact*

This construction is important to this study because it makes RPPs actors with motives and purpose to drive the innovation process. Otherwise it would have to be driven by someone else. From this perspective, the RPPs will not be innovating just to fix problems, but to achieve a longer term purpose important to them, and from which they will have the basis to continue making choices around it. The perspective also allows them to be a dynamic actor in the innovation process instead of a passive one who functions by merely responding to external impulses resulting from a donor-funded facilitation. In fact, looking at the RPPs as *'makers of relationship choices'* permits my analysis to question their motives and expectations as they were made by them and not as mere circumstances, or as made by someone else.

In addition, I considered the fact that smallholders in Africa have not changed their production systems despite 50 years of external support. My assumption here is that, what was promoted did not suit their circumstances, and for whatever reasons smallholders rejected or abandoned it once programmes ended. While we may say the programme failed, it is the smallholders who made the decision to 'abandon' whatever was promoted.

Therefore throughout the study, I have focused on the cumulative behaviour and abilities of producers rather than in their individual weak status.

The concept of 'rural' as used by the study

In this study I have chosen to use the terms 'rural chicken' and 'rural poultry industry' to refer to poultry birds (specifically chickens) raised in rural areas and the entire process of producing, marketing and consuming them, while involving both rural and non-rural actors. According to business dictionary[19], industry can be defined as "(i) the manufacturing or technically productive enterprises in a particular field, country, region, or economy viewed collectively, or one of these individually. A single industry is often named after its principal product, for example the auto industry; and (ii) any general business activity or commercial enterprise that can be isolated from others, such as the tourist industry or the entertainment industry.

Therefore, in this study 'rural poultry industry' refers to keeping and marketing of chickens as a productive enterprise particularly in 'rural areas' and I have named it after the principle product which is chicken/poultry. I have also considered it isolated from the mainstream 'poultry sector' or 'poultry industry' which involves both urban and rural areas, as well as industrial poultry production. However, my definition of 'rural industry does not exclude forward and backwards linkages with the urban. Therefore the term rural poultry production includes all other terms like local, indigenous, village, backyard, and traditional chicken or poultry production. However, the term goes further to include the 'rural-ness' of the areas and its social inclinations beyond administrative and geographical demarcations like 'villages', as well settings beyond family and households.

Furthermore, I have taken the idea of the rural to be that of social representation as put forward by Halfacree (1993, 1995; cited in, Pospěch, 2014; p.97) and which describes it as a cultural concept rather than a specific material location. This idea embraces both concepts of the rural idyll by Bell, 2006; and Short, 1996; (cited in Pospěch, 2014 Pg.97) and rural deprivation by Woodward, 1996 (also cited in

[19] http://www.businessdictionary.com/definition/industry.html

Pospěch, 2014, Pg. 97). Both concepts rely heavily on the relationship between rural and urban, with rural being the opposite of the urban (Ibid). In that case I have embraced the assumption contained in this rural-urban relationship that the rural is an entity not yet conquered by modernity (Murdoch and Pratt, 1993, p. 417, cited in (Pospěch, 2014). Implying that knowledge, technology, infrastructure and culture (traits perceived to be necessary for modern technologies and innovation) are still missing in rural areas referred in this study. This means, the study considers the rural chicken industry in Tanzania to be operating in a social setting with little to minimum *'modernity'*.

2.6.2 Input suppliers

These are private businesses which manufacture, import, distribute or trade poultry inputs. In this study I have decided to focus on chicks and feeds only. From RIU literature there are three types of input suppliers, i.e. those who produce and sell wholesale and those who retail. In rural areas most input shops are at district headquarters selling all agricultural inputs for both crops and livestock. Therefore, most district input dealers sell agricultural inputs and implements, and their main business is mainly on crops and large animals like cattle, goats and pigs. Those in more urban areas also sell poultry inputs to commercial farmers who keep exotic breeds.

Feed manufacturers

RIU worked with five private feed manufacturers who produced three types of feeds, i.e. chick mash, growers mash, finisher and layers mash. None of them was producing breeder mash until RIU supported one of them to acquire the technical capacity to do so. Their role in the programme was to supply quality poultry feeds to producers and provide linkage with stockists (or agro-dealers) in the target districts. They also identified individuals to help them access producers at Ward and village levels. This aimed at bringing their service closer to producers and at reasonable cost. Before RIU they used to do business with urban commercial producers and none of them had worked with rural producers before.

RIU worked with the following feed manufacturers; (i) *Farm Base/Farmer Center*, *Matocha feeds* and *Mkombozi Feeds* based in Dar es Salaam Region (supplying the Coast Region); (ii) *Calvin Animal Feeds* and *Mapusa Farm Care Ltd*. based in Dodoma Region; (iii) *Tanfeeds International Ltd*., based in Morogoro Region; and (iv) *VETA* based in Singida Region. Their production capacity ranged between 1 to 10 tons per day.

Chicks suppliers

These are private entrepreneurs who invested in hatcheries to produce chicks of indigenous crossbreeds. These are located in Dar es Salaam, Coast region, Dodoma and Iringa Regions. Their production capacity varies depending on the size of their incubators. However, the capacity ranges between 500 and 10,000 chicks per week. Five of these have contracted out-growers to produce fertilised eggs for them. Apart from producing chicks they also provide information and suggestions to the ministry and local government officials based on their experiences on managing indigenous Parent stock and hatching. They also advise producers on chick raring.

RIU worked with fourteen chick producers whose production capacity grew from between 200-500 chicks per week to up to 10,000 chicks per week. The chick producers formed a Tanzania Poultry Breeders Association (TPBA) as a platform for policy dialogue and for collaboration with investors and national programmes.

Agro-dealers (Stockists or District input Suppliers)

These are private business selling veterinary drugs and distributing vaccines in rural areas. Most of them are veterinarians and few of them are livestock officers with animal health background. Often the shops belong to Local Government employees. Some of them also supply feeds, vaccines and drugs, and others supply drugs and vaccines only. Normally they supply vaccines against Gumboro, Newcastle Disease, and fowl pox only. They would usually buy or stock directly from manufacturers or from whole sellers importers. RIU worked with one agro-dealer in each district.

Agro-dealers are also very important in transferring knowledge on how to administer vaccines, manage disease, feeding chicken and on general poultry husbandry. They

also post stickers and posters on their shops with different information on poultry. Some perform post-mortem on carcasses brought by producers from villages. Apparently, producers trust their advice more than they do with government extension staff.

2.6.3 Other service providers

These are both private and public service providers. In this study I have focused on three key services, i.e. extension services, veterinary drug supply (drugs and vaccines), veterinary services (disease diagnosis, laboratory analysis and prescription), and poultry business and entrepreneurship trainer.

Extension service providers

These live and provide extension services in the villages. RIU worked with two types of extension service providers as described below;

- ***Household advisors (Caretakers)***

These are livestock trained officers (certificate holders). Their main role was to provide technical advice and training to farmers on chicks rearing, feeds preparation, vaccination handling and administration, and general poultry management. They also linked with drugs suppliers, veterinary officers and stockists to ensure that drugs and vaccines were available in the target villages. They normally attended to about 10 households (for beginners) within a village for a period of 30 days, where they visited them every day. However, under the contract farming programme, caretakers stay with farmers for the whole production cycle of four months. RIU worked with forty of them and when RIU phased out they were employed by private commercial farms and hatcheries. As I will describe later, this was RIU's innovation to make sure farmers learn chick rearing by doing (i.e., on-the-job).

- ***Government extension staff***

These are Village Agricultural and Livestock Extension Officers (VALEO) or Ward Agricultural and Livestock Extension Officers (WALEO) employed by the Local Government Authority (LGA) to provide extension services at the village and Ward levels. In the programme, they provided caretaking services to producers in their

respective villages. Their role was basically the same as those of Caretakers above, and actually they were used instead of Caretakers in villages where they were available. RIU contracted and paid them some allowance to facilitate movements. Their responsibilities increased after Caretakers left on the 31st day.

Veterinarians

These are hardly found working in rural areas. Those present in villages are senior officer employed by LGAs or project/NGOs. Thus they usually have little time to attend to producers. In some areas there are private veterinarians working with drug suppliers who visit producers and train them as part of their company marketing strategy. In rural areas their services are mostly provided by extension staff and agro-dealers.

Vet drug suppliers (importers)

These are private firms engaged in veterinary drugs and agro-chemicals business. They supply and provide technical advice on disease diagnosis and general poultry management. They conduct training and organise field meetings as part of their marketing strategy.

The programme worked with two wholesale companies i.e. Farmer Centre Ltd. based in Dar es Salaam with a wide network of stockists in all regions in the country; and Bytrade Ltd. who are also based in Dar es Salaam. Bytrade is an agent of several giant European agro-vet drugs manufacturing companies such as; Pfizer, Bayer, Invesa, etc. They also provide technical advice to hatchery owners on proper hatchery management. They train farmers on proper management of diseases, use of drugs and general poultry management. Both companies provided credit facilities to district input suppliers when demand increased.

Vaccine suppliers (manufacturers and importers)

The programme worked with the Animal Diseases Research Institute (ADRI) in Dar es Salaam. This is a government agency responsible for researching on animal diseases and advising on drugs and their use. They also supply vaccines to districts through the Veterinary Investigation Centres (VICs) and District Veterinary Offices

(DVO). Most of the vaccines are currently imported but a government plant to produce ND vaccines has been established. However, there are private individuals who import and sell vaccines in the country.

Usually RIU would pay the Agency, and they would dispatch the vaccines to the districts, where they will be collected by extension officers for distribution to producers. According to RIU, vaccines are best handled through the government channel for quality assurance and traceability in case of an outbreak.

Local Government Authorities (LGAS)

LGAs are very important actors since all producers come under their administration. They play a significant role in influencing policies and intervention in the rural poultry industry. They are also the custodians of the public extension services. They are responsible for order and regulations. In this study I have worked in six LGAs.

Researchers

Within the RIU intervention, research was utilised as a service needed at a particular time. Thus livestock researchers engaged with the programme just like other service providers, but paid by public funds. In most cases, RIU would cover their cost of attending meetings like all other invitees, but expected them to conduct research using public resources. This means, RIU did not fund any research, but facilitated processes to secure funds from the government.

RIU worked mostly with the Sokoine University of Agriculture, the National Livestock Research Institute (NLRI), now Tanzania Livestock Research Institute (TALIRI), and the Central Veterinary Laboratory (CVL) based in the Ministry of Livestock. Apparently, during the implementation of RIU, veterinary investigation (including poultry feed lab analyses) and other poultry research activities were both considered as *'research services'*. This means, regardless of processes and tools, what actors wanted from every actor were solutions.

2.6.4 The innovation broker

Muvek Development Solutions Limited (Muvek) is a private consulting company which was contracted to implement the RIU programme in Tanzania. Muvek

employed key staff to coordinate and oversee the implementation. During implantation the programme relied heavily on its local partner's (i.e. Muvek's) knowledge of the country, the agricultural sector, and most important, its reputation and network. Its ability to command respect and trust from different actors played a significant role in influencing and coordinating processes. When RIU was about to end, Muvek established KukuDeal, a sister company to provide services to farmers on contract terms.

2.7 Summary and Conclusions

The chapter links the case study (i.e. RIU programme) with the study analysis. It presents three study situations identified from RIU claims and derives an analytical framework from them. RIU claims that; (i) the programme used the innovation systems perspective to build networks and promote learning; (ii) followed a three steps process, i.e. changing mentalities, inducing system shocks, and adopted a 'bottleneck approach' to build capacities after the shocks; and (iii) used 'business' (commercialisation) to shape decisions and processes. The claims explain that despite their indeterminate and unpredictable nature, complex agricultural systems can be deliberately influenced to produce desired behaviours. Therefore three study situations emerge from the above claims.

The first study situation is the consistent nature of low innovation tendencies observed in the rural poultry industry, which the study considers it to be a lock-in, caused by multitude of actors and factors. The chapter thus builds a case for use of the concept of 'lock-in' from 'path dependency' theory to explain the observed prevalence and persistence of the traditional poultry production system in rural Tanzania. The concept of 'path creation' is also used to explain how the industry can be unlocked. Basically, the chapter considers the two poultry production systems as competing systems and therefore suggests the use of path dependence theory to analyse the competition between them and explain what makes one to dominate.

The chapter mentions three types of lock-in i.e. 'structural lock-in', 'political lock-in' and 'cognitive lock-in' used in the analysis. It also explains the use of 'organisational thinness' and 'fragmentation' concepts to explain the observed low number of actors

in the industry. Fragmentation is also used to explain why there are low interactions in the industry. The chapter also highlights that the transaction cost theory could also explain the observed lock-in, but unlike the path dependency theory the transaction cost theory fails to capture factors beyond the market.

On the second study situation, the chapter proposes to analyse the commercialisation process in two perspectives i.e. from the *'network building perspective'* and from the *'business perspective'*. It clarifies that, the two perspectives emerge from the RIU's decision to operate within a network of actors and use business as the driving force. The perspective also forced RIU to handle both technological and organisational issues. Therefore, using the AIS framework the study analyses the commercialisation process and explains how innovation networks that involve subsistence producers can be built, and link them with the urban-based supply systems and markets. On the last study situation, the chapter explains that the role played by RIU is better analysed in the light of the innovation broker concept elaborated in the AIS perspective which captures the role of an external facilitator to stimulate processes in a system.

Lastly, the chapter describes five types of poultry actors who were instrumental in driving the RIU process and who are important in the study. Those are subsistence rural poultry producers, input suppliers, extension service providers, veterinarians, LGAs, Researchers and Muvek who was the innovation broker. The chapter makes it clear that the study pays more attention to the collective behaviour of subsistence producers than them as individuals. This does not imply denying their heterogeneity, but a focus on what emerges as a dominant behaviour among them as a heterogonous group. It is argued in the chapter that, the collective behaviour of subsistence producers is important in the analysis because their power to influence and be influenced emerges from their dominance, mobilization and aggregation. Therefore, their group identity is constructed based on their scale of production, resource allocation, farming techniques/practices, geographical location (i.e. remote or rural), and their circumstances.

The chapter explains further that the analysis has considered the subsistence producers in two ways; first as a semiotic network actor representing heterogeneous

individuals who share similar characteristics but are not formally organised (i.e. a group of rural households who keep chicken under traditional system); and second, as an actor with powers accumulated from the otherwise weak individuals. The study has therefore reconstructed the semiotic network actors (i.e. the collective identity of subsistence producers) from being a 'victim' of market exclusion (or market failure), into a 'maker of relationship choices' in a network. That makes them (as group) an actor with 'inherent powers' to choose and redefine relationships within the network. The chapter argues that, this perspective enables research and development to view smallholder interactions (as an innovation proxy) as outcomes of 'relationship choices' and not accidental occurrences which the actor has no control of. Apparently, such powers provide the room for a 'demand-led' facilitation.

Chapter 3 Research design and methodology

3.1 Introduction

This chapter discusses the research design and methodology for the study. In chapter 1, I explained the background and motivation of the research followed by research questions of the study. This chapter explains how these questions will be answered describing how I designed the research to conduct the empirical study, what choices I made in research strategy and method, and how I collected and analysed the data. I delineate the process of designing and conducting the research and justify my choices. Justification of those choices also includes reviewing the strengths and weaknesses of the research design.

The next section introduces the 'case study' approach as the relevant research strategy for this research with regard to the nature of research questions and phenomena under study. The section also explains why rural poultry industry and the RIU programme were selected as the case study and what the implications of this choice are. It also describes the multiple data sources derived from the case study in relation to the main research questions. Section 3.3 explains the data collection methods for both primary and secondary data, as well as highlighting on data limitations. Section 3.4 discusses the validity and generalization of data from the case study followed by section 3.5 which explains the data analysis methods and processes used. The section elaborates how data were interpreted and constructed into meanings using the 'Framework approach'. Lastly, section 3.6 summarises the chapter and concludes.

3.2 Case study research strategy

This research was inspired by the Agricultural Innovation System (AIS) research particularly the innovation broker concept (Geyskens, 2012; Klerkx et al., 2009a; Klerkx & Hall, 2009; Preissing, 2012) in building innovation networks. The AIS framework guided me to examine how innovative behaviours and structures in a subsistence based industry can be externally influenced towards meeting broad objectives like poverty reduction. So I decided to conduct an in-depth analysis of the

recently implemented DFID-funded RIU programme to understand how it played such a role in Tanzania. Studying the RIU interventions helped me to investigate how a donor-funded programme could act as an innovation broker and facilitate processes that stimulate interactions and learning in an industry dominated by subsistence producers. I therefore examined the process of changing routines, building partnerships and building capacities to demand and utilise new knowledge as revealed by RIU's history. Specifically, the analysis considered changes in innovation behaviours and the process of inducing those changes. Therefore, for the study to capture in-depth knowledge of those changes in behaviours and processes that caused them, and to capture the history of RIU interventions, I used a case study research strategy – with RIU as my case study.

Literature explains that case study research strategy is useful in answering the 'why' and 'how' questions (Gerring, 2007; Yin, 2009, 2014) particularly to relatively contemporary events when the phenomenon under study is not the subject of experimental control (Yin, 2014). It moves the analysis away from being variable-centred to analysing causes and effects (Gerring, 2007; p.3) which is the interest of this research. More specifically, Yin (2003) distinguishes case study research as an empirical enquiry investigating: (i) a contemporary phenomenon when, (ii) the boundaries between phenomenon and context are not clear, and (iii) various data sources are used. In business studies, case study is also defined as a methodology that is used to explore a single phenomenon in a natural setting using a variety of methods to obtain in-depth knowledge (Collis & Hussey, 2009).

Therefore this strategy seems relevant to my study because the outcome of the RIU programme was a single phenomenon which occurred in natural settings. The strategy is also useful in answering the research questions in this thesis which include both how- and why-type questions. The questions are about a contemporary global development concern (i.e. how to increase agricultural performance in developing economies) and which happened coincidentally as RIU was being implemented. In other words, the outcomes of RIU programme are unique and unexpected, that it is only by examining its history will we know what actually happened and be able to replicate elsewhere. Moreover, we are not able to control neatly all the contextual

variables responsible for the transformation that happened. However, multiple data sources exist (process-tracking (historical), qualitative, and quantitative) which allow us to explore the important contextual factors and analyse their contribution in the observed outcomes and impacts.

This case study has both explanatory and descriptive parts. In order to answer the first research question, I attempt to explain the innovation behaviours in rural poultry production which have historically remained very low. In fact, this is my 'why' type question where the aim is to explain what reinforces low innovation behaviours in the industry and what makes subsistence tendencies to persist–or what makes it hard to switch to market-oriented production. This is explained using narratives from actors in the industry regarding perceptions on poultry production, sources of knowledge and flows, policy decisions and actions, resource allocation, attitudes towards rural poultry production, scientific findings and recommendations, etc. The descriptive elements of the case study include explanations of how interactions and learning can be stimulated in subsistence-based industries. The shifts in innovation behaviours are explained with reference to process and contextual factors such as scale of production, husbandry routines, input demand and usage, learning patterns, resource allocation decisions, and structural factors like links to inputs and output markets. In addition, I aim to explain producers' innovation behaviours in terms of lock-in, organisational thinness and fragmentation, and liken it to RIU's facilitation process towards unlocking and path creation. This means collecting data to explain the mechanisms established to initiate a mental shift, create demand for new knowledge, and build systems capacities to adapt to new equilibriums.

In order to answer the research questions, a few research hypothesises were initially proposed according to the background information about subsistence production and theoretical and empirical literature. These were my first 'guess' about the reasonable answers to the research questions which guided the data collection and analysis stages. As discussed in chapter 2, I employed a number of theoretical concepts and frameworks from development, innovation, organisational and systems research to build a conceptual framework to guide the research. A conceptual framework is useful for delineating the main entity to be studied (Miles, 1994). However, the study

method may yet be rudimentary and may be refined and further developed alongside the empirical research. For example, it was after I collected most data, when I realised that the observed low innovation tendencies in the industry were better explained by path dependency theory (i.e. as a lock-in, organisational thinness and fragmentation). I therefore reviewed the theoretical framework retrospectively, which guided the collection of the remainder of the data needed to answer the first question.

While the primary data source for this study is field interviews, RIU documents, database, website, publications and artefacts like video, voice records, etc. were very important sources of data to describe the 'facilitation process'. The RIU datasets explain what was done, how it was done, why, who was involved (and why), and what was the outcome. On the other hand, field interviews provided information on perceptions about processes, interpretations of the actions and results, reasons for the actions (response) and underlying beliefs. Interviews were also used to triangulate information extracted from RIU documents, and to confirm my personal observations. This study shows how historical narratives of an implementation (or a programme) can be used as inputs to build new theoretical accounts.

Although it may have been ideal to interview representative samples of different categories of actors involved in the programme such as, rural poultry producers, inputs and services suppliers, researchers, regulators, and end-consumers, this research has sought to focus on how producers were engaged and influenced. Therefore, a large sample of producers and only a few representatives from other categories of actors were interviewed. Other categories of actors were involved as they were found relevant based on the chronology of RIU events. This decision is due, in part, to the limited scope of time and space given to this doctoral research, which gave little scope to focus on changes within individual suppliers, consumers and other market actors. The main objective has therefore been to observe and examine how subsistence producers were influenced, how they responded, and how they influenced other actors to respond to them. But more importantly, I seek to explain how the 'rural can be empowered to attract the urban' and not the urban to be forced to trade with the rural.

3.2.1 Selecting the case study

As explained in chapter 1, this study emerged from the work of RIU programme. I coordinated the programme in Tanzania and saw how the rural poultry industry was transformed and behaviours of other actors towards the industry had also changed. So I wanted to take an outsider's look to understand what actually happened. So I selected the case study because I saw a unique process which was worth examining and sharing.

According to Gerring (2007) and Yin (2014), RIU is a critical case justifying this single case study (Gerring, 2007; Yin, 2014). It is a critical case for the analysis of how a donor-funded programme can transform an industry dominated by subsistence producers because a glance at the drivers of change in the poultry industry in Tanzania where RIU intervened illustrates a transformation which was externally induced and facilitated. However this study allows rigorous examination of this raw idea with empirical evidence. In addition, the rural poultry industry exemplifies agro-industries which have a long history of dominance of traditional low-input low output production systems in all developing economies. It is an industry known for its conservative behaviour towards technological change, where a rural household may choose to commercialise other livelihood activities but not poultry. Therefore, it provides a very relevant setting for the analysis of how subsistence tendencies can be upgraded towards a sector-wide growth.

Given the limited time and space for this doctoral research and thesis, the single unit of study in such a depth and length should better serve the purpose of this research, bringing findings that contribute to knowledge and possible interventions in real-life complex situations.

3.2.2 The multi-sited ethnography

For analytical purposes, I divided the case into three domains according to the timeline of RIU and changes that occurred. The three domains are; before RIU (before 2009); during RIU (2009-2012); and after RIU (2012- to present). The stages reflect the situation and behaviours of the industry with and without influence from RIU. However, such a division is arbitrary because it is my own view of stages passed through by the industry. Thus the choice only reflects how I wanted to

organise my analysis by separating processes from how things were before and from how the industry turned out as a result of programme influence. Therefore, the shift (changes) is considered to have continued even after the programme ended.

Analysing behaviours before RIU (i.e. before 2009) I had to interview a group of producers in areas where RIU did not intervene and commercialisation had therefore not taken place. This acted as control group and involved villages in Njombe and Ruvuma Regions about 900 km away from Pwani Region where RIU worked. Data from this area was reflecting current behaviours and I had the opportunity to observe and therefore apply ethnography research. Apart from the control group, I also interviewed producers from the RIU target areas in Coast Region. These had already commercialised, or observed their neighbours/relatives keeping chickens in a different way. So they relied on memory to recall the situation before RIU, i.e. they were narrating past situations. I also read secondary sources that described rural poultry production in Tanzania.

When I was analysing the RIU process and behaviours between 2009 and 2012, I mostly used RIU documents, databases and other artefacts to understand what was done and motives of each process. I also interviewed ex-RIU staff, rural producers and other actors who engaged with the programme. And to analyse the situation after RIU I interviewed ex-RIU staff, Kukudeal[20], producers in RIU target area, government officials and donor organisations who are now working in the area. This reveals 'multi-sites' as sources of data. It also reflects the 'Tanzania rural poultry industry' as sub-case within the main case-study. This means, in order to study the RIU programme I also had to study the rural poultry industry. The two could not be separated, and still be able to meet the objective of the study.

The three domains discussed above show several sources of data, i.e. (i) control group interviews, (ii) participant observation in the control area, (iv) RIU target group interviews, (v) secondary data from RIU reports and datasets; (vi) interview with ex-RIU staff; (vii) interview with Kukudeal, government officials, donors and

[20] Kukudeal is a company registered under Muvek Ltd-who implemented the RIU programme. Kukudeal runs a poultry contract farming programme with different producers in the country. Now they own the Kukaya eggs" brand marketing eggs produced by rural producers under contract farming.

actors who continue with processes after RIU. These sources provided sufficient data to answer all the research questions presented in chapter 1. Key actors were mapped from each area although that does not suggest clear-cut boundaries in their roles and interactions. The mapping helps clarify the sites at which data collection would occur.

3.3 Data collection

Supporting the use of case studies, scholars noted the importance and benefits of using multiple sources of evidence (Fletcher et al., 1997; Gerring, 2007; Yin, 2009) because data triangulation enhances the validity of accounts of a particular phenomenon (Yin, 2009). Therefore, as explained in section 3.2 above, multiple sources of data were involved to bring valid accounts of how innovation was promoted in the rural poultry industry in Tanzania.

I combined the case study research with interpretive research strategy to help me understand behaviours from the actors' points-of-view (Gerring, 2007). I therefore adopted qualitative methods involving close contact and interaction with participants in the study. In addition, data for this study were collected one year after the RIU programme was closed. Although most interviewed actors had a clear memory of the programme and its processes, I decided to also collect information from the programme archives and harmonise it with narrations from field interviews.

3.3.1 Observation

As a Tanzanian born and raised in rural areas, and who has worked with rural communities for 15 years, I can say I have been observing rural poultry producers all my life. Moreover, as the RIU country coordinator for four years (i.e. 2008-2012) I observed things unravelling. Furthermore, during data collection I observed actions and processes related to poultry: chickens roaming, traders moving house to house persuading to buy chickens, a child sending a cock to the village market, food vendors selling chicken meat, etc. Therefore, being in the field, provided the opportunity to interact with, and observe participants beyond the structured interviews. This added to the internal validity of the information collected from interviews.

Field observation allowed me to see things not discussed during interviews and to get the context to issues in the spirit of ethnography. When I visited producers for interviews, I observed routines and spoke to members of the family. This provided a greater sense of the difference between producers who have commercialised and those who have not. For example, I could visibly contrast the two producers by looking at the number of chickens kept, types of sheds built, presence of fenced houses that restricted movements of chickens, supplementary feeds being prepared vs. birds just left to scavenge, etc. Being in the vicinity also influenced the type of questions I asked during interviews.

3.3.2 In-depth interviews

Literature explains that in-depth interviews are advantageous because they record more fully how subjects arrive at their opinions. They provide an opportunity to grasp the underlying mental processes that give rise to individual responses through witnessing outward manifestations like hesitations, stumbling, laughing, etc. as interviewees formulate their answers (Gerring, 2007; p.57). They also allow spontaneous probing for clarifications. Therefore, I have used about 110 days (approx. 4 months) to conduct 156 in-depth interviews (i.e. 143 individuals and 13 groups). The maximum number of interviews I had per day was three. Interviews were not tape recorded after the first three participants expressed discomfort in being voice recorded. So I relied on my field notes which I compiled and typed daily.

Table 3-0: Number by types of in-depth interviews held

Category	Location	Individuals	Groups	When
Ex-RIU Staff	Dar-es- Salaam	7	1	May 2013
Producers *(Control group)*	Ruvuma and Njombe	40	5	June – Aug 2013
Producers *(RIU target group)*	Pwani Region	85	7	Sept-Oct 2013
Other actors[21] *(Suppliers, LGA, etc.)*	Dar es Salaam, Pwani, Ruvuma & Njombe	11	0	June - Nov 2013
	TOTAL	**143**	**13**	

Source: Study data, 2013

[21] I interviewed extension workers, Agro-dealers and LGA staff between June and October when I was interviewing producers in their areas. The rest were interviewed in Dar es Salaam.

Individual interviews

Field interviews were conducted to understand what happened and how the RIU programme was perceived and understood by different actors. Therefore as shown in Table 3-0 above, seven (two by phone) individual interviews were held with ex-RIU staff who worked with the programme. Then a group discussion was held with five of the seven interviewees (two could not attend) and agreed on key events and processes that took place. While in the group, the team also made a critical analysis of the process and gave insights of the complexities involved. I also interviewed eighty poultry producers, four champions and one opinion leader in groups of ten from eight programme areas. The areas were selected from the programme database based on different subjective criteria including overall performance, high or low community response, remoteness, presence of cultural factors that are linked with poverty, and high presence of women, youth, the elderly and people with disability as RIU target group, etc. As mentioned earlier these criteria are very subjective and were proposed and discussed with the RIU team.

The 85 rural poultry producers interviewed came from seven different Districts. Forty of these came from four Districts in Pwani Region (i.e. Rufiji, Bagamoyo, Kibaha and Mkuranga) where RIU programme worked. The rest came from Songea Rural, Njombe Rural and Wanging'ombe Districts in Ruvuma and Njombe Regions where commercialisation had not taken place but a similar programme was just starting. The forty interviewees from the RIU programme area were selected by four District Champions who were asked to identify ten producers each. Out of the ten, two were whom they thought did very well in commercialising their poultry enterprises (Good performers), two were of average performance (Average performers), two who didn't do well (Poor performers), two who started but quitted prematurely (Dropouts), and two who did not participate at all (Non participants). This distribution made a total of ten interviewees (five women) from each of the five categories. The selection was therefore very subjective as it relied on how Champions defined performance. However, I believe their judgement tends to be relevant for the study as it reflects how rural communities themselves perceive success.

The remaining forty interviewees were picked randomly in Songea, Njombe and Wanging'ombe Districts by the researcher during community meetings organised to sensitize rural households to join a programme similar to RIU. These meetings were organised by Muvek, the same agent who implemented the RIU programme in Pwani Region. So, while the previous forty interviewees in Pwani recalled how things were before RIU intervened, these forty gave accounts of their present situation as commercialisation initiatives had not yet taken place at the time of interviews.

I also held individual interviews with three extension officers, one hatchery owner, a feed manufacturer, two district input shop owners (Agro-dealers), private veterinarian, one veterinary drugs company, two LGA staff and a Senior Officer from the Ministry of Livestock development and Fisheries. These gave information on the poultry supply chain situation in rural areas, before, during and after RIU.

Focus group discussions

After the individual interviews, and after I had gone through the data and did a bit of analysis, I went back to the RIU districts in Pwani region and conducted seven focus group discussions (FGDs) involving fifteen producers each. These meetings were organised at four district champions and three village champions' homesteads, approximately a month after individual interviews were conducted. Participants in these discussions were randomly selected, and were Champions' immediate neighbours regardless of whether they participated in RIU project or not. Each Champion had to list his or her neighbours to the fifteenth name and invite them for a meeting at her/his home on the next day. As an attempt to broaden variations in opinion, neighbours related to the Champion were excluded from the list.

During these FGDs I asked almost the same questions as I did with the individual interviews but this time with a community perspective. For example, I asked why Rufiji people kept chicken, how Rufiji people feed their chickens and why? Etc. Therefore, my aim was to gain deeper insights of what is common in their goals, behaviours and routines as a society. It was also an opportunity to hear more answers from the same communities, and which were agreed by them in a group. In all the seven FGDs, not more than 4 participants (16%) had previously participated in the

individual interviews. I also used the discussion to confirm what RIU did, how the community responded, what had changed and how they perceived RIU and the processes.

A group discussion was also held with four of the five ex-RIU staff (one could not attend) and agreed on key events and processes that took place. While in the group, the team also made a critical analysis of the process and gave insights of the complexities involved. I also presented my recall of the process as an ex-staff, and what I read from the report for them to discuss and comment. Finally, we agreed on the chronology of events and how they happened.

About five group discussions of ten producers each were also conducted in Songea and Njombe districts to further understand poultry production behaviours in the control group. These were picked randomly from the attendance list of the meetings held previously. Their names were sent to their village leaders and were invited for a meeting on agreed dates. These were mixed groups of men, women, and youths.

3.3.3 Data from RIU reports and datasets

As a former team member, I had access to reports , minutes, proceedings, letters, emails, working documents (i.e. strategies, guidelines, term of references for different assignments, contracts, advertisements, etc.), publications, policy briefs, blogs, databases and programme diaries written monthly by individual team members and then compiled for submission to the programme headquarters in the UK. I read and analysed these documents in their sequence of events. Then information on what was done, why it was done, who were involved and why they were involved was extracted and put in a matrix to create a map of what RIU did in the poultry sector in Tanzania, including what happened as a result of the interventions. Each event was then discussed in detail with relevant interviewees.

RIU had a rigorous documentation process and in Tanzania a communications officer was employed to document all events and processes and submitted to the RIU Management office in the UK. These documents were later uploaded to a ‘grapevine’ which is the overall (the global) RIU programme database. I have categorised the documents that I reviewed for Tanzania into seven categories, i.e. (i) framework

documents; (ii) progress reports, (iii) activity reports; (iv) innovation diaries and field notes, (v) study and consultancy reports; (vi) official communications and exchanges; and (vii) knowledge outputs and published materials. Table 3-1 below summarises the categories.

Table 3-1: Summary of sources of data from RIU archives

Category	What it is
Framework documents	These are documents defining the programme's overall strategy, approaches and other guiding principles.
Progress reports	Include reports prepared quarterly and annually by Muvek as the implementing agency and submitted to the RIU Management Team in the UK. They also include monthly reports submitted to Muvek by Household Caretakers who lived with farmers for 30 days and district champions who reported on the implementation progress at field level. Champions also submitted their reports to LGAs.
Activity reports	These were prepared for each activity as a record for what was done, who was involved, what happened, what was concluded or decided. Such reports include minutes from different meetings (e.g. between RIU and producers, RIU with hatchery owners, producers with hatchery owners, the Ministry with chick producers, etc.), workshop proceedings and staff field visit reports, etc. These reported on specific activities, i.e. describing what was done rather than progress.
Innovation diaries	These were written by individual RIU staff listing and briefly describing what they were doing. These were meant to capture all activities an innovation facilitator does to the smallest detail possible. These were different from activity reports as they included even the administrative tasks like writing letters, making telephone calls, organising a meeting venue, complaining about expired drugs to a supplier, attending a meeting, etc. These diaries were compiled monthly and submitted to the RIU management in UK. However, the idea of diaries started only in September 2010 and was sustained to the end of the programme in June 2011. However, it was abandoned during the extension period in 2012.
Study and consultancy reports	These were detailed reports prepared by consultants commissioned by RIU. Two main reports were found important for this study. The indigenous chicken subsector study which described the sector before RIU, and the farmer psychosocial study report which was commissioned to understand why some producers decided to quit after they tried to commercialise for a while. In my analysis I first looked at the reasons or circumstances that led to the commissioning of these studies, what came out and how the findings influenced future decisions and actions (process).
Official comms and exchanges	These include incoming and outgoing letters and emails between RIU and different actors including the ministry, input suppliers, champions, poultry producers etc. For example, RIU's correspondence with the Ministry of livestock regarding problems related to quality for vaccines, feeds, diseases, etc.

Knowledge outputs and published materials	These included analytical manuscripts, books, journal articles, video clips and other formal documents produced by the project. These provided analytical perspectives from third parties as well as those of RIU staff and target groups generated through an externally facilitated process. For example, the 'RIU Institutional Case Stories' booklet is an account of personal experiences of RIU staff, poultry service providers, and poultry producers of institutional changes that took place as a result of RIU interventions. These experiences were documented in a 'write-shop' facilitated by experts from KIT in The Netherlands. During the write-shop, information was peer reviewed and validated involving experts from outside RIU. These case stories were therefore very informative to me and I used the information to validate the account of the chronology of events reported in other RIU documents.
Video clips and speeches	These include video interviews recorded by journalists from outside Tanzania. They interviewed different people involved in the poultry industry who described what they do, what RIU did and their opinions. Going through the clips I leaned what RIU did, what actually happened, and how different actors view the changes.
RIU website	The global RIU programme had a rich website www.researchintouse.com and a web-based Tv and radio channel called 'RIUtv' where information on what was done, field experiences and general analyses of programme activities and outcomes could also be found. The website also has a link to key documents stored in the 'grapevine'.

Source: Study data, 2013

3.3.4 Data limitations and challenges

The 'insider' vs. 'outsider' problem

As I explained before, during the time of this research, I had worked in the livestock sector in Tanzania for 15 years, out of which four years were focused on poultry alone. So I had a rich experience of how the industry operates and I also had access to inside information, and had almost the ethnographer's experience of the issues. Furthermore, I coordinated the RIU programme and I also lived the experience of the programme processes and outcomes. I also had access to the field and all RIU data. This was both an advantage and a challenge.

Literature argues that, when doing interpretive research, researchers are actually attempting the difficult task of accessing other people's interpretations, filtering them through their own conceptual apparatus and feeding a version of events back to others (Walsham, 1995; p.77). And in doing that, they play either the role of an *'outside observer'*, or that of the *'involved researcher'* through participant observation or action research (Ibid). The author argues that from an interpretive

perspective neither of these roles should be viewed as that of an objective reporter, since the collection and analysis of data involves the researcher's own subjectivity (p.77). Therefore, even by aiming to play the outside observer role, the researcher inevitably influences the interpretations of the people being researched, a process referred to by Giddens (1984) as the 'double hermeneutic'. So even if researchers view themselves as outside observers, they are in some sense conducting action research by influencing what is happening in the domain of action (Walsham, 1995).

According to Geoff Walsham, being an outsider has both advantages and disadvantages. The merit is that the researcher is seen as not having a direct personal stake in various interpretations and outcomes, and thus interviewees will be relatively frank in expressing their views, provided there is trust (Walsham, 1995). On the other hand, the disadvantages are that the outside researcher will not get a direct sense of the field organizations from the inside, and may sometimes be debarred from access to certain data and issues which are regarded as too confidential (Ibid). Therefore, in my case, I chose to conduct the analysis as an outsider but I was actually an insider with insight of internal processes and access to most documents and information. However, in order to minimize the risk of 'self-narration' and 'self-reporting', I double-checked most data through rigorous triangulation and where relevant (e.g. when meeting with fellow ex-RIU staff) I presented my views and asked for comments. Nevertheless, I was able to identify most of the data which came from multiple sources, and there were no conflicts.

Data was not gender disaggregated

Literature shows that poultry production in rural areas is mainly a women's activity (Kitalyi, 1998). Therefore any changes in the sector are likely to have significant gender implications. For example, there is a high risk of shifting gender roles as more women engage in poultry keeping and are able to earn a stable income. These women may face new and increased financial responsibilities previously covered by their male partners. Women and girls may also face increased workload as male household members leave all poultry-related tasks to women and girls.

Unfortunately, gender dimensions were not covered by this research and doing that could have properly provided interesting findings. For instance, analysing the RIU's decision to recruit more women than men, and use the *'household approach'* to encourage the entire household to engage in the enterprise, and therefore promoted equitable distribution of production roles and financial responsibilities could have generated useful information regarding facilitating gender sensitive innovation processes to achieve equitable growth.

However, since the focus of the study was on innovation behaviours within the entire community, and since 65% of the interviewees were women, I have no doubt the findings generated by the study represent women's views and situations. However, a deeper analysis regarding power shifts as poultry started to earn more income, issues of ownership and access to resources, as well as decision making powers and processes after more resources were allocated to the activity is valuable. This could probably be an area for future research, i.e. to understand the position of women in such transformation, in terms of winners and losers.

Data did not capture internal processes within RIU

Data used in this research is limited to what RIU did, what happened, and how actors and the industry responded. It does not capture the dynamics within RIU management to correspond to what gave the programme the ability to do what it did. For example, it would have been interesting to show how planning, reporting, staffing and budgeting were done while taking such a flexible approach and still be able to satisfy the donor. However, given the scope and time of this PhD research, it was not possible to conduct an in-depth analysis of RIU as the broker and reveal the internal dynamics of being indeterminate and still be a successful donor programme.

Did not capture potential effects of commercialising rural enterprises

The study did not capture information on potential risks associated with commercialisations and the RIU interventions in general. RIU reports explain that commercialising rural poultry enterprises causes some unintended shifts which may not be desirable depending on how the society is organised around poultry business. Therefore, mechanisms to manage such shifts are important. However, RIU

forewarns that such problems only emerge subsequently and can therefore not be predetermined (RIU, 2011a).

Examples of such risks include;

- A shift in gender roles which could cause problems to women and girls as discussed above.
- Movement of nutritious foods from rural to urban markets for economic gain, while depleting resources in rural areas.
- Reduced effort on crop farming as more effort and resources are allocated to poultry production.
- Causing negative implications be it social, economic or environmental. For example, there could be loss of jobs for some stakeholders in the value chains e.g. middlemen, traders; increase in grain prices as more producers use them to feed chicken, less social exchanges of chicken as gifts, etc.

Therefore understanding such dynamics and how to address them is useful for future learning.

3.4 Validity and generalization

Generalisation through a case study has been debated. The method has often been criticised on the grounds of its weaknesses in generalisation to a larger population (Gerring, 2007; Yin, 2009). However, other scholars have argued that the uniqueness of situations can offer the groundwork for logical inference or analytic generalisation (Donmoyer, 2009). Therefore, generalization from case studies is not expected to be 'statistical', but more of an 'analytical' type (Yin, 2003). That is, results from a single case study produce theoretical propositions (p.21). Yin's argument is extended into four types of generalization as follows: (i) the development of concepts; (ii) generation of theory; (iii) The drawing of specific implications; and (iv) the contribution of rich insight (Walsham, 1995; p.79). He built the categorization by citing Bhaskar (1979) who argues that unlike in natural sciences, social structures do not exist independently of the actions and conceptions of the human agents in them,

and the generative mechanisms of such structures are not space-time invariant. Thus the identified mechanisms should be viewed as 'tendencies' (rather than 'predictions') which are valuable in explanations of past data but are not wholly predictable for future situations. They are valuable however, in the future in other organizations and contexts (p.79).

Therefore, while behaviours in rural poultry industries are a typical and replicable sample of other rural poultry industries in developing countries to allow possible application of statistical generalization logic from sample to the population, the cognitive structures and the industry's response to facilitation may not be similar. Moreover, the industry is not a typical of other subsistence-based industries, nor is the RIU work in the industry a typical of other rural development programmes. Nevertheless, I expect to draw some 'analytical' general lessons including concepts, implications, and insights which could be valuable in another context (domain of action), even in other research. That is, I expect under similar conditions, that a facilitation process similar to what RIU did will express similar impacts in other subsistence-based industries, and specifically in rural poultry industries in developing countries. Nonetheless, this is subject to empirical investigation.

3.5 Data analysis

In this section I will describe how I walked through the data and created categories without using a computer programme. My intention was to maintain ownership of every decision that I took to categorise, reject or interpret. Basically my approach was interpretive, and which I did in stages. The first task was to re-read the answers from my notes, and translated them into English from Swahili in their direct speech. This was done daily as interviews progressed. The average was between 1 to 2 interpretations per day (i.e. a maximum of 2 interviews per day). So it took me about 4 months to have the Swahili and English data files ready, including data from FDGs.

However, as I was re-reading and translating the notes, I decided to use what I can call an *'adding up method'*. After I translated the first interviews, I created a matrix with each question separated. Then I kept on adding new responses coming from

new interviews from the same category and locality. So, when an interviewee produced a similar response as the one recorded earlier (like "I don't have a chicken pen because they sleep in my kitchen"), I would not record it again in my English notes. However, I would still have it in my Swahili notes. I therefore separated the responses based on the category of respondents, and their locations. For example, I had a file for producers in District A, Producers in District B, etc.; and Extension officers District A, and District B etc. So the 'adding up was done' within the same participant's category of the same locality. This ensured that socio-economic and other contextual uniqueness were preserved. This process also helped to reduce the volume of data in English files. I maintained the original data in the Swahili files for specific reference and for citations (quotes).

I decided to use the 'Framework approach' (Ritchie & Spencer, 1994) to analyse the data because it kept me closer to the data and it helped me generate ideas and conclusions as I did the analysis. It therefore fitted my requirements for an approach that allowed the data to speak for itself without making me lose the nuances within the data that, in the spirit of ethnography, I wanted to concentrate on during my discussion of the data. This approach, in taking a traditional, non-computerised approach to data analysis, and which requires immersion into the data and constant re-reading of the transcripts and field notes provided me with a way to gain this depth while at the same time logically sort the data into useful categories to make it more manageable.

3.5.1 The 'Framework' approach

While the Agricultural Innovation System (AIS) is the main theoretical framework in which the study is grounded, I used the 'Framework' approach (Ritchie & Spencer, 1994) to analyse the data collected because it is systematic and has a well-defined procedure. It was also chosen, rather than the full, grounded approach as developed by (Glaser & Strauss, 1967), because this research is a form of action research for which the 'Framework' approach was specifically developed. Therefore, the AIS and Path-dependency theory were used to identify and organise themes and theoretical concepts which guided the analysis and not in data analysis. However, during data collection I used the AIS framework to conduct the innovation context analysis in

order to map existing actors in the system under study. This information was later used to analyse the organisational thinness and fragmentation in the poultry industry.

The 'Framework' approach is a five-step process of data analysis. It begins with familiarisation with the data set followed by identification of a thematic framework (development of an initial coding system). Indexing is then done using the framework after which the data is charted by a process of abstraction and synthesis that leads to "[searches] for structure rather than a multiplicity of evidence" (Ritchie & Spencer, 1994; p.186). Finally, mapping and interpretation occurs. This method emphasises the interaction that occurs between the researcher and the data in order that the nuanced and complex nature of the data is emphasised (Spencer, Ritchie, Lewis, & Dillon, 2003). Therefore, no computer analysis of the data was done to avoid losing any contextual underpinnings of the findings.

However, in order to capture the RIU process I merged all information from different sources and created a map of key events, decisions and actions. Then I explained the reasons for each one of them, who were involved and why, and what actually happened including outcomes. I thematically analysed to elaborate each event.

3.6 Summary

This chapter has outlined the research methods that I chose to use in order to answer the research questions outlined in Chapter One. I addressed different aspects of the research design through which the research questions are to be answered. I argued that a case study approach is the appropriate research strategy for this research, because it is focused on a specific event of a programme undertaken at specific time and place. In addition, the nature of research questions which are of a 'why' and 'how' type suggests the case study as a suitable method. I have also outlined why I chose interpretive methods conducted in the spirit of ethnography. I have provided an overview of my multiple sources of data which were important for triangulation given my insider/outsider position in the study. I also described the process and 'Framework approach I used to analyse the data. I also provided an overview of some of the main methodological and practical limitations that I have had to overcome in conducting my research.

Chapter 4 Rural poultry production in Tanzania

4.1 Introduction

This chapter reviews the literature on rural poultry industry in Tanzania and describes the industry's value chain and its characteristics. The chapter makes it clear that the nature of the industry has been encouraging a shorter value chain where producers kept chickens just to meet social needs. The chapter also establishes the link that seems to exist between actors' knowledge of the research findings on the low genetic potentials of the local breeds and policy decisions on how to support the industry. Furthermore, by discussing the dynamics of the industry before and after the Tanzanian independence in 1961, the chapter makes it clear that there has been a deliberate bias to maintain poultry production in rural areas under the traditional system, while promoting the commercial system in urban and peri-urban areas using exotic breeds.

The chapter will therefore set the scene towards answering the first research question on why innovation is generally low in the industry by showing the existence of a dual production system where the traditional system is dominant in rural areas, and the commercial one is used mainly in urban and peri-urban. The chapter also provides background information of the industry where RIU intervened.

The chapter is organised in eight sections. The next section gives a brief overview of the rural poultry value chain. Then section three describes the characteristics of the industry which is subsistence in nature and dominated by local breeds of chicken, raised under the traditional production system. In section four I explain the perceived weakness of the dominant breeds in the industry and the implications to behaviours in the industry. Then section five discusses the dynamics that took place in the poultry sector before and after the independence in 1961, including how the government introduced the commercial production system into the country. This section is followed by section seven where I briefly describe the different strategies which have been used by the public sector to develop the rural poultry industry in Tanzania. The last section (8) summarises and concludes the chapter.

4.2 The industry value chain

The Tanzania rural poultry industry value chain is short involving mainly production and marketing. However, there are other functions like input production and supply which are handled mainly by actors living in urban areas including small rural townships. The functions are briefly discussed below.

Production: This is where the largest group of actors are in the value chain. Their production is largely subsistence with 94% of the producer households keeping only a few chickens, between one and fifteen. To a small extent, medium scale production is emerging, especially around urban areas. Ministry of Livestock Development and Fisheries (MLDF) estimated that the entire chicken sector is growing at a rate of 2.6%, a rate, which is nearly equal to the national population growth rate of 2.4% in 2010 (Match Makers Associates, 2010). However, the traditional sector is the dominant one.

Input supply: Since rural production is mainly traditional there are very few input suppliers (for feeds and day old chicks) linked to the industry. The existing feeds and chicks suppliers mainly operate in urban areas. The available chicken feeds are manufactured by medium scale animal feed processors.

Drugs and vaccines supply: In Tanzania big private firms and their agents characterize the market for vaccines and veterinary drugs. Private companies (e.g. Farmers Center, By-trade, Tan Vet etc) import drugs and vaccines from the Netherlands, Israel, Germany etc. Twelve vaccines, also available in the market are made in Tanzania. Many agro veterinary shops (stockists) based upcountry, work as agents of the importing companies.

Market: The main markets for indigenous chicken are urban areas and in particular Dar es Salaam as well as Arusha, Mwanza and other regional towns. In towns, high and medium income household consumers purchase indigenous chickens. Indigenous chickens are also sold in restaurants as chicken soup or roasted chicken, but rarely consumed in big hotels. The end market price for indigenous chickens' meat is almost double the price of exotic ones. Very little processing is done in urban areas where very rudimentary dressing is done. Dressing is offered by the retailers but

done at the cost of the customer. The farmer's share of the end market price varies between 26% and 35%, which increases as the actor moves further upstream in the supply chain. As a result, up market traders in urban areas realize a bigger share of the end market price (Match Makers Associates, 2010).

In rural areas there are no organised markets for chickens. Sales are *ad hoc* during regular markets where producers sell when in need of cash. However, traders have been moving around buying chickens at farm gate and transport them to urban markets. These traders usually go door to door, or visit village markets where they buy and keep them until they have sufficient number to transport (Match Makers Associates, 2010). Some of these traders go with merchandise and sell them in exchange for chicken.

Eggs from indigenous chickens are often not sold but left to hatch or consumed by producer households.

Other actors and functions: These include researchers, extension staff, regulators, NGOs and development programmes who are involved in providing services like training, extension, credit, community mobilization, etc. These are mainly involved in providing services as mechanisms to support small producers to reduce mortality and earn a little more income. The initiatives are usually area specific and focusing on special groups like women, HIV/AIDS victims etc.

4.3 Characteristics of the industry

Literature shows that village chicken keeping in Tanzania has remained subsistent despite huge demand for chicken products and high poverty levels which signify higher needs for cash (Mack, Hoffmann, & Otte, 2013; Match Makers Associates, 2010). A significant body of poultry innovations to boost production also exists in the country, as well as political will to promote rural growth (RIU, 2011). Interestingly, rural producers have commercialised other farm enterprises within their domains but not poultry production. For example, a farmer will be producing tea or rice for the market, but keep 2 or 5 chickens at subsistence level, even when he sees numerous traders knocking on his door looking for chickens to buy.

Furthermore, little research has addressed the complexity of factors that determine and drive innovation processes in rural poultry settings specifically where indigenous breeds of chicken are involved. As a result, there is insufficient explanation as to why subsistence based chicken keeping, which operates under low innovation levels is still common in rural Africa (by almost 60%) despite the significant advancement in poultry science and technology in the world, and more so even after over 50 years of development interventions and research in rural poultry. Apart from poultry breeding, nutrition, health and economic studies, there is almost no research (at least that I am aware of) that goes beyond looking at the chicken and its needs (i.e. feeds, vaccines, drugs, shelter, etc.) and go deeper into the 'poultry keeping situation' and to provide an analysis of systems and social-cultural processes that govern creation, adoption, adaption and use of innovations in rural poultry production.

Significant literature dwells around the scientific finding that 'the genetic performance of indigenous breeds is very low' and hence the consequent economic grouping of 'industrial vs backyard chicken' where the former is exclusively for the 'improved' breeds considered to be high performers (Adedokun & Sonaiya, 2002; Dinka, Chala, Dawo, & Bekana, 2010; Grobbelaar, Sutherland, & Molalakgotla, 2010; Mwacharo et al., 2011). Such literature treats rural poultry as being 'technologically-weak' just because the breed involved is 'not a high performer'.

Seemingly, scientific conclusions and the sustainability question made innovation in the industry harder because research focused more on incremental innovation while the Government focused on improving the gene pool. The notion that local breeds were inappropriate for commercialisation also made adoption of innovations to improve productivity difficult. Researchers and development actors argued for maintaining the investment in the industry low (See FAO/IAEA, 2006; Otte, 2005; Sonaiya & Swan, 2004) mainly for two reasons: (i) rural producers are too poor to invest in commercial inputs; and (ii) even if they are assisted to invest, the genetics of the breed is not efficient enough to provide the right returns to investment. Hence it will be a loss to farmers and therefore unsustainable. In addition, others argued that, the low input output nature of the activity fits in well with the rural farming systems and does not put stress to the environment. According to FAO, commercial

inputs and technologies were inappropriate for village chicken production (E. Sonaiya & Swan, 2004).

Generally, growth in the rural poultry industry is said to be limited by poor knowledge of flock management especially by producers, limited usage and therefore limiting supply of inputs (especially day old chicks), limited business knowledge among producers because they don't produce for the market, limited market access because of low and inconsistent volumes, poor market and handling infrastructure and limited sources of finance for investments in the subsector (Match Makers Associates, 2010).

4.4 The perceived weakness of the breeds

Five indigenous chicken ecotypes have been identified in Tanzania (Msoffe et al., 2010) and which are argued to differ in both productivity and disease resistance potential (FAO, 2008). Some of the ecotypes, like *Kouchi* are not indigenous but were introduced to the country and their hybrids have now been adapted and are widely reared in most parts of the country. Some hybrids like those of the Black Australorp, Hi sex, Bovan Brown and Rhode Island Red have also been introduced and adapted. NGO programmes and lately local government programmes (e.g. TASAF, ASDP and DADPs) have introduced and encouraged cross breeding as a way to improve quality of indigenous chicken breeds. In this study I am primarily concerned with indigenous breeds commonly known as 'rural chicken' or 'village chicken' and hybrids i.e. breeds kept under the traditional poultry production system (scavenging/extensive) or under the semi intensive management system, where supplementary feeding is sometimes done. The study is therefore not concerned with pure exotic breeds, which are often raised under intensive management.

There is limited knowledge of which chicken ecotype should be promoted in Tanzania. Ministry of Livestock Development (MLDF) cited identification of genetically suitable chicken varieties as a key problem facing breeding in the industry. Also, introducing exotic species has been identified as a constraint in breeding because it leads to dilution and even loss of indigenous breeds. Initiatives at the Agriculture Research Institute (ARI) Naliendele and Mpwapwa are at an initial

phase, but have identified and collected indigenous chicken ecotypes with various desirable traits. To a large extent, physical attributes of chickens such as size and weight remains the most preferred criteria for identifying good breeders.

Indigenous chickens are dual purpose breeds and unlike the exotic ones where layers and broilers are separate, they combine both laying and meat traits. Since egg laying capacity is negatively correlated to weight gaining for meat, some chick producers (hatchery owners) seem to be uncertain which breed to keep as a parent stock. This is very challenging because parents with high egg laying capacity produce chicks with the same quality but also with low weight gaining capacity. On the other hand, keeping parents with high weight gaining capacity will produce chicks that gain wait for the market and the chick producer will be getting very few eggs from a large parent stock for hatching. This increases hatchery production costs especially in feeding and caring for a large parents stock which produces very few eggs at a given time. In fact this is one of the areas where the cost of commercialising indigenous breeds is higher on the supply chain.

Currently, the market for day old chicks and also for chicken meat accepts some degree for cross breeding, which provides a good bargain for actors in the rural poultry industry to model their businesses to respond to customers' desire for chicken types with quick weight gain (as in exotic chicken) and which at the same time lay many eggs. Some hatchery owners have already adopted some degree of crossbreeding to increase production. So the trend now is hatcheries investing in producing dual purpose chicks (i.e. both for meat and eggs) which lay more eggs and at the same time gain market weight relatively quicker i.e. within four months.

4.5 Dynamics before and after independence in 1961

As explained in section 1.2, prior to independence in 1961, the poultry sector was entirely dominated by indigenous breeds of chickens kept in rural areas for social purposes. The Government started to regulate the sector in 1967 with a strong bias of promoting commercialization of pure exotic breeds (RIU, 2011a). The current policy is to develop a commercialised and competitive poultry subsector through

developing large scale and vertically integrated commercial farms that keep exotic breeds.

After the Arusha Declaration[22] in 1967, and in line with the socialism ideology and the national policy for self-reliance the government of Tanzania promoted commercial poultry production with a specific focus on improved breeds. The government approach was vertical integration and it therefore decided to establish the National Poultry Company (NAPOCO). As a government Parastatal NAPOCO was mandated to set up commercial poultry farms, breeder farms and import parent stock. The government also promoted commercial production of exotic and hybrid chicken in public schools (both primary and secondary), prisons and in agriculture training institutions.

The decision to establish NAPOCO provided a strong financial base for the introduction of the commercial system in the country. This is contrary to how the traditional system started and which never received any attention even during the colonial times. Therefore, the government introduced a parallel production system which received more attention and resources from the government while neglecting the old traditional system. This sent the first signals that commercial poultry production entails powers, i.e., financial, political and a superior breed from the West. This understanding was reinforced when schools were involved in managing public-owned commercial poultry farms.

After the successful introduction of public-owned commercial farms, the demand for commercial poultry inputs increased, especially feeds and the Tanzania Feeds Company (TAFCO) was established. This was also a government parastatal. Later in the 1970s the government embarked on a nation-wide campaign to promote consumption of eggs and poultry meat, particularly to women, children and sick people. This was after the successful performance of the commercial farms where production of eggs increased significantly. By then, rural people were using different

[22] The Arusha Declaration and Tanganyika African National Union (TANU) party's Policy on Socialism and Self Reliance (1967), referred to as the Arusha Declaration, is known as Tanzania's most prominent political statement of African Socialism, 'Ujamaa', or brotherhood. The Arusha declaration is divided into five parts: The TANU "Creed"; The Policy of Socialism; The Policy of Self Reliance; the TANU Membership; and the Arusha Resolution. See https://en.wikipedia.org/wiki/Arusha_Declaration for details.

means including setting taboos to minimize consumption of eggs which were very important for breeding in the traditional system. Therefore, the government campaign was important in changing deep rooted taboos to promote consumption of eggs. However, since the supply of eggs from public farms was limited, the triggered change in consumption patterns affected the traditional breeding system, as fewer eggs became available for breeding.

In the mid-1980s NAPOCO collapsed and private small to medium-scale commercial producers of exotic and hybrid chickens in urban and semi-urban areas emerged. During this time, the emergence of private farms intensified importation of day old chicks from neighbouring countries including Malawi, Zambia, South Africa and Uganda, because until its collapse, NAPOCO was the only company importing parent stock and producing chicks. The government responded to the situation by encouraging private entrepreneurs to establish hatcheries to cater for the increased demand of day-old chicks. Only Inter-chick Company, Ruvu JKT and Kibaha Education Centre managed to establish large enough hatcheries. Yet still, these three hatcheries were unable to meet the demand for day old chicks. Hence importation continued. To date, there are nineteen large commercial producers of day old chicks (of improved breeds) on the Mainland Tanzania, some of which also keep parent stock and raise commercial layers and broilers (RIU, 2012).

It is important to note that, during the NAPOCO era, the knowledge on how to raise chicks and manage a commercial poultry farm was disseminated by the government to the farms, including to those owned by schools and prisons. So it is fair to anticipate that the knowledge could be publically available. However, availability of veterinary services and drugs including vaccines was strictly controlled by the government through the Veterinary Investigation Centres (VICs) initially present in eight different zones. The government was importing and distributing vaccines and drugs.

Ten years after the collapse of NAPOCO, the private sector managed to significantly increase the commercial production of broilers and layers. For example, between 1995 and 2003 the number of layers increased sharply from 287,691 to 1,126,697, representing an annual growth rate of 18.6%, and that of broilers increased from

184,002 to 665,712 in 2003 during the same period, representing an annual growth rate of 15%. However, a much higher growth in layers of 26% per annum was experienced between 1995 and 1999 while broilers population grew at a rate of 30% per annum during the same period (RIU, 2012).

The vacuum created by NAPOCO created a business opportunity to private producers and input suppliers. However, they did not enjoy the financial support NAPOCO had from the government. Consequently investment in input supply was scanty and small. Thus the country continued to rely on importation of vaccines through the government system, while government veterinarians got engaged in the private business of selling veterinary drugs. This situation was the same even in the production of other livestock like cattle, goats and pigs. As a result, the private sector businesses that emerged had very weak financial resource base, which ended up filling the gap left by NAPOCO by supplying poor quality inputs including counterfeit drugs. This necessitated the government to start regulating the sector. Nonetheless, the quality of poultry inputs continued to drop, thus pushing the production and supply of meat and eggs way below the demand. Consequently, in early 2000, complaints on producers' involvement in unhealthy practices of raising exotic chickens including administration of high doses of antibiotics and growth hormones emerged. This caused a sharp decline in consumption of exotic chicken and eggs.

4.6 Strategies and approaches for developing the industry

According to RIU, the Tanzania livestock policy document only mentions the indigenous poultry sub-sector as one of the types of poultry farming systems practiced in Tanzania (although accounting for about 92% of the total poultry population in the country) but not as an important sub-sector that would receive government attention. The government focus has thus been on commercial poultry production which deals with exotic breeds only. Therefore the indigenous chicken industry has not been a priority industry and because of the perceived low genetic potential and the fact that it is mainly managed as a village backyard activity, the government's strategy has been to upgrade the local breeds through distributing improved cocks to mate with local hens in the villages.

Currently, development of the poultry industry in Tanzania is based on a vertical integration strategy which is evident in large cities such as Dar es Salaam. In this system, large firms are involved in feed milling, day-old chicks production, broiler and egg production, marketing and processing. While this system has its benefits it is not beneficial for the majority of rural poultry producers who produce 79% of the chicken population in the country. The horizontal approach which is inclusive of more smallholder and medium-scale producers can create a more equitable growth of the sector as well as benefit the majority of the rural populations.

Different approaches have been used to develop the rural chicken industry in Tanzania and Africa in general. What is common in all the approaches however, is the intention to increase productivity without increasing producers' interactions with commercial input suppliers. Therefore the intention has always been to maintain the low-input usage. Below are some of the common approaches used.

4.6.1 Improving the genetics

As a strategy to address the acute animal protein shortage among the poor in rural parts of the world, genetic improvement of local chicken through cross breeding with improved commercial breeds has been suggested (Malago and Baitilwake, 2009), and used (Tiamiyu, 1999; Atteh, 1999; Fayeye, 2005). The strategy is meant to improve the productivity of local breeds of chicken in terms of egg traits, hatchability, growth performance, and live weight gain. This strategy is based on the arguments that the performance of local chickens vary considerably and no single ecotype meets the attributes of good egg traits, fertility, hatchability, survivability, high growth rate, heavy weight at slaughter and high egg production (Msoffe et al, (2001) and Fayeye, et al., (2005), in Malago and Baitilwake, (2009); p.25). So this strategy focuses on dealing with the biology of the chicken itself and therefore directing substantial research work into analysing, screening and comparing egg traits, fertility, hatchability, chick hatch weight, and chick survivability of experimental breeds. Most of these studies conclude that crossbred chickens have better performance than local breeds (Malago and Baitilwake, 2009).

At farm level, producers selected cocks and kept them for breeding. Then later researchers distributed improved cocks through extension agents. However,

inbreeding occurred and producers came up with an exchange plan where they sold a cock to buy a cock from a faraway village. Apparently farmers sold more cocks and gave them away as gifts than hens. When the desire to sell more chicken to gain more income aroused, natural breeding was found to be too slow. Hence researchers trained farmers how to manage and synchronise breeding cycles using selected hens. Still there were less chicken in the market since mainly cocks and old hens were sold. Then small and low cost incubators were introduced in villages under a government programme with the aim of increasing rural household's capacity to produce chicks. However, this programme was not very successful because availability and quality of breeding eggs were a problem. Thus, rural farmers continued to rely on natural breeding while controlling their rates of consumption, selling and other disposals like gifts.

4.6.2 Controlling and managing diseases

Controlling poultry diseases and especially the Newcastle Disease (ND) has been widely used as a strategy to improve village level chicken production both in Tanzania and in other rural communities (Dinka et al., 2010; Permin, Riise, & Kryger, 2004; Riise, Permin, & Kryger, 2005). The strategy is chosen because diseases and especially ND have been identified as the major health threats affecting chicken stock levels in rural SSA (Minga, Mtambo, & Katule, 2001).

Disease exposure and transmission in rural chickens is unique among other poultry production systems because village chickens congregate during scavenging. This makes household level disease intervention strategies very difficult to apply (Msoffe et al., 2010; p.254). However, this co-mingling of flocks permitted by human community structures of African villages, and the social nature of these communities of acting collectively in different aspects of their lives provides an opportunity for collective actions by humans to prevent diseases (Mwaikusa 1994; and Krishna et al. 1997, cited in Msoffe et al., 2010). Hence the widespread use of local community based rural vaccination programmes (Snyder 2002: cited in Msoffe et al., 2010). In these programmes the problem at hand is assumed to be two-fold; first, a lack of knowledge and awareness on how and what can treat the diseases; second, a lack of skills to utilize knowledge and technology involved; and third is lack of access to technologies and drugs to treat or control diseases.

In 2009, a social strategy was tested for implementing Newcastle disease (ND) vaccination and biosecurity improvements among free-ranging chicken at village level in Tanzania. The strategy involved training of local vaccinators, poultry keepers, and local government leaders on poultry health, management and marketing of village chickens with an emphasis on ND vaccination and improving biosecurity against avian influenza (AI) (Msoffe et al., 2010; p.253).

4.6.3 Consumer preferences as innovation driver

In early 2000 consumers became more health conscious and began to question production methods for exotic chickens. The perception that commercial chickens were raised using drugs and hormones with potential health hazards to consumers became widespread leading to a sudden fall in demand for exotic poultry products and a surge on the demand for indigenous chickens and eggs[23]. Market studies revealed that Tanzanian consumers had more trust in the way local chickens were raised, felt that the chickens had a better taste and texture than exotic breeds, and were therefore willing to pay more (Match Makers Associates, 2010).

Consequently, the exotic layers' annual population growth rate of 26% experienced between 1995 and 1999 declined to 11.7% over the period 1999 to 2003, while that of broilers dropped sharply from 30% to 2% over the period 1999 to 2003. To date, indigenous chickens remain the most consumed poultry type in rural areas. In addition, the relatively more health conscious and affluent consumers in urban areas continued to be a niche market for the indigenous chicken products (Ibid).

Following this drastic change in the poultry market equation, some large-scale poultry producers responded by including indigenous chicken in their flocks. Consequently, out of a total of 456,638 chickens kept by large-scale farms in Tanzania mainland as of 1st October 2003, indigenous chickens were 22,423 while 241,592 were exotic broilers and 312,043 were exotic layers. Meanwhile, the government's response focused on improving the genetics of indigenous chickens through crossbreeding with improved cocks, rather than developing a comprehensive national strategy for commercial expansion of the indigenous poultry industry. The response was associated with a strongly held view among policy makers and

[23] http://www.researchintouse.com/resources/riu040412-tz-policy-brief1-mail.pdf

scientists about the low genetic potential and productivity of indigenous chicken, even as studies continued to demonstrate that productivity of indigenous chickens can be significantly increased by improving nutrition, disease control, production methods for day-old chicks, and housing among other recommended poultry management practices (Minga et al., 1996; Msami, 2000; Mwalusanya, 2002).

The initiative to improve the genetic potential of local chickens through crossbreeding with improved cocks has been widely promoted through Local Government Authorities (LGAs) under the Agriculture Sector Development Programme (ASDP) with funds from Tanzania Social Action Fund (TASAF) and the Councils' own sources through District Agriculture Development Plans (DADPs). However, its prospects for commercial success were significantly diminished by the long-term system challenges which have over the decades, impeded growth and development of the indigenous poultry industry.

Overall, even though the government's active participation has had some positive impact on growth and development of the poultry subsector, its failure to integrate the indigenous poultry industry in the mainstream of commercial expansion is a major missed opportunity to tap and harness the tremendous potential of the industry to contribute to poverty reduction and livelihood improvement especially in rural areas.

A market study contracted by the RIU in May 2010 showed that the price of a mature local chicken in major urban centres such as Dar es Salaam, Mwanza and Arusha ranged between Tsh.9,000 and Tsh.12,000, while that of the exotic chicken ranged between Tsh.5,000 and Tsh.6,000, making the local chickens a preserve for the affluent urban upper and middle classes. A bigger share of the urban market remains untapped due to undersupply of the local chickens and the high price which has locked out low-income earners in urban areas from enjoying a highly nutritious delicacy. Under-production of indigenous chickens is therefore, a missed opportunity to maximise on the existing market opportunities to increase incomes, reduce poverty and improve livelihood for the rural poor especially women and children. It is also a missed opportunity to contribute to overall growth and development of the national poultry subsector.

4.6.4 Improving the production systems to semi-intensive or intensive

There are various models of the use of family poultry as a tool for development. Examples of traditional models tested over several years are the Smallholder Semi-Scavenging Poultry Model in Bangladesh and the Projet pour le Développement d'Aviculture Villageois in Burkina Faso. An example of a small-scale intensive model is the Nigerian Union of Local Government Employees model, which has been tested for only a short period, and the Rakai Model implemented by Farm Africa in Uganda.

The Rakai Chicken Model is a typical example of the recent move from linear to systems approaches in addressing constraints in rural chicken production. The Model was adapted from the famous Bangladesh model and used by Farm-Africa to improve indigenous chicken production in Rakai District in southwestern Uganda under the Maendeleo Agricultural Technology Fund (MATF)-supported project. The purpose of the Rakai Chicken programme was to improve household welfare by improving indigenous chicken production through programmed hatching and cockerel exchange. The chosen entry point was therefore to change existed breeding strategies followed by improved stock management, housing, feeding and health-care (Roothaert, Ssalongo, & Fulgensio, 2011).

The Rakai Model combines two popular approaches used by Donors, NGOs and Governments to improve rural chicken production. The first approach is to improve breeding through cockerel exchange where cocks of improved breeds are introduced in villages to mate with local hens. The goal of this approach is usually to improve the genetic make-up of indigenous breeds dominant in rural areas and which are argued to be of low productivity potentials. The second approach is to communicate improved poultry husbandry/management knowledge through training, extension visits, farmer field schools, and through media. The assumption guiding the second approach is, if farmers are made aware (both in theory and in practice) of better ways of managing and raising their chickens, they will adopt them. In both approaches, the starting point is supply of knowledge, skills and technology (e.g. technology like improved cocks, vaccines, etc.). Unfortunately, these approaches, and as

demonstrated by the Rakai programme have not shown the ability to trigger sector-wide interactions to transform the industry beyond subsistence.

Programmed hatching is a local technology involving synchronization of hatching by a group of local hens in order to produce relatively larger numbers of day-old chicks of exactly the same age. In this technology, no incubators are required and birds may hatch up to seven times a year compared to un-programmed birds. The technology is considered to be a fast and cheap way of increasing the number of chickens on a farm (*Ibid*) and as a better alternative to the use of incubators. Another approach is giving loans and subsidised to increase farmers' access to poultry inputs.

Technology dissemination is increased through organizing farmers in producer groups or associations. In these groups, individual farmers learn from each other, other knowledge providers use these structures as entry points to train and disseminate knowledge. Value addition and hands on experience in business and marketing skills are gained by farmers through these structures.

Roothaert and his colleagues argue that the creation of real demand and use of a holistic approach to development are key factors for successful innovation facilitation in rural-based industries. By holistic they imply, balancing of attention to technological aspects, community-based approaches and ownership, and establishing links to other important actors in the poultry innovation system. The question however, is what determines the balance? In this study I argue that, the balance of attention to technological, organisational and socio-economic aspects of the innovation process, which defines successful innovation facilitation, is determined by how flexible innovation facilitators or brokers are in allowing their interventions to be shaped by the ever emerging context which also results from the interventions. This means allowing interventions and context to shape one another through a continuous process of seeking and utilizing solutions to meet expectations.

4.7 Summary and conclusion

The chapter shows that in the rural poultry value chain majority actors are producers. Most rural households keep a few birds under traditional system using very little external inputs. Therefore, input supply and supply of veterinary drugs is almost non-

existent with vaccination done sporadically through public campaigns. The chapter also explains that there are no organised poultry markets in rural areas as sales are *ad hoc* during regular village markets when producers are in need of cash. A few traders also move around, buying chickens at the farm gate, and transporting them to urban markets. The volumes are usually low and eggs are rarely traded as they are often left for breeding and for home consumption.

The chapter also makes it clear that there is a relationship between the research findings regarding the breed and the observed dominance of the traditional production system in rural areas. It is explained that, local breeds have been promoted because they require very low investment and can withstand the harsh conditions in the field. So the traditional production system was perceived to be appropriate for the poor in rural areas. On the other hand, the commercial system started with the government support in urban areas, and used imported exotic breeds which are argued to have higher genetic potentials. Finally, it is made clear in the chapter that, strategies used to develop the rural poultry industry have been more incremental than radical with the government strongly desiring to improve the genetic make-up of the indigenous local flock through cross breeding with improved cocks. The chapter also highlights some recent initiatives to improve productivity in rural poultry farms through credit, vaccinations, organising producers, training on improved husbandry practices and even introducing supplementary feeding and vaccination against the Newcastle Disease. However, these strategies thrived to maintain the low innovation nature of the traditional production system.

The next chapter will use concepts from the path dependency theory to analyse behaviours in the rural poultry industry and present findings from the field to explain the observed persistence of low innovation tendencies.

Chapter 5 Analysing innovation in rural poultry

5.1 Introduction

This is the first of the four empirical chapters in which I present my study findings. The chapter makes it clear that Path Dependency theory can explain the observed prevalence and persistence of subsistence agricultural production in rural Africa, and specifically in poultry production. As explained earlier in Chapter one (section 1.2), the theory is used to explain why a certain development path or trajectory is chosen and becomes entrenched to the level where it becomes hard for a new path to be opted for, even where the old path is considered less superior.

In this chapter therefore, I explain why innovation is generally low in the traditional (extensive) poultry production system, and why the system is dominating the rural poultry industry in Tanzania despite the high market demand for poultry products and the desire to fight rural poverty. I later use the information to explain in the next chapters what RIU did to unlock the industry and initiate a new technological path.

As described in Chapter 2, the traditional rural poultry industry in Tanzania produces 94% of the total poultry products produced in the country. It also satisfies over 94% and 60% of the current consumption for poultry products in rural and urban areas respectively. However, the current national production of poultry meat and eggs is way below the demand (including potential demand). Which prompts the question, *'why do rural producers not utilize existing improved knowledge and technologies to commercialise and produce more to earn more'*?

In the traditional poultry production system, breeding is slow, mortality rates are high and time to maturity is very long and with very low weight gain even after eighteen months of age (Minga et al., 2001; Msoffe et al., 2010). This happens while technologies to control diseases, for ensuring proper nutrition and for producing quality chicks are available in Tanzania. In fact, these technologies

and practices are habitually adopted in the commercial (intensive or semi-intensive) production systems practiced in urban and peri-urban areas.

FAO categorised the traditional (village or back yard chicken) production in Tanzania as Sector four where there is minimal bio-security and birds and products are consumed locally. Apparently, this kind of categorization implies that in order to upgrade from traditional to commercial production in sectors three or two, rural producers need to make three major changes; i.e. (i) must produce for the market (change scale and therefore stop relying on natural breeding); (ii) feed either intensively or semi-intensively (change feeding strategy i.e. introduce supplementary feeding); and (iii) increase biosecurity (change diseases management and control strategy i.e. introduce spending on vaccines and disease management). Therefore, **'breeding'**, **'feeding'**, **'disease control/management'** and **'marketing'** are the strategic areas where technology and innovation define the difference between traditional and commercial poultry production systems.

Building on the discussion above, the traditional poultry production system (extensive system) and the commercial poultry production (which could either be semi-intensive or intensive) can be regarded as two strategies within which there are embedded competing technologies and innovations (i.e. around breeding, feeding, diseases control/management, and marketing) to which sources and features of path dependence are inherent. Therefore, in this chapter I have analysed the two production systems as competing technological paths in an attempt to understand why the commercial production system which is known to generate more income is not adopted in rural areas. Apparently, the same rural producers have commercialised other agricultural enterprises. For example, most rural poultry producers also grow other crops like cotton, tea, coffee, pyrethrum, and sunflower etc. which they specifically produce for the market.

In order to analyse the mechanisms behind the persistence of the inferior extensive poultry production system in rural Tanzania, I have used three

particular concepts emerging from the path dependency literature[24] namely; (i) general concept of *'lock-in'* developed by Arthur (1989) which refers to situations or **sequential patterns of activity and behaviour** to form a fixed trajectory which becomes costly and difficult for actors to break free from (Salamonsen, 2014: p.5); (ii) *organisational thinness* which refers **to scarcity of relevant actors** with the ability to facilitate innovation; and (iii) *fragmentation* which refers to situations where **relevant actors exist but do not interact** (Kaufmann & Wagner, 2005) due to either lack of trust (Iskasen, 2001) or they simply do not know each other (Ibid). Fragmentation can be mitigated by improving relational behaviours to facilitate actors engagement e.g. through meetings or any other exchanges to shape collective programmes (Salamonsen, 2014). A detailed discussion of how I use the concepts in the analysis is presented in Chapter two (section 2.5.1).

The chapter is organised in six sections. Section two will highlight the principles of path dependence by briefly introducing the concepts of lock-in, organisational thinness and fragmentation used by the study to explain why innovation is generally low in the rural poultry industry in Tanzania. Then the third section uses data from the field to explain how the industry is experiencing the three types of lock-ins i.e. the cognitive, structural and political, followed by section four which describes the level and causes of organisational thinness and fragmentation in the industry. Lastly, section five presents summarises and conclusions.

5.2 Principles of path dependence: A literature review

5.2.1 'Lock-in'

In my analysis the concept of 'lock-in' is used to explain why the traditional extensive system is dominating the poultry production in Tanzania, and why rural producers are not switching to produce commercially under intensive or semi-intensive production systems. Analysing technological competition and lock-in is well developed both at theoretical and empirical levels. However, it is

[24] The three concepts were also adopted by Krister Salamonsen (2014) to analyse the effects of exogenous shock on the development of a regional innovation network in nothern Norway.

often used to explain adoption in sectors of high technology but hardly applied in the field of agricultural development (Cowan & Gunby, 1996). Specifically, it has not been explored in poultry research.

In agricultural research, path dependence and lock-in have been used to study adoption of pest control strategies (Cowan & Gunby, 1996; Ugaglia, Homme, & Filippi, 2011; Wolff & Recke, 2000) where chemical crop protection (CCP) and the integrated pest management (IPM) were treated as competing technologies. In their analysis, Wolf and Rekke (2002) used the theoretical framework of path dependence to examine how the CCP and IPM technologies developed and why one persists over the other. When studying pesticide control in tomato production in Ghana, the authors established that path dependence theory could predict that a shift from the inferior technology to the superior was actually impeded by the inferior technology itself. They also concluded that through examining feedback mechanisms, the theory leads to a satisfactory explanation of how systems develop. Essentially, Wolf and Rekke applied the theory beyond the present moment and examined implementation strategies which could break down the cycle of the self-reinforcing mechanisms towards the inferior technology (p.167-168). This means they used the theory to understand the present as well as to predict a future shift.

On another study, Ugaglia, Del'homme and Fillipi (2011), used the same framework and the dynamic approach to analyse pesticide lock-in in vineyards in France. These authors analysed the technological change needed to escape lock-in and to reduce pesticide use by considering innovation process both at farm and upstream levels (Ugaglia et al., 2011). Therefore, unlike in the Cowan and Gunby case, they considered grape growers as being locked-in the use of pesticide (i.e. pesticide lock-in) rather than on the use of a specific pest control technology or strategy (thus no competing pest control technologies were involved). However, the analysis in both case studies focused on understanding the main reasons and mechanisms that led to the lock-in (specifically what inhibits diffusion and learning), and later in determining how to escape the lock-in. This study employs a similar focus in order to explain why rural producers

are not switching to relatively more productive poultry production systems and whether a deliberate unlocking is possible.

Central to the idea of lock-in is that technology and technological systems follow specific paths that are difficult and costly to escape (Perkins, 2003; p.1). Thus lock-in hinders growth because actors become unable to change and adapt (Schienstock, 2004). Consequently, and if not intervened, such systems or technologies tend to persist for extended periods even when the need to shift arises, and a superior alternative exists (Perkins, 2003). Literature provides two overlapping explanations for the existence of lock-in, those are related to *'technological paradigms'* and to the *'presence of increasing returns'* (Arthur, 1989; Cowan & Gunby, 1996; David, 2000; Perkins, 2003; Salamonsen, 2014; Ugaglia et al., 2011; Wolff & Recke, 2000).

Technological paradigms

According to Perkins (2003), the nature of and direction of technological advances is strongly shaped by the *'cognitive framework'* of actors referred to by Nelson and Winter (1977: cited in Nelson & Winter, 1982) as technological regime, and as technological paradigms by Dosi (1982: cited in Dosi, 1993; Van den Belt & Rip, 1987) with both citing the existence of certain rules, heuristics or principles that define the boundaries of thought and actions of relevant actors (Perkins, 2003). Apparently these shared mental frames tend to direct technology performance towards the direction shaped by past achievements, ideas and knowledge. Hence there is a tendency to exclude possibilities and solutions that lie outside the dominant paradigm. This leads to incremental rather than radical technological change (*Ibid).*

Therefore, explanations for the lock-in under the technological paradigm concept are mostly derived from *'actors' behaviour'* or the society, and not from the technologies in question. Thus, in my study I will analyse the behaviour, attitudes, perceptions and beliefs of producers and other actors to establish the shared mental frames which are reinforcing the adoption of the traditional poultry production over the commercial one.

Existence of increasing returns to adoption

On increasing returns to adoption, and apparently with minimum reference to agricultural industries, literature explains that these are positive feedback mechanisms that make adopting a particular technology more attractive as more people adopt it (Allison & Hobbs, 2004; Arthur, 1989; David, 1994; Grabher, 1993; Perkins, 2003). This means, in case of competing technologies, the one that has a secured lead persists. According to Perkins (2003) this situation arises because early adoption can generate a snowballing effect whereby the preferred technology benefits from greater improvements than its competitors (p.2). Literature also shows that, this process can lock a society into an inferior design and cause a market failure (Arthur, 1989; Cowan & Gunby, 1996; David, 2000; Perkins, 2003). Such a situation is argued to result from uncertainty and ignorance about qualities and properties of various options. Thus a technology that would have been superior if given equivalent learning gets locked out (Perkins, 2003). Examples of such situations includes the QWERTY keyboard over Dvorak Simplified Keyboard (David, 1985), light water nuclear reactors over heavy water ones (Cowan, 1990), and the VHS video cassette recorder standard over Betamax (Arthur, 1990) (all examples are cited in Perkins, 2003; p.2).

Literature presents four classes of increasing returns argued to cause a lock-in. Those are; (i) *scale economies* which is the reduction in unit cost of a product or service as output rises; (ii) *learning economies*, where the cost and performance improvements are reduced as individuals and organisations learn from experience and repetition how to use the technology more effectively and efficiently; (iii) *adaptive expectations*, whereby increased adoption reduces uncertainty about the performance, reliability and durability of technology commonly used; and (iv) *network externalities* which are external benefits gained by users as more users use the same technology. Basically, network externalities result from technological interdependencies where increase in network size attracts more potential users, which leads to positive feedback effect (*Ibid)*.

Therefore, analysing increasing returns to adoption means looking at features embedded in the competing technologies which tend to attract or block adoption. This means analysing features of the traditional and commercial poultry production systems, then establish what is attracting rural producers more to the traditional over the commercial system.

Types of lock-ins

Three types of lock-in, i.e. structural lock-in, political lock-in, and cognitive lock-in are explained by Grabher (1993) and explored in this study as follows:

'Structural lock-in' exists when most resources are bound to a specific technology and existing organisational and institutional settings are tied to this technology, leaving no room for diversification and the development of new technological paths. Rural household allocate resources to other livelihood activities but not in poultry. Likewise, public organisations and donor funded projects invest in promoting traditional poultry keeping, while private sector operations like those of banks, input suppliers, insurance, etc., are designed to work only with urbanised commercial producers. This means these resources do not support rural producers to switch from the traditional production system.

'Political lock-in' exists when dominating power structures have a vested interest in the dominant techno-organisational path and resist changes. In this case, the government bias towards promoting commercial poultry production through vertical integration, and mostly in urban and peri-urban is analysed and explained. I will also explore the influence of research in creating a policy lock-in as they promote non-use of commercial inputs in village chicken production arguing that it is 'inappropriate' and 'unsustainable'. This acts like an external force that ensures the traditional system is safeguarded in rural areas.

Lastly is *'cognitive lock-in'*, which exists if economic actors, because of earlier success, continue to adhere to the existing development path, even if it can no longer ensure global competitiveness and economic growth. Literature explains that an industry is bound to exhibit path dependence if information stickiness occurs. This happens particularly when information sharing and knowledge

development is frequent among actors through localised linkages (Hassink and Shin, 2005; cited in Salamonsen, 2014). In addition, the same can happen if actors are bounded by common beliefs, norms and values, and then suffer from a lack of external orientation (*Ibid*). Strong ties among actors and many years of specialization and investment towards predictable market structures also lead to collective rigidity and inflexibility (Grabher, 1993). Thus to change the situation such industries have to face externally driven alterations, like exogenous shocks which are events with the potential to significantly influence the destiny of the industry (Newey & Zahra, 2009: p.83). I discuss such shocks in Chapter seven.

As earlier described in Chapter two (Section 2.5.1), I consider the dominance of the traditional poultry production system in rural Tanzania to be a 'lock-in' and which is the explanation for the observed generally low innovation in the industry. So, I analyse actors' behaviours (mental frames) and presence of increasing returns in order to establish mechanisms for the lock-in. I then explain how information about the mechanisms helps to predict and promote a shift out of the lock-in. Essentially, the chapter describes how the rural poultry industry in Tanzania is locked-in; identifies the mechanisms for the lock-in; and uses the information to establish areas targeted by RIU towards the unlocking.

5.2.2 'Organisational thinness' and 'fragmentation'

The analysis in this chapter is specifically built on, and adapts the argument that 'smaller peripheral regions often suffer from the absence of relevant actors with resources and capabilities to stimulate growth patterns' (Salamonsen, 2014). The question answered in this chapter is *'why relevant actors especially from the poultry supply chains with such capability for growth are missing in the rural poultry industry in Tanzania'*?

According to Isaksen (2001; cited in Salamonsen, 2014), organisational thinness stems from deficiencies such as lack of decision-making powers, financial resources, or from policy orientation. And that, creating such missing resources is achieved by stimulating actors to establish extra-linkages in the region.

I argue that organisational thinness in rural poultry industry in Tanzania stems from having a **'large number of rural producers'** who are **'self-sufficient'** in terms of inputs sourcing and product consumption. Being self-sufficient makes rural enterprises less attractive to external actors because the two do not complement each other. When the majority of producers in a particular area are not using external inputs or services like vaccines, feeds, and drugs etc., then it is unprofitable for other organisations to do business or provide such services in that area. Therefore, even when a few producers decide to switch and use external inputs, it becomes too costly for them to access such inputs. Hence the rational option becomes not to switch. Different factors reinforce input self-sufficiency tendencies among rural producers, which in fact discourage (block) them from introducing resources from outside. These can be classified as economic, social and political factors.

Additionally and linked to the above point, literature reports the role of high transaction costs in hindering interactions and therefore causing organisational thinness in subsistence-based industries (Pingali et al., 2005; Vakis et al., 2003; Zant, 2012). This implies that, in the absence of mechanisms to cushion or lower transaction costs, organisational thinness occurs. Poor producers who are disorganised, and who are not supported to lower individual transaction costs, specifically by taking advantage of their aggregate volumes (of demand and supply) are not attractive for business partnerships with other actors. This is to argue that organisational thinness in rural areas is also caused by lack of scale which causes high transaction costs. Overall, low business volumes (i.e. of demand for inputs and services, and of final outputs) makes other actors less interested in investing to trade (interact) with rural poultry producers.

5.2.3 Fragmentation

Fragmentation occurs where relevant actors exist but do not interact (Kaufmann & Wagner, 2005) due to either lack of trust (Iskasen, 2001) or they simply do not know each other (Ibid). Such fragmentation is related to actors' relational behaviours. Therefore in this study, These issues are related to; geographical distances (i.e. rural vs. urban); knowledge about existence of services or goods

provided by other actors; and knowledge of need, use and value of such goods/services. There is a *'lack of affinity'* between or among actors' when producers do not utilise inputs or services provided by other enterprises (actors). And the need for them to interact diminishes. For example, if a producer relies on natural breeding (hence does not buy chicks), the need to interact with hatchery owners is basically non-existent. And this fragmentation persists until the breeding strategy changes.

The next sections present findings to explain why innovation is low in the rural poultry industry in Tanzania. They describe how the industry is experiencing a lock-in, which makes it difficult (costly) for actors to change and adapt more profitable production systems. It also describes the organisational thinness and fragmentation which currently inhibit diffusion and learning in the industry.

5.3 Explaining the rural poultry industry's lock-in

The section uses primary data from field interviews and secondary data from RIU and government reports to explain path dependency in the rural poultry industry in Tanzania. It explains why the observed persistence of the traditional poultry production system is a lock-in, and the mechanisms behind it. This analysis is a necessary step towards understanding how the RIU unlocking process proceeded towards a new development path.

In the analysis I consider innovation processes both '*at farm'* and at *'upstream'* levels in the industry (Possas, Salles-Filho, & Da Silveira, 1996). This includes analysing producers' behaviours, routines, beliefs, etc. as well as those of other actors in the industry including input suppliers, extension service providers, regulators and marketers. As I explained in the previous section, my analysis focuses on factors related to **'technological paradigms'** (i.e. existing cognitive framework or shared mental frames shaping the observed technological performance of the industry) and to the presence of **'increasing returns to adoption'** (i.e. feedback mechanisms that make adopting the extensive traditional poultry production system more attractive).

However, the reasons for the lock-in are interrelated, and it is impractical to separate explanations related to shared mental frames from those related to increasing returns (and even in-between the different types of increasing returns). Therefore, I will present my findings based on different types of lock-in described in section 5.2 above.

5.3.1 Cognitive lock-in: Analysing production behaviours

Keeping chicken in rural Tanzania is guided by deep rooted social norms and tendencies established for generations. How rural producers relate with their poultry enterprises, the purpose of keeping the chickens, their expectations and their management routines, are all socially determined and reinforced. This situation disfavours commercially oriented production. In addition, these tendencies are hard to change especially at an individual level.

Keeping local breeds is a social choice

During interviews producers proved to be conversant with raising local chickens extensively but not keeping other breeds or using other systems. For example one producer said:

> ["I also heard that these local chickens cannot be kept for business but there are other types which grow faster and lay more eggs. But they are *'foreign (European)'* and are very delicate that you have to care for them like babies. [Interview with Producer, June, 2013]".

And another lady said:

> "I don't keep *'foreign (European)'* chickens because I know nothing about them (Laughs). I don't even know if I can raise them properly. I don't have the money needed. I hear they are very delicate. Those are for town people." [Interview with Producer, June, 2013]."

Those two quotes reveal assumptions about exotic breeds and commercial production systems. My observation is that the context does not provide rural producers with realistic choices for accessing and affording other breeds besides what they have now. This is partly due to societal perceptions (including those of politicians, researchers and development actors which I will elaborate later) around cost, and levels of organisational and technical requirements associated

with optional breeds. Consequently, a strong tie has been created between living in rural areas and keeping local breeds of chicken with the argument that keeping local breeds requires very low investment hence appropriate for the poor.

Uncertainty and ignorance about qualities and properties of improved breeds and commercial production systems make it more convenient for rural producers to keep local breeds under extensive system than otherwise. This supports Perkins' argument that uncertainty and ignorance about qualities and properties of various options locks a society into an inferior design, and a technology that would have been superior if given equivalent learning gets locked out (Perkins, 2003; p.2). The question is therefore, why are rural producers not equally exposed to other options for them to choose from?

Producers mentioned during interviews that they started keeping chickens as a tradition. They felt compelled to keep chickens as part of what responsible families do. So they could feed their families, feed visitors and use the little income from it to fulfil other social obligations. To them, the decision to keep chickens was more socially than economically driven. See Table 5-0 below.

Table 5-0: Selected quotes from interviews regarding the purpose of keeping chicken

The purpose for keeping chicken is social:
Mainly for feeding visitors "They were mainly for feeding visitors. Visitors would eat the whole chicken, or take home to eat. Sometimes we would give it live for the visitor to take it home. When my father was happy he would slaughter one and we would eat, mostly during Christmas or Easter, or during other celebrations. We ate eggs as they were laid. We never sold eggs." (Female producer).
For food and emergence cash "Keeping chickens for sale is not my main goal. The main purpose is to have them for food and for quick cash to solve emergencies like illnesses, school fees, travels in case we are bereaved, or give gifts, etc. So I keep them not as a main source of cash. (Male producer).
As a source of quick cash "For me keeping chickens is mainly for quick cash, like when my wife was sick I sold 3 cocks. It is also for feeding special visitors like in-laws. People you really want to impress. Also when a sick child needs a special diet-like soup, give a gift, or during celebrations like baptism, or pay government fines, etc." (Male producer). "…when you need quick cash it is easier to sell a chicken than a goat." (Male producer).
For home consumption I keep chickens only for food. Having chickens helps when I have nothing else to cook, and for visitors." (Female producer).

Source: Study data, 2013

Additionally, a lady producer in Songea said during the interview:

> ["I found chickens at home when I was born. They were there and we grew up keeping them. And when I got married I just continued" (Interview with Producer, August 2013)].

Therefore, to this lady, the decision to keep chickens was more for social conformity than for economic gains. She made the decision believing she had the ability to raise the chickens in the same way her parents did. So she felt confident and competent enough to manage and meet the expectations she set for the activity in manners that she knew from her growing up. Arguably, her expectations happened to be properly linked to the level of skills and resources disposable to her. So, it is possible to argue that keeping chickens in rural areas is perceived to be technologically simple, affordable and manageable because it is socially designed and therefore expected of most members in the society. Meaning that, what is socially expected from most members of the society (like feeding visitors with chicken), is more likely to be technologically simple so it could be afforded by many if not all. This makes adopting the traditional way of keeping chickens easier and more natural to most rural dwellers than adopting an alternative production system.

All interviewed producers reported that they started with not more than two chickens which they got from relatives, friends or neighbours. They received these first chickens as gifts or loans to be paid later after hatching. So they all started with what was available within their close social networks. These producers could not buy the first chicken(s) from the market for several reasons. But the most important one was unavailability of good hens. One interviewee said:

> ["I could not buy chickens to start keeping them because it is very expensive to buy a good hen. Those you find in the market are old and which don't lay enough eggs anymore. People don't sell good hens. We also don't sell chicks. We mostly sell or slaughter cocks and old hens. Very few people give out hens, even as gifts" (Interview with Producer, June 2013)].

This means the best available source of the first chickens is from close relatives and friends. And from this source the number of birds to be obtained is not

determined by the recipient. The source of foundation stock is therefore social and it supports producers to keep few birds and to rely on natural breeding.

The above situation makes the choice of breed (which could also be considered a technology) more community-determined than individually. Which means making individual choices is much harder in rural areas and any proposals to change routines and processes have to involve more than an individual. This implies that, changing a technological path involves changing the society and not individuals.

Each rural family is expected to produce most of its own food to feed the family throughout the year, hence the general tendency to have staple crops grown by every family in villages. In addition, rural families are expected to feed their guests well with special diets and slaughtering is considered an honour. Giving gifts to in-laws, visitors, new born babies, and during ceremonies, etc. is also paramount. Therefore, households are forced to keep chickens to meet such obligations, and it is naturally easier for them to adopt the extensive production system which is relatively affordable.

Unlike producing crops like maize, rice, etc., poultry production has no seasons, hence producers are not expected to have planted by a certain time, e.g. before the first rains, or cultivate before the rains start etc. Consequently, there is no motivation to seek information on when to control breeding etc. In this case chickens are left to their own cycles. As one producer said:

> ["We always know the chicken will grow up one day. We just watch the size. We don't even know how old they are. We are just watchful of their size and weight" (Interview with Producer, August 2013)].

So there is no seasonality or time pressure to look for an early maturing breed, etc. This means, practices embedded in the traditional system are also responsible for promoting low innovation tendencies.

Some producers mentioned to be keen on the physical size especially of cocks. They select big cocks and keep them for breeding purposes. Others are keen on colour because some traditional healers specifically ask for certain colours.

Traditional healers sometimes prescribe the type of chicken they want. These could be in terms of sex (i.e. either a cock or a hen), age (e.g. a hen which laid only once), or in terms of colour preferably white, red and black. The colour preference is argued to have made producers focus on cocks believing that a black cock will always give a black chick etc. The preference for colour reinforces the interest to keep local breeds where colour variation is possible.

Keeping chicken is communal rather than individual

While individual producers own the chickens, and take the responsibility to shelter and make decisions to dispose them, it is evident that the main goal for keeping them is more communally determined than individually. See Table 5-1 below.

As mentioned earlier, households are socially expected to feed certain visitors with chickens and give gifts as a gesture of solidarity and respect. The shame of not being able to meet those social obligations like slaughtering at least a chicken for visitors especially in-laws is considered too gross to bear. So every family tries to meet them. Like one lady said during the interview:

> ["You will be labelled selfish, disrespectful and unkind. People would talk negatively about you" (Interview with producer, June 2013)].

Apparently, no interviewee mentioned eating chicken regularly in their families. Producer families would eat chicken when they have absolutely nothing else to cook, when a chicken looks sick, during religious holidays like Christmas, Easter, Eid etc., or when the head of the family occasionally decides to do so. This is also confirmed by the small number of chickens usually kept, and the finding that rural families would rarely buy a chicken just for the family to eat. Therefore buying chickens is mainly for feeding visitors and for special occasions.

Some producers consider chickens as assets that one can easily liquidate to respond to emergencies. This is because it is easier to sell a chicken than a goat or cattle in rural areas. However, some interviewees said they find it better to sell grains like maize than chicken because chickens take longer to mature than

maize. Therefore, the role of chickens as a source of quick cash is variable and it is not necessarily the main purpose of keeping chickens in rural Tanzania. As one interviewee said:

> ["I only sell my chickens when I have a pressing problem and I have nothing else to sell. You know, I always have very few, and it will take a year to get another mature chicken. So you don't just sell them. At least with maize, selling a bit still leaves you with a lot to eat and sell" (Interview with producer, July 2013)].

Table 5-1: Rural poultry keeping is a tradition not business: Selected quotes from interviews

Keeping chicken is part of life
"I have been keeping chickens all my life, since when I was a child. Here you grow up seeing chickens every day and in every home. You go to your grandmother you find some, you go to your uncles, you find them, and even when you go to your neighbours or to village leaders' houses. Etc. Chickens were in every home when I was growing up, and are still are. I don't think there was family not keeping chickens. If anyone from here tells you he started keeping chickens only as a grown up, he would be lying." (Male producer)
"I always have one or 2 chickens in my house. They are just there. It's one of those things that you can't miss in most houses here, like a knife or lamp. Even my parents kept chickens. Everybody keeps chickens here. If you don't find one, then probably they all died or sold but soon they will be replaced." (Male producer).
"My parents kept chickens as a tradition. Keeping one or two chickens was a tradition just like growing pumpkins and other vegetables for family food. During colonial times chickens were used to pay taxes, or give gifts. They were also used in traditional healing." (Male producer).
"I found chickens at home when I was born. They were there and we grew up keeping them, and when I got married I just continued." (Female producer).

Source: Study data, 2013

Interviewed producers in Songea district said that selling chickens is a recent phenomenon in their areas because traditionally they were only distributed as gifts. Therefore, they see chickens as a commodity less integrated in their cash economy. After all, sales are irregular because households do not know when (which season) chickens will be sold, and buyers are sporadic and not necessarily known. One producer said:

> ["When you want to buy a chicken you have to ask around for someone to sell one to you. You even have to persuade if you know there is a mature chicken in the house. Alternatively, you have to go to the market and find out if anybody has brought one for sale. Likewise, when you want to sell a

> chicken you have to go around looking for buyers. You carry a cock to the market not knowing if it will be bought. So selling chickens is not regular because there are no seasons and nobody plans ahead. Traders from all over the country know when maize is harvested and they come to buy during that time. But with chickens they just come once in a while, trying one house to the other. So you see, buyers are not sure and farmers are not sure. Sometimes we just decide in the morning to sell a particular chicken, or after a buyer comes looking for one to buy. It is not like maize or beans where we all know the seasons" (Interview with Producer, August 2013)].

This narration explains that selling chickens in the study areas is irregular and decisions to sell are made either when there is a persuading buyer or a seller moving around. In most cases, both the persuading buyer and the persuading seller are motivated by pressing social needs. In some cases chickens are given out as in-kind payments. For example, in Mtwango, Gumbiro and Madaba wards in Songea District, chickens are still exchanged with goods and services. In these areas, traders would carry merchandise like plastic kitchenware and sell door to door in exchange for crops like maize or chickens. Some producers mentioned offering chickens to traditional healers to get a remedy. Therefore, the market for mature chickens in the study area is more socially developed, and specifically designed to absorb low and irregular volumes.

> ["I only sell to passers-by. There are people who move around asking for chickens to buy. I also go to food vendors who would always buy chickens to cook. Getting someone to buy your chicken is not difficult at all. Especially if they know you have a problem to solve, like illness. A friend may refuse to lend you money but he would buy your chicken if you have one (Laugh!).You are better off with a chicken than without." (Interview with Producer, June 2013)].

The market structure is thus closed with interactions limited to those who can move around in the areas persuading buyers and producers. These interactions are also motivated by 'pressing needs' and not by structured economic expectations. Pricing mechanisms are also socially determined, hence less motivating to profit oriented production where costs of production have to be fully recovered with a margin. One producer said;

> "Selling price is known by everybody. We all know when a chicken is due for sell and weight variations are small. Even if

> you have a very big cock, which everybody can see it is big- its price is also known… But if it is small and you still want to sell it because you have problems, and the person buying it knows s/he has to keep it for a while before s/he can sell or slaughter it, then you two start bargaining. But even at that, the price range is known. Traders from town have set this price range and we are using it" (Interview with Producer, August 2013)].

This means efforts to increase marketed volumes at producer level also require changing existing market structures. This is because existing market structure reinforces sporadic production where the cost of keeping chicken does not increase with time. Meaning, delaying selling does not add cost to the producer (e.g. as cost of feeding or labour).

Therefore, from the fact that every family is expected by the society to keep chickens, the society has put in place affordable mechanisms for accessing the first chicken and for transferring husbandry skills. Consequently, selling chickens is not a priority, and thus not commercially driven. By being socially driven, keeping chickens is simplified and generalised to ensure everybody affords to keep chickens. As a result even some resources are communally shared. For example, feeding by scavenging allows chickens to feed anywhere in the neighbourhood, and natural breeding allows sharing of cocks. As one interviewee said:

> ["You don't have to own a cock. When hens move around they meet cocks. You may not even know the owner. But you are sure the hen will meet a cock somewhere (Laugh)" (Interview with Producer, July 2013)].

In addition to communal feeding and breeding, the community also ensures perpetuation of the activity through generations. This is achieved by ensuring that brides and grooms get at least a hen to start their own flock when married. This sense of communal responsibility also ensures that basic husbandry skills are transferred across generations.

The traditional poultry system fits well with existing social frameworks that shape expectations and choices around chicken keeping in Tanzanian rural societies. Such frameworks demand affordability, simplicity and easy

transferability of knowledge (skills), possibly explaining why investment has remained low in this system. The implication is that introducing economic goals into the system, even at an individual level confronts the described social system. Specifically, it changes the expectations and purpose for keeping chicken, as well as shifting some management roles like feeding and breeding to individual producers. Such shifts require reorganisation of the society as a whole, as well as increasing individual capacity to take over new responsibilities that come with the change. In principal, it is currently difficult for an individual to shift into a different production system.

The decision making process vs. self-sufficiency

During interviews it was evident that producers are continuously making decisions like in any other livelihood activity. However, the study found that, since keeping chickens is more social (a tradition) and therefore considered obligatory, the capacity to manage the activity is assumed to be present in every household. As said before, chickens are kept first for social purposes and second for business when necessary. Thus it is not produced for the market as doing so means changing breeding and feeding strategies. Particularly, findings show that rural producers do not think of the market when starting the activity. They also do not consider the activity when making decisions regarding household resource allocation. Therefore, poultry is not a priority during household resource allocation, especially when allocating land, labour and capital.

All interviewees mentioned that the first decision made regarding poultry, was to keep chickens. To some this decision was made by parents and relatives who gave them hens as a wedding gift, and all they had to do was to keep them. Reasons for keeping chickens are obvious, therefore for those who did not receive hens as wedding gifts the next decision to make was on where to get the first chicken(s). This includes knowing how to get it and how many to start with. All interviewees knew they would raise the chickens traditionally just as their parents did. Therefore, in this case the context of keeping chickens including the purpose, the source of the first chickens and the method of keeping them are all

socially determined, and thus accessible by and affordable to all. This implies that basic thoughts and ideas around poultry keeping are commonly shared.

Learning from individual narratives, rural producers perceive themselves as making the decision to keep chickens for social purposes. However, they also admit to feeling obliged to do so. Apparently, the socially-oriented way of making decisions makes rural producers relate with chickens in ways that only fit with the social nature of their expectations. For example, most producers do not have to allocate specific resources for the activity. They would let it share the family house at night e.g. in a store or kitchen, then let it fend for itself during the day. In this case, chickens are expected to gain weight, produce eggs and hatch chicks at their own pace. This means producers do not fix targets regarding time to maturity, weight gain or number of eggs and number of chicks to be produced. Therefore, in this relationship producers assume no powers to control or influence how the chicken feeds and produces.

Individual producers decide when to sell, slaughter or give away as gifts for many social reasons. In addition, the environment may interfere with the life of the chicken by not providing enough feed where the chicken is scavenging or by interfering with chickens' health through diseases, predation or accidents. Therefore, the relationship between man and chicken is influenced by what is social (society, economic and political etc.) and that which is ecological (environment). Apparently, these are the two main areas where men can innovate to increase efficiency in order to meet human expectations.

For example, a producer may decide to build a shed to protect it from predators, or vaccinate it against diseases like Newcastle. He may also decide to supplement its feeding if scavenging seems insufficient. Thus the environment may trigger producers to innovate to counter negative effects. In addition, producers may also decide not to give out chickens as gifts, or not to feed them to visitors, so as to have more for sale. In this case the decision is meant to counter the effects of 'the social' on the flock size. The producer may also decide not to eat chickens or sell eggs and allow them to hatch instead. He may as well decide to keep (or not to keep) a rooster, and choose the type/breed, etc.

What is common in all these decisions is the human interest to regulate stocks i.e., to manage outflows and inflows which form a very important part of human expectations. According to Donella Meadows, analysing how humans regulate stocks is very important in systems analysis (Meadows, 2008). From the analysis, study data makes it clear that, innovation in traditional poultry system is low because producers are not keen to *'regulate stock flows'* through choosing the size of the starting flock, managing feeding, breeding, sales and through reducing mortalities and other losses.

Basically, it is the producer's decision to regulate stocks that determines how he interacts in the system. It defines how he should interact, and with whom. The decision to interact creates needs for knowledge, skills, market, and technology like vaccines, feeds, drugs, etc. In addition, the decision to interact, which comes after a need has been perceived, is made after the producer has acknowledged a gap, or a sense of being *'self-insufficient'* in meeting a particular need. For example, one interviewee explained that if he happens to know a plant which can cure certain poultry diseases, he would not seek a veterinarian or a drug seller. Rather he would use the plant to solve the problem. But if he does not think he knows the solution he would search for it elsewhere. To most rural poultry producers the process of seeking solutions involves an inward search before searching outward (see Figure 5-0 below). So they mostly rely on knowledge already gained and entrenched within families.

Figure 5-0: Rural producers' outward and inward solution seeking process

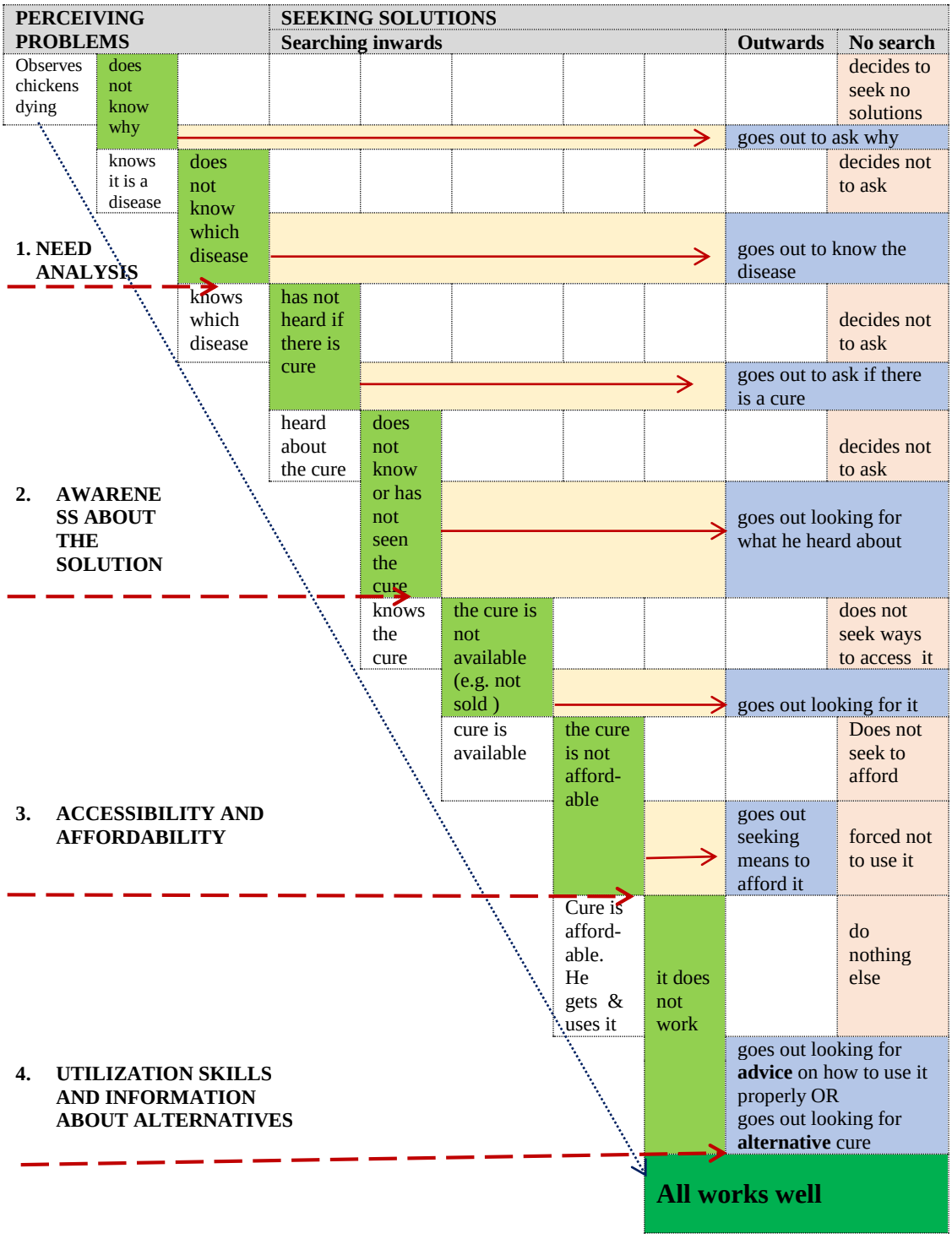
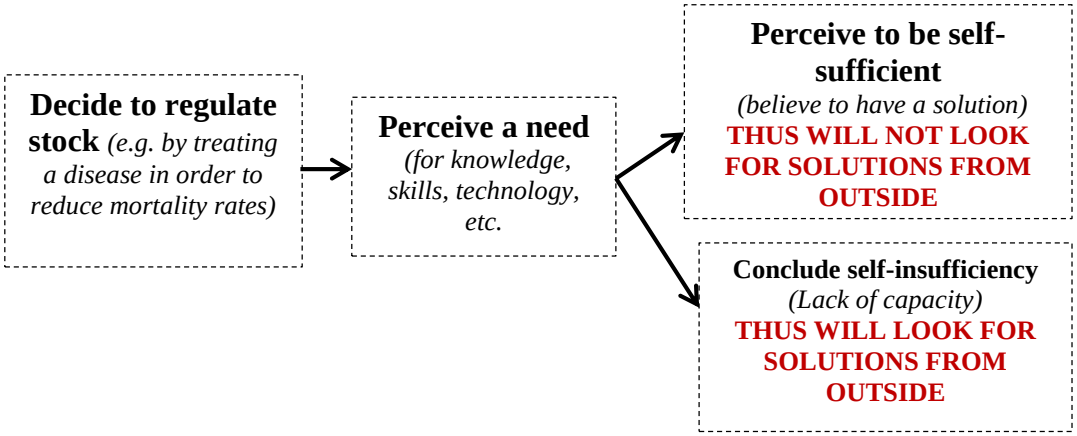


Figure 5-1: Outward vs. inward solution seeking process



The above process shows the search for solutions stays inward unless '*self-insufficiency'* (or lack of capacity) is perceived by the producer. During interviews, some producers indicated that no searching is done when solutions are offered freely as gifts or as part of a programme. Because in this case they just apply as advised or told. However, if the offer arrives before a need is perceived by producers themselves, the likelihood is not to use it at all, or just use to it temporarily to fulfil an external mission (like of a donor project), or get shelved for future use.

It is important to note that, up until they look outward, individual producers are not conscious of innovation or technology. Rather, they are only aware of the problem, his/her self-insufficiency and the possibility of a solution out there. Therefore, it is the desire to look for solutions, and the actual search that initiates the conscious process towards innovation. Thus it is the desire to look for solutions for regulating stock (avoid deaths), e.g. to treat a specific disease that leads to innovation. That it is through this journey the producer opens up the possibility to encounter knowledge, skills, information, technology or innovation. In addition, after a certain piece of knowledge is absorbed, a new process of decision-making is triggered and which may lead to another learning encounter. If producers stay in situations where they do not perceive problems,

or if they do but choose not to look for solutions (either inward or outward), then learning hardly takes place.

Therefore, it is the desire to regulate stock (i.e. want to increase the number of chicks, number of cocks, number of hens, buy, sell, give as gifts, reduce deaths, accidents etc.) that triggers and justifies learning. Hence, since rural producers are currently not regulating stocks, they don't perceive problems that trigger outward search for solutions. Hence innovation is generally low. In fact, what is of interest here is how this tendency is shared by most rural producers.

Another finding linked to the above, is the observation that producers and other actors perceive local breeds of chicken as breeds that survive and produce in harsh conditions hence they don't need inputs and other cash investment. They also believe that the nature of these breeds makes keeping them very simple and no significant knowledge or skills are needed. Consequently, the thinking has created habits that simplify poultry production and therefore make it attractive to most households as it frees resources to be used in other activities. Moreover, the belief influences behaviours of all other actors in the industry towards producers who keep these breeds. For example, from the understanding that the breed can withstand harsh conditions and has high resistance to diseases, etc., development actors concluded that it can survive and produce even with very minimal external support, making it 'suitable' and 'appropriate' for the resource poor and the marginalised. One producer said:

> ["Everybody is keeping chickens like this, except for those keeping *European* chickens in town. I hear they build houses and feed them all the time-the chickens don't walk, they just wait for food. I also heard they grow very fast, lay many eggs, eat a lot, fall sick easily… so you need a lot of money to feed and treat them. I hear they give a lot of money but you need large capital to keep them… (Laughs)…those are kept by rich people....not us poor people in villages" (Interview with Producer, August 2013)].

This means rural producers are aware of different management routines, but not meant for the local breeds. They also understand that keeping exotic breeds need capital investment but not when keeping the local ones. The above quote also reveals producers' understanding that local breeds are for the poor people, and

that all poor people keep chicken in the same way. In addition, another producer mentioned that local breeds are not for business. He said:

> ["I also heard that these local chickens cannot be kept for business but there are other types which grow faster and lay more eggs, but they are 'European' and are very delicate that you have to keep them like babies." (Interview with Producer, July 2013)].

This describes a perception that keeping chickens for business means adopting other breeds which are difficult to manage and are too demanding in terms of resources. Consequently, and as confirmed by the interview statement below, the perception discourages the shift to commercial production. It is also perceived to be suitable only to rich-urban producers. The producer said:

> ["I don't keep '*European'* chickens because I know nothing about them (Laughs). I don't even know if I can raise them properly. I don't have the money needed. I hear they are very delicate. Those are for town people." (Interview with producer, June 2013)]

However, it does not mean these producers are not used to producing improved varieties. Findings show that same producers have adopted improved varieties and techniques to produce other crops like maize, sunflower, rice, and even keeping improved dairy cows. As one producer mentioned, she interacts more with the extension worker regarding crop production but not on poultry because she grows improved varieties. She said:

> ["I only call the extension worker to help me on crops, especially maize because of the improved seeds that I use" (Interview with Producer, June 2013)].

Explanations to why rural producers are not keeping other breeds of chickens are beyond individual willingness or abilities to adopt improved technologies. The explanations can also not be generalised to include all agricultural activities managed in those villages because same producers have adopted improved crop varieties. It is the existing perceptions (mental frameworks) related to the nature of the breed, the social role of chicken, low priority in resource allocation and the thinking that rural people should keep local breeds for social gains and not

for business. These perceptions reinforce the traditional system and thus making commercialisation difficult.

5.3.2 Structural lock-in: Analysing resource allocation

Clearly, poultry keeping is not a priority activity in rural Tanzania. It is treated as a women's activity and therefore less economically important. During interviews, producers identified themselves as *'wakulima'* meaning farmers in English. Literature uses the term 'farmer' to mean both crop producers and livestock keepers. However, study interviewees specifically identified themselves as 'crop farmers' and not livestock keepers or producers. This means their main occupation is to produce crops and not livestock. Then all other activities are considered secondary and only meant to supplement and fill in food and income gaps. As one producer said:

> ["I am a farmer. I have three acres of maize and one for rice. Those are the main crops I grow. I also keep goats as a side activity, and now I have five that I breed and sell when I need money to buy seeds and fertilizers, or even pay labourers especially during planting and weeding. I also use the money to hire tractors to plough. I just keep few chickens for my visitors" (Interview with Producer, June 2013)].

This kind of specialization has implications on how household resources like land, cash and labour are allocated. This can be read from this statement;

> ["I have two acres of maize, half of rice and another half of sunflower. I also keep a cow, three goats, three dogs and eleven chickens. But I only have one hen with ten chicks (Laughs!). I invest mostly in maize, rice, sunflower and to produce milk" (Interviews with Producer, July 2013)].

All interviewees did not identify themselves as poultry producers but rather as crop producers. Some even went further and identified themselves as maize farmers, or sunflower producers etc. Findings also show a consistent bias on how resources are allocated, especially land and cash, in favour of the priority commodity. So, since keeping chickens is more socially driven, and not a priority activity, households tend to allocate less resources (See Table 5-2 below). This means attempts to push for more resources to be allocated for

poultry innovation must either introduce a new source of such resources or facilitate reorganization of existing household priorities to allow a reallocation of resources, which is in principle a very complex process. Basically, in order to adopt a more resource-intensive poultry production system, the household farming system needs to reorganise to give priority to poultry production.

Table 5-2: Household resource allocation in poultry: Selected interview quotes

We don't allocate cash resources:
No cost on feeding "We don't feed local chickens. They feed themselves. When I was a kid chickens used to sleep in the kitchen just to protect them, and in the morning we would open the door for them to come out, and they would wonder around ('zurura') fending for themselves. But once in a while when washing dishes we would normally throw leftovers to them. You know in villages we wash dishes in the morning because we don't have lights at night. So when you wake up the first thing you do in the morning is to soak all dirty dishes and we let chickens pick on them… for anything. Sometimes my mother would ask us kids to pour water on a broken pot for the chickens." (Female producer)
No housing "I have not built a chicken coop. At night they stay in my store….where I keep hoes and stuff." (Female producer).
Some resources are communally shared "When I started my parents gave me two hens. I used other people's cocks… (Laugh!).., you know when they move around looking for food they meet cocks. In villages we share cocks. (Female producer).
The decision not to invest influences the decision on scale (i.e. how many chickens to keep). "I don't expect to keep more than 10 because my kitchen is very small. (Female producer).
Inability to buy foundation stock "I could not buy the first flock because we all start with hens (and not cocks), and it is not easy to get good hens in the market. Nobody sells a good hen unless he/she is in serious debt or need for cash. We don't start with chicks because they die easily and it is not easy to raise them without their mother. And you can't start with cocks because you won't get chicks. Even your very good friend will not give you a hen just like that, but they can lend one to you and you keep it until it hatches and you pay him back with some chicks as a token. If the hen dies, they understand, but that will make people afraid of lending their hens to you. So when you borrow one, you really look after it." (Male producer).

Source: Study data, 2013

Production scale vs. choice of production system

Study findings reveal generally low production scales of between 1 and 10 chickens. Such scales directly affect the rate of innovation in the industry because by keeping few birds, producers don't find it justified to invest in sheds,

inputs, or in disease control strategies like vaccinations. Hence there is no demand for such inputs to trigger supply. On the other hand, producers also do not see the need in investing more resources while they cannot determine the scale (because they rely on natural breeding). Therefore, this implies a positive correlation between scale of production and rate of innovation. The implication here is therefore that, any decision to increase innovation in poultry production requires an expansion in scale, and which also means stop relying on natural breeding. Apparently, it is also very costly and difficult for an individual producer to stimulate and access a reliable source of chicks and stop relying on natural breeding.

The study establishes different factors both internal and external to producers behind the dominating low poultry production scale in the study area. One of those factors is lack of exposure to someone keeping larger flocks in the villages for producers to *'see and learn'* from. For example, one producer said:

> ["I would say it's because we don't know how to keep a large flock, we don't know how to protect them from diseases. We have never done it before and we have not seen anybody doing it in our villages. If I did, I would have copied." (Interview with Producer, August 2013).]

This means, like in most cases, rural producers are used to *'act after seeing'*. Therefore, the consistent absence of commercialised household poultry enterprises around them blocked the opportunity for *'potential switchers'* to observe and opt or experiment to change. I therefore argue that existing deliberate initiatives by researchers, government and NGOs which avoid exposing rural producers to commercial input systems are reinforcing the traditional poultry production system which promotes subsistence production. Apparently, such initiatives are built on beliefs that rural producers are better off small or subsisting (for whatever reasons). As a matter of fact, such initiatives deny rural producers the opportunity to see and learn about new scales of production, to later allow them make own choices. This means such public actors are actually locking rural areas to extensive subsistence production.

Other factors observed to sustain the keeping of small flocks in rural areas include; absence of reliable sources of good hens in the market as foundation stock; lack of chick-rearing skills; high disease risks and lack of disease management and control knowledge; and the perceptions that local breeds are not meant to be raised differently (i.e. commercially) just like a lady producer said:

> ["…. I am also not sure about buying chicks because how do you keep them? Unless you also buy a few hens to help chicks feed. On the other hand, if they die of ND it becomes a bigger loss especially after spending so much money to buy them. Honestly, keeping many chickens is just not easy here…..I also heard that these local chickens cannot be kept for business but there are other types which grow faster and lay more eggs. But they are 'European' (meant foreign) and are very delicate that you have to keep them like babies." (Interview with Producer, July 2013)].

Therefore, even where there is a desire to keep more chickens, the insecurity about performance of the available breed, coupled with producers' perceived inability to rare chicks or keep larger flocks, discourage them from increasing the scale. One lady producer mentioned during the interview that:

> ["I really want to keep more chickens, but I need to know how best to keep them. How to deal with Newcastle (Kideri) because I don't want to invest while knowing they will all die during the Newcastle season. I also want to know how to make chicks survive because many do not survive. They die one by one every day as they move around with their mothers. Some are eaten by mongoose, dogs and snakes" (Interview with Producer, June 2013).]

Findings also show that *'diversification tendencies'* among subsistence producers force them to manage many enterprises with limited resources. As a result some commodities like poultry get less attention and often the little resources available within households get spread very thinly to levels insufficient to afford significant innovation in particular enterprises. For example, producers mentioned handling up to twelve commodities all at subsistence scales. And focus group discussions further revealed that most

households do not have enough labour and capital to manage all activities efficiently. Therefore, activities are prioritised based on; amount of land owned; whether it is a traditional crop or not (apparently all producers tend to produce what is traditionally common in the area, e.g. maize, rice, fish, etc.); weather (seasons); family needs (e.g. the family must produce their staple food); political prescriptions (e.g. newly introduced or cash crop, etc.); and sometimes availability of market (e.g. presence of a private or public buyer, etc.).

Furthermore, the study observed most producers in particular villages making similar choices of what to produce. As a result the majority end up producing similar commodities in the same way. This situation makes individual switching very difficult (costly) as the structure of rural supply chains is often biased against what the minority are producing. For example, since poultry keeping is traditionally not a priority activity in the study villages, existing input shops do not stock vaccines or poultry feeds. Thus any individual who wants to buy them has to travel to the district headquarters about 70 to 150kms away. Extensive diversification is also reduces the possibility of releasing resources from other priorities should one decide to produce poultry commercially. This is because poultry is currently not a priority activity and only a few chickens are raised under extensive systems regardless of the resources one has. Therefore, the more producers diversify to other commodities, the less important poultry becomes, and thus less probable switching to larger scales or commercial production becomes.

As they seek to diversify rural households tend to produce small amounts of many things. This pushes production scales and marketable margins further down, hence keeping producers into perpetual low incomes. Therefore, while diversification is intended to increase food security, or cushion poor producers from shocks, in rural areas where incomes are already too low, it also sustains poverty especially by discouraging growth. In addition, since most rural households keep chickens under the scavenging system, there is fear that keeping more chickens is not possible because there is insufficient scavenging base to support a larger flock. As one producer argued:

> ["I also don't think it is possible to keep many of these local chickens. What will they eat? If everybody keeps 40, and we all let them out what will they eat?" (Interview with Producer, June 2013).]

Therefore, the predominance of the traditional system is actually limiting expansion of scale in the study areas because of; (i) reliance on natural breeding-hence producers cannot decide on the foundation stock and it also takes long to re-establish the lost flock; (ii) low utilization and therefore low demand/transfer of knowledge regarding disease management, chick raring and feeding-hence producers have uncertainties regarding management of larger flocks; (iii) producers' previous negative experiences of losses due to ND which makes producers perceive high risks in keeping many birds; and existing mistrusts on quality of vaccines and of other drugs offered under government campaigns, as one interviewee mentioned in the quote below:

> ["After I heard about vaccines I wanted to try and keep chickens again this year, but I am still not sure if the next batch will survive. I really need to be sure before I start investing again. However, I know I will still keep a few for home consumption and if possible keep more for sale" (Interview with Producer, July 2013).]

Additionally, producers mentioned clearly that selling chickens and eggs is not a problem because there are aware that many buyers do not get enough to buy. Apparently, this understanding of existing high demand seems not to trigger any change in scale, neither positive nor negative. And it contradicts the popular assumption that market demand triggers increase in production. See the interview quote below:

> ["The reason for keeping few chickens is definitely not lack of market (Laugh!), because we are so used to complaining about the market. People like chicken meat and can eat it every day. All celebrations have chicken in the menu. Traders are here every day looking for chicken. Believe me we all know that there is a huge market, but we just can't keep more chicken" (Interview with Producer, June 2013).]

What data explains in this section is that the extensive poultry production system promotes low production scales in rural areas because of its nature especially its reliance on natural breeding. However, the predominance of low poultry production scales, which is caused by the society's general under prioritization of poultry keeping as a livelihood, is also promoting the extensive production system because of its low demand for production resources. Therefore, low production scale and traditional production system are reinforcing each other. Thus any change in scale to start producing for the market requires a change in the production system, and vice versa.

5.3.3 Political-lock in: Analysing dominant powers

The poultry industry's innovation space is dominated by public actors who try to incrementally improve on indigenous social knowledge and organisation. Those are public extension staff, NGOs and donor-funded development projects, and are the industry's main sources of new knowledge and innovations. Apparently, these actors tend to deliberately avoid promoting radical shifts including linking producers with commercial actors i.e. they discourage the use of commercial inputs. Therefore, since they are the main players with resources, their bias towards promoting the extensive production system makes the shift to commercial production difficult.

According to a study commissioned by RIU in 2010, NGOs were found to develop the industry as a safety net for the vulnerable, i.e., to act as a cheap source of animal protein and an affordable income generating activity for women and other vulnerable groups. Consequently, they promoted use of simple breeding technologies like use of kerosene incubators, application of synchronised breeding strategies etc., which happened neither to fit well with existing social patterns within the traditional poultry system where breeding has to be natural and therefore a shared responsibility, nor with the commercial systems where use of commercial inputs including buying chicks from a specialised hatchery is essential (Match Makers Associates, 2010).

The focus of the Government of Tanzania has been to promote research and activities to improve the genetic make -up of the local flock through cross

breeding even without facilitating efficient production of chicks. They also carried out vaccination campaigns against the Newcastle Disease (ND), and supported extension workers to train producers on improve husbandry practices specifically to control spreading of the avian flue disease, e.g. by setting by-laws to reduce animal loitering including promoting feed supplementation knowledge, etc. All these initiatives were incremental in nature and since they do not challenge existing dominant mental frameworks, they reinforced the traditional production system.

5.4 Explaining organisational thinness and fragmentation in the industry

This section analyses the institutional infrastructure responsible for stimulating innovation among poultry producers in the study area. The study looks at the presence, type and capability (including resource, technical and technological capabilities) of NGOs, private firms, research institutions and other public organs which interact with rural producers to share knowledge, provide skills, services and promote technologies. I then analyse levels of interactions between rural producers and these institutions. However, the study does not analyse the linkages across these institutions.

As mentioned in Chapter 2, the study defines organisational thinness as *'scarcity of relevant actors'* (key organisations, firms and institutions) which possess resources to facilitate innovation activities (Todtling and Trippl, 2005; cited in Salamonsen, 2014; p.4) and fragmentation as situation where *'relevant firms exists but not interact'* (Kaufmann and Wegner, 2005; cited in Salamonsen, 2014; p.5). I have thus looked specifically at the level of interactions between organisations and rural producers and explained the predicted organisational thinness and fragmentation, and how the situation promotes low innovation by locking-in rural producers into the traditional poultry production system.

It is clear that organisational thinness and fragmentation are very high in the study areas because rural poultry enterprises are subsistence in nature and thus have low affinity for what is offered by other actors in the industry. Therefore, the producers' tendency to use as little resources as possible isolates them from

other firms that innovate to produce inputs and services for the industry. It is also clear from the data that, public actors like LGAs, NGOs, and researchers are promoting the traditional production system which blocks other actors (specifically those who are commercially oriented) from working with rural producers. So, in addition to the general absence of basic innovation infrastructure like roads, electricity, and running water, etc., establishment of new firms in rural areas is hindered by the continuing emphasis on subsistence poultry production where use of external inputs and services is discouraged, and therefore very limited.

5.4.1 Analysing the innovation context to identify actors

In order to analyse the organisational thinness and fragmentation, I conducted the innovation context analysis using the agricultural innovation system (AIS) framework to identify and map existing actors in the system under study. Although the Innovation Systems Approach has often been analysed at a national level to describe the 'National Innovation System', the approach is thought to be equally valid at a regional level or at a community level (Klerkx, Laurens; Barbara, van Mierlo; Cees, 2012) or even as it affects specific groups – such as 'poor women farmers'(Whiteside, 2008). The analysis can also be focussed at a particular sector or even narrowed down to a specific crop, or to a specific value chain (Anandajayasekeram, Puskur, & Zerfu, 2009). Therefore, in this study I have used the AIS framework to analyse the innovation context both at industry level (i.e. poultry) and at community level in Ruvuma and Pwani Regions in Tanzania.

Literature portrays the absence of an agreed list of questions to answer or tools to use to conduct an "innovation system diagnosis" (Anandajayasekeram et al., 2009; Anandajayasekeram, 2011; Klerkx, Laurens; Barbara, van Mierlo; Cees, 2012). And as Prof. Norman Clark describes in his report to NEPAD, there is no template, and that inductive methods are useful. He writes:

> ["…. understanding the complexity of science policy issues cannot easily be demonstrated from 'first principles'. There is no ideal template or cookbook set of recipes. In most cases examined what seems to be much more effective is to proceed inductively. Here the use of illustrative case study material has proved to be

quite successful because good analyses contain so much "tacit knowledge".]

Therefore, I decided to use *'functional analysis"* as a diagnostic tool. The functional analysis process, which is also recommended by Martin Whiteside (2008, p.5) borrows on the checklist used in World Bank case studies (World Bank, 2006), identifies all functions perceived to be necessary if a system or a value chain is to be complete and efficient, then followed by mapping of existing actors to establish who is doing what, and where gaps exist. As Whiteside (2008) guides:

["One insight is that some form of "map" needs to be developed that lists the various "actors" (individuals and organisations) that currently exist and are likely to be required for successful innovation to take place within a country, region or sector. Such a map might usefully be guided by putting names and organisations into a 'framework' diagram…. It is important that these system diagnoses provide an "over view" of the whole system (or sub-system) rather than focus on one small part (or domain) of it. Different levels of detail are appropriate at different stages (Whiteside, 2008; p.5)".]

Therefore, it is from these maps that I was able to establish the thickness and engagement of organisations within the rural poultry industry in the study area of Ruvuma and Pwani Regions. Specifically, I have used the list of functions which RIU actors came up with in their first planning meeting when they analysed the poultry system in September 2009 (RIU meeting report of 2009, p.24 has details). Table 5-3 below presents the list of functions and the corresponding actors from the RIU report.

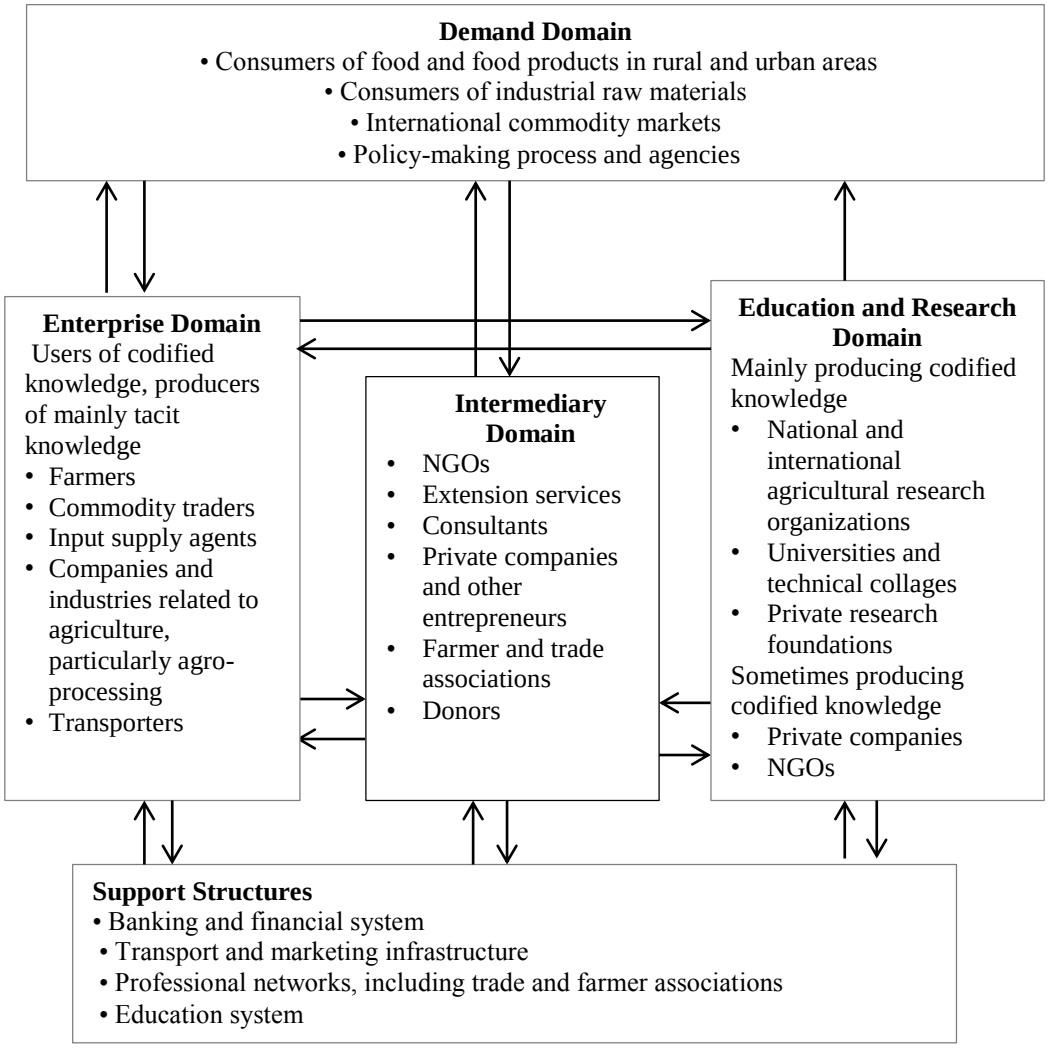
Table 5-3: Key functions and actors for supporting innovation in rural poultry

What is needed	Functions	Actors
Quality chicks	- Management of breeder stock - Production and distribution of chicks - Quality control	- Research institutions, - Breeder farms, - Hatcheries,
Quality feeds	- Feed manufacturing, - Distribution and marketing - Quality control	- Feed companies, - Input shops, - Central Veterinary Laboratory
Veterinary services	- Drug manufacturing (or importation), - Distribution and selling, - Disease diagnosis and treatment, - Laboratory services	- Veterinary drug companies, - Stockists/input shops, - Veterinarians + clinics - Vet. Investigation centres,
Extension services	- Train and employ extension agents, - Provide advice on poultry husbandry	- Livestock Training Institutes, - LGAs/extension staff, NGOs
Markets	- Buying and selling of birds and eggs, - Value addition (e.g. slaughtering, packaging, branding etc.) - Provide market information,	- Traders, large scale buyers, - Producer associations, - Off-takers/aggregators, etc. - Processors,
Transportation	- Transport inputs and products, - Ensure roads are passable from poultry farms to markets throughout the year,	- Logistics /transporters, - Cargo business owners, - Government /LGAs
Construction services	- Selling building materials like cement, nails, sheet, timber, etc. - Building poultry sheds,	- Hardware businesses, - Artisans, - Carpenters etc.
Equipment	- Manufacturing and selling of different poultry equipment for breeding, feeding, transportation, processing, etc.	- Different industries, - Wholesale and retail distributers
Utilities	- Reliable supply of utilities i.e. water and electricity throughout the year	- Power and water companies, - Government
Support services	- Strengthening stakeholder organisations, - Training on business, advocacy, etc. - Financial services, Insurance, etc.	- NGOs and Private trainers, - Financial institutions, - Insurance companies, etc.
Regulatory services	- Ensure quality of inputs and services, - Regulate standards and measurements, - Monitoring, disease surveillance - Etc.	- Public authorities i.e. Government

Source: Secondary data from RIU report, 2009; p.24

Generally the AIS framework identifies five categories of organisations or institutions whose interactions are responsible for innovation processes in agricultural systems (Anandajayasekeram, 2011; Spielman, 2005). The categories are as shown in Figure 5-2 below.

Figure 5-2: Elements of an Agricultural Innovation System



Source: Adapted from Arnold and Bell 2001: 292. Cited in (Rajalahti, Janssen, and Pehu 2008, p.4)

The main categories or domains of the AIS are: the (i) Research domain; (ii) Intermediary domain; (iii) Enterprise domain, and Demand domain; and (iv)Demand domain. These are further discussed below.

Literature explains that the central insight of the innovation systems framework is to analyse partnerships and linkages in their historical and contemporary context. This is because context greatly defines the opportunities and necessities for innovation (Riikka; Rajalahti et al., 2008). It also identifies four main elements of the analytical framework to include; (i) Key actors, the roles they

play, and the activities in which they are involved, with an emphasis on the diversity of public and private sector actors and on the appropriateness of their roles; (ii) Attitudes and practices of the main actors, with an emphasis on ways of working, views on collaboration, traditional roles, potential inefficiencies, patterns of trust, risk taking, and the existence of a culture of innovation; (iii) The effects and characteristics of patterns of interaction, with an emphasis on formal and informal networks, links, and partnerships, inclusion of the poor, and the existence and functions of potential (sector) coordination and stakeholder bodies (Ibid, p.6).

Below is my analysis of the five domains in which I have attempted to establish the kind of organisations that exist, their types, roles, attitudes and linkages, in relation to rural producers' routines and practices. Basically, the discussion reveals that the public sector is actually reinforcing the dominance of the traditional poultry production system in rural areas. And by doing so, they hinder emergence and engagement of private organisations who have the potential to stimulate innovation in the industry.

Research domain

This domain includes suppliers of formal knowledge like universities, research institutions, and other training institutions, etc. In Tanzania livestock Research is coordinated by the Directorate of Research, Training and Extension of the Ministry of Livestock Development and Fisheries (MLDF). However, most research is conducted under the Tanzania Livestock Research Institute (TALIRI) which is an independent organ directly answerable to the Minister. TALIRI operates in seven zones, and conducts research based on priorities in the zones. The two study regions i.e. Ruvuma and Pwani belong to the Southern (i.e. TALIRI Uyole) and Eastern (i.e. TALIRI Tanga) zones respectively.

Reports from the National Livestock Research Institute (NLRI), now TALIRI, show poultry research receiving less attention (i.e. funding) within the livestock research institutions in the country if compared to beef and dairy. For example, the NLRI report of 2006/2007 shows only 10.3% of the research activities and

projects in that period being specific for poultry, refer Table 5-4 below (NLRI, 2009). This implies that, while research organisations are present, and mandated to work in the study areas, they seem to have little interest and capacity (especially in terms of funding) on poultry. However, whenever poultry research was done, they used participatory approaches with on farm experiments which involved farmers in setting experiments and in evaluating results. Unfortunately, none of the interviewees including discussions in the FGDs mentioned to have been involved in such experiments. Additionally, all 62 producers interviewed in this study were not aware, or informed of any poultry research organisation. This means even the zone offices are not known to them.

Another type of organisation under this domain is those involved in livestock training. In Tanzania livestock training is coordinated by the Ministry of livestock through ten livestock training agencies (LITA), the Vocational Education and Training Authority (VETA), and higher learning institutions like Sokoine University of Agriculture (SUA) and the Open University of Tanzania (OUT). These institutions cater for the entire country and conduct research based on institutional priorities earmarked for funding. Often, they conduct studies and their graduates also work in rural areas.

Table 5-4: Livestock research activities within NLRI between 2006 and 2007

Research area	Total activities	On poultry	Type of activity/project specific to poultry
Dairy Cattle	8	0	NONE
Beef Cattle	7	0	NONE
Pastures and Forages	10	0	NONE
Range & Environmental Management	7	0	NONE
Small Ruminants	11	0	NONE
Non and Pseudo Ruminants	8	8	i. Collection of important qualitative information on different indigenous poultry, pigs, rabbits and guinea pigs. ii. Identifying production ability and physical characteristics of each breed /type under different management systems iii. Improvement of feeding and housing system of non and pseudo ruminants, iv. Improve and promote disease control methods to non-ruminants, v. Develop cost effective feed packages using locally available feed materials, vi. Studying the performance traits of crossbreeds including fertility & carcass quality for commercial marketing. vii. Promotion Artificial Insemination (AI) technique for poultry improvement. viii. Development and Promote of Dual purpose Tanzania chicken.
Socio-Economics and Innovation systems	11		NONE
Information, Documentation & liaison	10		NONE
Animal Health	6	2	1. Control & treatment of animal diseases such as Newcastle disease and respiratory diseases of poultry; Ecto & endo parasites, 2. Collection and documentation of indigenous knowledge on ethno-veterinary including ethno-botany
Research projects (2006/2007)	20	2	i. Characterization and performance evaluation of local chicken in semi-arid Central Tanzania for improvement of village chicken. ii. Feeding & Management Strategies for Rural Poultry Production in Central Tanzania
Total	**97**	**10**	
% of Total		**10.3%**	

Source: Tanzania National Livestock Institute Report, (NLRI, 2009)

Out of the ten LITAs, two are within the two study areas i.e. LITA Madaba in Songea District, and LITA Morogoro in Morogoro Region. However, LITA Morogoro is located about 170 km from the Coast (Pwani) region where the study was conducted. Basically, LITA trains both at Diploma and Certificate levels and enrols students from all over the country. These agencies also conduct short courses if paid by NGOs or donor programmes to train farmers or extension workers. Apparently all these LITAs have been promoting the traditional system and not commercialisation. As regards to vocational training institutes, some offer poultry courses to youths who want to either employ themselves, or get qualifications to join LITAs. In the study area, there is Kibaha Education Centre located in the urban part of the Coast Region offering a certificate course in Poultry Management. However, it has no outreach programmes to rural areas.

Therefore, regarding this domain, it is arguable that while research and training organisations are present in the study area, they are not directly engaged with rural producers in manners that could stimulate innovation and encourage them to opt out of the traditional system. The focus of these organisations has been to improve the traditional routines in rural areas, while separately developing commercial production system for the urban.

Intermediary domain

These are bridging institutions (individuals and organisations) assisting in articulation of needs for new knowledge by users and for outlining new knowledge available from different sources. These include extension agents, NGOs, schools, churches, prisons etc., Infomediaries (like Press, radio, TV, internet, mobile phone etc.), Private sector (input suppliers etc.), Producers and sectoral /commodity coordinating organisations, and informal knowledge transfer systems.

The study reveals that extension workers employed by Local Government Authorities (LGAs) are the most frequent actors involved in receiving and disseminating poultry information in rural Tanzania. These would often work

with NGOs and development programmes to advise rural producers. For the past 50 years, NGOs and LGAs have disseminated information that reinforces existing traditional routines and which is against commercialisation. As one producer said:

> ["Basically we all keep chickens in the same way here. Local chickens are kept in the same way. However, some buy maize bran and build sheds for them. Even the district officers have advised us to do that. But first we need to know how to stop chicken from dying" [Interview with Producer, June 2013].

The quote above shows that everyone knows how to keep chicken (i.e. traditionally), and what the extension officer advices is just minor improvements on existing routines like building a chicken pen and supplementing feeding with maize bran. Another interviewee described extension officers as incompetent and unreliable sources of knowledge. The producer said:

> ["I did not ask the extension officer anything because he lives here, he sees us every day struggling with ND, but he is not doing anything. He even saw how my 25 chickens died… but what did he do? Nothing! I know he would have just said exactly what the radio said.. (He smiles). After all the disease kills their (extension staff's) chickens too." [Interview with Producer, June 2013].

The quote above can be interpreted as a state of 'inertia' within the extension system, where the information disseminated is perceived not to be new, and not useful in relation to current problems. Thus the producer might imply in his quote above that, 'what the extension staff knows, is what farmers also know'. And as another producer elaborated, some of extension advice fails because it involves buying certain inputs or drugs which are not available in the villages, or are not known to producers. Like a woman in Songea mentioned in the interview:

> ["…As I said, I tried to keep many chickens but they all died. I needed to be sure of 'Kideri' (*ND*) vaccine. I needed training. I wanted to know how I could protect chicks. But I did not know where to buy what they were telling us to use (i.e. vaccines)." (Interview with Producer, June 2013)].

What is revealed here is a disconnect between extension advice and access to materials needed to implement the advice. This means, intermediary organisations may fail if other actors like input suppliers are not available to provide the needed services. It means that presence of intermediary organisations and their effectiveness depend on existence and functioning of actors in other domains. For example, it is not effective to promote use of vaccines if there are no suppliers, or producers cannot afford, etc. A woman producer said:

> ["…It depends on the advice and if I can afford it. You know, some advice like what I heard from the radio about building a good shed, are not easy unless you have many chickens. And most advice needs money which I don't have. So I only do what I can." (Interview with Producer, June 2013)].

Therefore, emergence of organisations in this domain is largely shaped and stimulated by the level of engagements in the research, enterprise and demand domains. And this explains why, LGAs, NGOs, and other public initiatives have a tendency to provide extension services together with materials or products needed, i.e. support extension workers to intervene both in intermediary and enterprise domains.

As for media organisations, these are generally present in the study area especially radio and occasionally printed materials are circulated by NGOs and projects. Interviews reveal that some producers listen to programmes on radio but for different reasons they do not follow the advice. The most frequently mentioned reason was the general perception that the information provided does not fit with their production systems, including flock size and routines. This is revealed in the quote below:

> ["I have also listened to a radio programme on improved chicken raring. Sometimes I follow the advice that I hear, and sometimes I don't. For example, I listen to a radio programme called *'Mkulima wa kisasa'* (i.e. A Modern farmer in English). They teach how to feed chickens. They also say we should keep chicken as a business. But I could not implement any of the advices. I had no means to do so. I also read a newsletter called 'A Modern Farmer'-quite often, and it talks about the same things. But I can't do what they say. I don't even know where to start." (Interview with Producer, June 2013)].

The quote confirms that, the relevancy of intermediary organisations is established by existence and engagements of organisations in the enterprise domain. This makes the enterprise domain important in determining innovation in the rural poultry industry. Otherwise the public sector (i.e. extension, NGOs and Programmes) continues to dominate the industry's innovation space.

From the discussion above, the study concludes that intermediary organisations are very few in the industry, and are dominated by public actors (including NGOs, projects, and churches) who promote low innovation tendencies. Private organisations, including media houses and input suppliers (who disseminate information about new products and their uses) are not encouraged to enter the space because the dominant production system does not make their role relevant. Poverty and lack of electricity in rural areas make use of tools like TV, and radio very limited. Moreover, use of ICT-based services to disseminate agricultural information is more prominent in other commodities but not in poultry. Apparently, most infomediaries are located in relatively more urbanised areas (i.e. in district headquarters).

Enterprise and Demand domain

This domain includes agricultural value-chain actors and organizations that use new formal knowledge in the production of goods and services for end users. For example, producers (subsistence, small, medium, large), farmer organisations, and companies, etc.

The functional analysis conducted by RIU in 2009, identified producers (both as individual households and as organisations), chicks producers (including out-growers producing and selling fertilised eggs), feed manufacturers, veterinary drugs dealers, vaccines suppliers, agro-dealers (or stockists), traders, food vendors (including hotels and restaurants) and final consumers as the key poultry value chain actors. Among all these, only traders and food vendors had direct links with rural producers. The rest were mainly located in urban areas (district headquarters) and mostly working with urban commercial producers who raised exotic breeds. This happened because rural producers were not using commercial

inputs. Exceptionally, ND vaccines would occasionally be available to rural producers through government campaigns or under specific arrangements with an NGO or a project. And in such cases extension staff would get the vaccines from the government (i.e. from the Veterinary Investigation Centres (VICs) located in district headquarters). As a result, none of the interviewed producers mentioned having a direct link with a vaccine supplier, or a stockist. Vaccines for other diseases beyond ND were not accessible (not known) at all.

As regards to chicks, rural producers rely on natural breeding and often start with a mature hen. Thus they do not buy chicks from a specialised chick producer. The situation is the same with feeds and veterinary drugs. Therefore, since rural producers do not supplement feeding with commercial feeds, or treat their birds, no suppliers have been encouraged to establish such businesses in rural areas. The quote below explains how rural producers deal with poultry diseases without using formal veterinary drugs:

> ["Elders knew these herbs and we used to look for them. But these were mainly for protection and not used when a chicken is already too sick. A sick chicken is usually slaughtered before it is too late." (Interview with Producers, June 2013)].

A few respondents mentioned recently starting to buy maize bran from maize millers located in rural areas, but other interviewees said most maize bran in their villages is used to feed pigs and produce local brew. See the interview quote below:

> ["I get the maize bran from the miller. I ask for it when I go to mill my maize for flour. Usually people do not ask for it, and the owner of the miller would sell it to people who keep pigs. But I ask for mine and for those of my friends. I also buy once in a while, but it is expensive, because of the pigs." [Interview with Producers, June 2013].

Therefore, poultry producers are not the target clients for maize bran produced in the villages. Moreover, maize bran is just a by-product of another business which is not directly invested for poultry.

Inputs suppliers are almost non-existent in the study area because the traditional poultry production which uses very little external inputs is dominant. However, there are few stockists located in some rural trading centres selling crop inputs like seeds, fertilizer, pesticides, etc., and who have the potential to become suppliers of poultry inputs if there is demand. In such areas, the problem is therefore fragmentation rather than absence of actors or organisation. This argument is confirmed by the interview quote below:

> ["I don't know any poultry input supplier. But I know there is a shop selling fertilizers, seeds and other inputs for crops. Not for chickens. In fact nobody sells chicken feeds…. maybe maize bran from the miller." (Interview with Producer, June 2013)].

Regarding marketing actors, results show that rural producers have direct contacts with traders who move from door to door as their main buyer. These traders also attend village markets to buy live mature chickens. However, no such traders were found buying eggs probably because most eggs are consumed within households or are left to hatch. As one interviewee said;

> ["I don't have problems in selling chickens. Buyers would usually come to my house and buy. They come every time. They always move around looking for chickens to buy. Personally, I have never gone around looking for buyers, even when I have problems. They always pass by my house. They somehow know who has chickens. Some move with merchandise like plastic basins, buckets, plates and kitchen utensils and we exchange with chickens….. I usually sell cocks and keep hens for hatching and for laying eggs…. But people don't sell eggs because eggs are future hens and for the family to eat." (Interview with Producer, July 2013)].

Very few organisations were found in the study area producing goods and services needed in poultry production. The present few are not engaging with rural producers because dominant production routines do not require such services (or inputs). Both concepts of organisational thinness and fragmentation are therefore valid in relation to the enterprise domain.

The support structures

These include structures like banks, insurance companies, transporters, etc. These are not yet well developed to specifically service the poultry industry in general. Some are improvised to serve commercial production, poultry input supply and value addition. For example, banks give loans to large and medium scale commercial farms and use buildings or machinery as equity. They also give loans to veterinary drugs and hatchery businesses because it is possible to analyse cash flow as well as use equipment as collateral. The banking system only works with parts of the industry that fit with existing banking structures and policies. Unfortunately, this does not include the current poultry production system found in rural areas.

The demand domain

This refers to the "final users" or beneficiaries of new knowledge like final product consumers or industries that use poultry products as raw materials. From the functional analysis conducted by RIU in 2009, and from the sub-sector study of 2010, it is clear that the main products from the rural poultry industry in Tanzania are live mature birds and a few eggs that enter the rural and urban markets mainly through individual traders (Match Makers Associates, 2010). Therefore, buyers are mostly individuals who buy and sell to others, e.g. traders buying from villages and sell to food vendors, restaurants or to other traders in urban markets.

Meat and eggs produced in rural areas are preferred by final consumers for their taste which they associate with the way chickens are raised under the traditional system. They support slow growth and zero use of commercial inputs, and are thus ready to pay a premium price. However, these are very few buyers who have income to spend on poultry products. The majority of Tanzanians have low incomes and spending on poultry products is considered a luxury. Therefore, they tend to consume cheaper poultry products, which often come from commercial farms.

Additionally, commercial consumers like the confectionery industry, hotels and other food chains prefer products from commercial farms because their prices are relatively lower, and have consistent quality and quantity. Furthermore, some food vendors claim that cooking exotic chicken is faster and a lot cheaper because it uses less fuel and reduces customer waiting time significantly (i.e. indigenous chickens have tougher meat thus take longer to cook). Despite their preferred taste, products from rural producers have not entered the formal food business because they fail to meet certain basic standards. For example, eggs from the traditional flock are found too small for the bakery business, and are also found unsuitable to supermarkets because they are usually fertilised and therefore have a shorter shelf life. This makes them too costly to store, and too unreliable in terms of setting expiry dates. One butcher said:

> ["I don't stock local chicken meat because it changes colour when frozen. Hence customers want them live, and I can't keep them live here. I also don't sell local eggs because I can't tell when they will go bad." (Interview with a Butcher, July 2013)].

Therefore, existing structures and systems for meat and egg business are biased towards exotic breeds raised in commercial farms. Furthermore, such systems or actors are more likely to operate in urban settings because they need amenities like electricity, good roads, etc., and which are rarely present in rural areas. Keeping local breeds of chicken (i.e. the size of eggs and weight of chickens are irregular) under the traditional system (i.e. where eggs are fertilised, tradable volumes are small and irregular, etc.) disconnects rural poultry producers from formal marketing structures which connect most producers and the final consumer.

5.5 Summary and conclusion

The chapter makes it clear that Path Dependency theory can explain the observed prevalence and persistence of subsistence agricultural production in rural Africa, and specifically in poultry production. Using the concepts of lock-in, organisational thinness and fragmentation, the chapter explains why the traditional (extensive) poultry production system where innovation is generally low is dominating the rural poultry industry in Tanzania despite the high market

demand for poultry products and the strong public desire to fight poverty which is currently high in rural Tanzania. It also uses the theory and the concepts to explain why innovation is generally low in rural poultry production where the traditional production system is dominating.

The chapter departs from the observation that commercial poultry production system is currently adopted in urban and peri-urban areas but not in rural areas. This happens even when rural producers dominate the country's poultry sector, and where the government's interest is to increase rural incomes and domestic production in order to reduce imports. Therefore, the chapter makes it clear that, understanding what limits commercial production of chicken among rural producers in Tanzania, and who are increasingly commercialising other agricultural enterprises, is very important for policy and practice.

In the analysis, the study establishes that the rural poultry industry in Tanzania is experiencing a lock-in, where the traditional poultry production system is reinforced by both public and private actors. That the innovation space is dominated by public actors who promote low innovation, by excluding producers from interacting with commercially oriented actors. They achieve that by promoting *'input-self-sufficiency'* and *'enterprise diversification'* where rural producers are encouraged and supported to manage many enterprises while using only locally available resources. Apparently, rural producers have limited resources and spreading them thinly to many resources lowers investment in certain enterprises like poultry and renders them less important. Consequently, these enterprises become closed and with less affinity to other enterprises in the industry as they end up not utilising external resources or inputs.

Chapter 6 Initiating the unlocking process: How RIU 'took off'

6.1 Introduction

The analysis presented in this chapter describes how RIU began to unlock the Tanzanian rural poultry industry from the path-dependent situation established in Chapter five. It therefore looks at RIU as an external actor which deliberately facilitated processes to create new thinking among producers, and to promote interactions among different actors. These processes stimulated investment and therefore reduced the organisational thinness and fragmentation that existed. Using data from RIU reports and interviews with ex-staff and programme beneficiaries, I have analysed initial processes and contextual negotiations that took place at different levels of implementation. Specifically, and by recreating the RIU programme processes, the chapter sheds light on how interactions and learning were practically facilitated, brokered or promoted to transform an industry which was dominated by subsistence producers.

The analysis that follows focuses on interpreting how the programme unfolded to overcome internal and external challenges facing development programmes which typically operate within predefined frameworks and structures. It then describes how the programme changed and later managed to be flexible and operate from the context. The intention is therefore to explain how such flexibility emerges from a pre-determined development programme to suit the innovation process which is known to be complex, non-linear and context specific. It also reveals how a system perspective can be put to practice in setting development programmes.

The chapter is organised in six sections with the first three elaborating the origins and founding themes of the RIU programme. They describe how traditional and rigid programme frameworks were dealt with to create space for context specific decisions. Then in section four, the study explains how the programme negotiated the implementation space to merge programme interests and those of actors and beneficiaries in the industry. In section five, I have explained how RIU explored the

local context by first creating a common understanding of what is to be achieved. RIU began by addressing a socio-cultural problem identified by actors, then turned this problem into an innovation challenge. A functional analysis was conducted and guided actors to visualise the envisaged system needed to meet the innovation challenge. Section six summarises the chapter and draws some conclusions.

6.2 Origins and founding themes of RIU

RIU evolved out of a problem felt by DFID as a funder rather than an opportunity to be explored. DFID wanted to understand why its previous 10 year investment in agricultural research did not generate the expected results of increasing agricultural productivity and therefore reduce poverty in sub-Saharan Africa, Asia and in Latin America. The implication was therefore that DFID had specific expectations as final deliverables which influenced how the programme was planned.

DFID launched the RIU programme specifically to support the adoption of the previous research outcomes in Africa and Asia and maximise their poverty reduction potential, and at the same time generate lessons on how best to put research outputs into use for future planning. In other words RIU was supposed to continue from where research stopped and learn how best to complete the linear process of development starting from research.

The programme decided to develop approaches towards facilitating innovation for development which led to the establishment of Country Programmes (CPs) including Tanzania. However, nobody knew exactly what that implied in practical terms. A review of RIU literature shows that choosing innovation system thinking to guide the RIU implementation created challenges to the planning process because very little had gone beyond the conceptual levels into developing clear tools and frameworks for implementation; and the thinking was still new in agriculture development; hence there were too many ideas floating around and with very few experts on the subject.

Most RIU target countries had a difficult start with many organisations and consultants involved in designing the programme implementation strategies. This led to a long inception period of receiving mixed messages and over-elaboration of the approach. While this happened with the good intention of bringing methodological

clarity to the teams, it was simply a manifestation of the deep desire to be in control of processes and eventualities and therefore being able to justify value for money. It was also reflecting the professional battle regarding the role of research, public and private sector in putting research outputs into use as a consequence of the conditioned linear thinking and inability to visualise actors and processes from a seamless web perspective.

6.3 Coping with deterministic frameworks

Most development planning approaches are grounded on the ability to make presuppositions about the true nature of its 'objects of intervention" and therefore tend to be deterministic about what can be done to influence or model them. This overlooks the fact that these 'objects' are actually embedded in contexts which are temporary in nature, and with evolving internal structures (Norman Clark, 2010). In many cases such determinisms has led to execution of costly counterproductive programmes (Clarke & Ramalingam, 2006; Ramalingam, Jones, Reba, & Young, 2009).

Therefore, even before the actual implementation started on the ground, RIU was already navigating through a complex system of DFID structures and policies; of development funding frameworks engrained in the ability to clearly demonstrate deliverables against the expected value for money even before funds could flow; and a complex web of professional empires and traditions. Usually, development programmes would reduce this complexity by risking everything else and work to fit in specific prescriptions provided as guidelines. The initial RIU design followed the same path until three years later when the mid-term review[25] (MTR) observed that too much expert-planning and decision making at higher level limited implementation at country level. The MTR therefore recommended for more powers and autonomy to be shifted to the country teams and allow them decide what to do (See (See Norman Clark, Frost, Maudlin, & Ward, 2013; p.35). This shift of power is elaborated further in coming sections.

[25] The RIU Mid-term Review (MTR) was conducted in November 2008, but its final recommendations were reviewed in January 2009, and that is when they were implemented followed by a Technical Review in June 2009.

In principle, RIU made the decision to establish Country Programmes (CPs) to focus on facilitating innovation for development based on the premise that promoting innovation required interventions that strengthened innovation capacity, which in turn required strengthening links and interactions between and among different actors involved in agricultural innovation. According to RIU reports, it was at this point when the idea of establishing innovation platforms (IPs) emerged and later adopted. RIU defines an IP as a network of partners working on a common theme and using research knowledge in ways it has not been used before to generate improved goods and services for the benefit of the poor. The IPs therefore involve the concept or system of working together as a group focusing in specific area of opportunity so as to address major challenges that affect the system (for more information on IPs and RIU IPs in other countries see; Mur & Nederlof, 2012; S Nederlof & Pyburn, 2012; Suzanne Nederlof, Wongtschowski, & Lee, 2011; Ngwenya & Hagmann, 2011).

RIU idea was for the country programmes to identify themes or commodities then facilitate processes of bringing together different stakeholders to find innovative solutions for the challenges or bottlenecks preventing the system from functioning efficiently. The assumption here was that innovation and learning would take place as stakeholders interacted to solve challenges. At this point the overall RIU programme had a detailed log frame which specified programme objectives, processes, expected results, assumptions, indicators and inputs.

After the decision on approaches to be used in Country Programmes was made, a series of other decisions on which countries, strategies and plans followed. Initially, RIU wanted to work in 10-15 countries previously covered by the RNRRS programme, with at least three countries in Asia, Africa and Latin America. However, it was later decided to work only in six countries in Africa, which were later selected based on different criteria such as land-locked versus coastal, post-conflict versus stable governance and geographic divisions. Hence Malawi, Nigeria, Rwanda, Sierra-Leone, Tanzania and Zambia were selected. The objective of these country programmes was stipulated in the overall RIU log frame as *'to facilitate agricultural innovation in such a way as to contribute to the ultimate goal of*

transforming smallholder farming and associate value chains into viable and sustainable enterprises'. This shows that the RIU focus on **'the enterprise domain'** of the Agricultural Innovation System (AIS) was explicit from the start.

After the countries were selected, consultants were hired to conduct country assessment and use the results to develop country strategy documents. Therefore each country started the programme with the overall RIU log frame and specific country strategy document established. Reports show that the programme did not start in all the six countries at the same time, rather they were rolled in one after the other starting with Rwanda in late 2007, followed by Malawi, Nigeria, Sierra Leone, Tanzania and finally Zambia in mid-2008. This study focuses only on what took place in the Tanzania country programme.

6.4 Negotiating the implementation space

As in most development programmes, RIU managers had to properly answer the 'when' (defining the implementation time frame), 'where' (choosing the geographical location and coverage), 'who' (selecting staff team and the target group), 'what' (deciding on issues, systems, commodities, industries or sectors to work with) and 'how' (choosing approaches, strategies and even process) questions before any implementation could start. This initial planning process was very critical because it is usually from planning that funders and programme managers agree on what is to be expected as value for money and as proof of expertise respectively. Therefore, this study is particularly interested on how RIU arrived at these decisions including finding out who made them, and how far the planning went to predict and therefore prescribe future implementations.

As a result of the programme's struggle to fit into development planning standards and formats, the programme in Tanzania started with strategies and an operational framework defined and therefore prescribed by higher authorities. Below are some of the prescriptions:

6.4.1 The time frame was defined: Timing innovation process?

RIU documents show that this was a five-year action research programme running from July 2006 to June 2011. However, there was a room for extension depending on

circumstances, and a one-year extension to June 2012 is reported, though involving only selected activities. Therefore, although a five-year time frame seems to be preferred by many development programmes, it is clearly not a period long enough to have system changes and wide impact results delivered both at the same time. However, programmes need to have a beginning and an end, and the question is therefore how to make time frames and unpredictability co-exist and still be able to promise and achieve realistic results.

The RIU experience clearly suggests that since we can't do away with time frames, then maybe we should consider inventing new targets of achievements and leave impact indicators as eventualities and not the end targets that drive implementation. This is to learn to accept the fact that 'we don't need to see millions of litres flowing in the tap before we know that the water system is in place. Rather, even a few drops flowing from the tap, can explain that the plumbing system is working.' This means putting ambitious impact targets creates a competition between focusing on achieving systemic changes and impact targets, which may be counterproductive.

6.4.2 Geographical location is defined: Innovation has boundaries?

The RIU programme in Tanzania was first implemented in the Eastern Zone of Tanzania involving four Regions i.e. Morogoro, Pwani (Coast), Tanga and Dar es Salaam. This was called a pilot zone with the intention for up-scaling to other zones. In order to select the pilot zone, a Tanzanian consultant was contracted to carry out a desk study based on criteria[26] developed by RIU headquarters in UK. The consultant assessed both the agro-ecological zones (AEZ) and general zones as defined by the government. The assessment involved assigning subjective scores to each criteria as judged relevant for each zone then used final results to select the pilot zone. The desk study recommended that RIU uses the general zones to set up its programme but address priorities based on AEZ characteristics of that particular zone.

Therefore, the Eastern Zone was selected because of the following reasons: (i) the zone covered all characteristics found in the 7 agro-ecological Zones (AEZ) making

[26] (i) number of RNRRS outputs considered relevant; (ii) number of poor people; (iii) economic growth potential; (iv) market linkages; (v) perceived innovativeness of local population; (vi) capacity of the zonal research stations; (vii) accessibility to major markets; (viii) number of development initiatives and intermediaries in a single agro-ecological zone; (ix) Accessibility to capital; and (x) Potential local partner to help manage the Fund

most of the RNRRS outputs relevant; (ii) It scored high against most of the criteria for selection; (iii) It had a good number of intermediaries that could work with the programme; (iv) It's central location was found to ease the anticipated roll over and up-scaling of the programme to other zones; and (v) Its proximity and accessibility to the business city Dar es Salaam was found very important in linking up with policy dialogue during the pilot where learning and setting the stage for working in other zones was crucial.

6.4.3 The target group is stipulated: Specifically focusing on the poor

RIU targeted rural households who depend on renewable natural resources for their livelihoods. This is linked to objectives of the RNRRS that led to the design of RIU. So whatever the programme did had to involve and benefit rural households.

This decision is explicit in RIU documents and also in their approaches. Throughout the programme, small agricultural producers were 'the end' and all other actors were involved as 'the means'. In my opinion, it was important that this kind of 'targeting' was done because unless they are deliberately put at the centre of processes, small producers and the poor can easily be side-lined and be excluded from mainstreams. Therefore, RIU has shown that when promoting innovation among the poor, every strategy must revolve around empowering them, otherwise they remain the weakest link of the system and may even get expelled. For example, RIU made sure that input supply was organised to suit rural producers' circumstances including packaging (into smaller quantities), transporting in bulk, bundling orders etc., just to make them attractive for doing business. RIU also created special mechanisms to help them experiment with new inputs through subsidies. So, RIU did all these, because they had producers as the end and not as the means. However, targeting has its limitations in terms of who in the end participates in the process because the final decision on which actors stay in the system is not known until the decision is actually made. Hence, even with targeting the poor, some degree of flexibility is necessary.

6.4.4 Implementation approaches were drawn up: Predetermination

The initial strategy for RIU was to enhance demand for and use of research outputs, new knowledge and technologies by supporting activities focused on improving the functioning of agricultural innovation systems. The Tanzania Strategy which was

drawn prior to commencement of activities in Tanzania categorises the work into four main thrusts as follows: (i) Putting research outputs into use through the Demand Lead Innovation Process (DLIP); (ii) Improving communication and marketing of agricultural related information; (iii) Developing institutional arrangements and capacity to enhance innovation systems; and (iv) Monitoring and learning.

Through its implementation, the programme was expected to deliver the following outputs; (a) Functional Innovation platforms working to arrive at solutions to systems constraints and to exploit innovation opportunities; (b) Poverty reducing innovations targeting the poor, women and marginalised households generated and used; (c) One or more information markets that can effectively link knowledge providers and knowledge users; (d) Policy Processes enabled by research into use experiences and lessons; and (e) Lessons on approaches for enhancing demand for research outputs using challenge funds documented and disseminated.

The use of Innovation Platforms (IPs) as the implementation approach was also decided. The programme was expected to establish platforms around themes or commodities and facilitate actors to solve system blockages by using knew knowledge and innovations. It was expected that through such platforms creative solutions (based on research outputs, knowledge or technologies) could be sought, produced and utilised to solve system challenges.

RIU reports show that while the main theme of promoting innovation was maintained, the programme team in Tanzania did not make implementation decisions based on what was written in the programme documents. The team focused on commercialisation and in doing so new knowledge and technologies were demanded and used. However, the platform approach was later dropped and instead, they focused on building networks based on what was emerging.

6.4.5 The local team was recruited with predetermined skills

Prior to operation, two organisations were contracted to manage RIU activities in Tanzania. Muvek Development Solutions Ltd. (Muvek), a private consulting company was put in charge of overall implementation including overseeing

coordination, facilitation, communication, and monitoring and learning activities of the programme. The programme was therefore managed by an in-country team consisting of the Country Coordinator (CC), National Process Facilitator (NPF), National Monitoring and Learning Coordinator (NMLC), and Fund Manager (FM). In this case, the management of the Challenge Fund was assigned to another organisation called Economic Development Initiatives (EDI-Ltd.).

These staff needed different skills at different times. The team also had the option to outsource and seek advice externally. The implementation process involved multiple processes and no specific knowledge could initially be lined up for the task. However, the ability to articulate needs, facilitate, coordinate and search for knowledge and solutions.

The RIU staff seem to have played more of managerial and coordination roles than providing technical expertise on poultry, etc. One RIU staff member said during the interview:

> ["WE were like a CEO of a big conglomerate trying to make sure every firm or department works efficiently." (Interview with ex-RIU staff, May 2013)]

6.5 Exploring the local context

RIU worked in the Coast Region also known as Pwani Region. The region is one of the 26 regions of Tanzania. It borders Tanga, Lindi, Morogoro and Dar es Salaam regions in the North, South, West and East respectively, and the Indian Ocean also on the East. The region has six districts and seven Municipal Councils, and RIU worked in all of them expect in Mafia Island which was excluded due to its logistical challenges. The main livelihood activities in all these districts is sea fishing and crop farming specifically cassava (major staple crop), cashew nuts (major cash crop), maize, rice, sweet potatoes, sunflower, sesame, palms, and fruits (mainly mangoes, citrus fruits, pineapples and water melons). Other activities include livestock keeping (i.e. local breeds of cattle, goats, and sheep), local chicken keeping, bee keeping, and forestry i.e. mangroves. Apparently, Coast is considered one of the poorest regions in the country despite its proximity to the business city of Dar es Salaam and to its vast agricultural potential due to high soil fertility and bimodal rainfalls.

6.5.1 Collective identification of programme focus and entry points

When rolling out the programme, RIU organised a national stakeholders' workshop to discuss the new programme and seek their advice on where RIU should focus on. The idea was to have the RIU programme introduced to stakeholders and then make a collective decision on which commodities or issues to work on and therefore build Innovation Platforms around them. In essence, RIU wanted to be demand driven and as Knickel, Tisenkopfs, & Peter (2009, p.10) say, they wanted to valorise emerging niches from below. At that time, it was already decided by the 'Global RIU (G-RIU) programme'[27] to build Innovation Platforms (IPs) as the approach to implement the Country programmes. The G-RIU hired a consultant to introduce the innovation platform approach to the six country teams and also do the actual facilitation process to establish the IPs. This means the IPs approach was new to the RIU teams and they had to learn by doing, also implying that the team didn't have to technically master everything as outsourcing was possible when needed.

Participants for the first stakeholder workshop were mainly identified by the RIU team. They used their experience and networks to identify and invite individuals they thought would give meaningful contribution. However, they also looked at the list of people previously interviewed during the country assessment exercise commissioned by the G-RIU. One staff mentioned during the interview that:

> ['..all we did was to make sure we get representatives from agribusiness, NGOs, Extension, Training, Research, Livestock, crop, Ministry, Famers, Farmer groups, etc. and the names just came from on top of our heads. We just made sure that the person would be ready to come and would give good contribution." (Interview with ex-RIU staff, May 2013)]

Another interviewee said:

> ["..by then Muvek was not a big name that senior people would recognise and respond to. But fortunately we used our Coordinator's network and invited those senior people who

[27] For purposes of clarity the study has divided the RIU programme into the 'Global RIU programme, Country Programmes and RIU Tanzania programme'. While the Country Programme (CP) collectively refers to the RIU activities in six African countries i.e. Malawi, Zambia, Nigeria, Sierra Leone, Rwanda and Tanzania, the RIU Tanzania programme (RIU-T) specifically refers to activities in Tanzania. The 'Global RIU programme refers to the entire programme (i.e. including the six Country Programmes in Africa, the Best Bets Programme also in Africa, Asia programmes, the Research Team in Rome and the Management Team in the UK).

respected her and therefore attended." (Interview with ex-RIU staff, May 2013)]

This means the team just started interacting with the people they knew and add in others as they were needed.

This meeting was facilitated by the IP expert who wanted the meeting to identify commodities, opportunities or issues that the programme could focus on and decide which systems RIU was to build or strengthen. However, reading from the proceedings of this meeting, stakeholders were not discussing 'systems' as such, rather they were looking at which 'value chains' needed innovations and which 'problems' needed solutions. Finally, and contrary to RIU's expectations, the national level stakeholders did not come up with any list but rather asked RIU to fund consultative visits to the Local Authorities first. Therefore RIU team together with six stakeholders appointed from the meeting were asked to visit the four administrative Regional offices falling within the RIU's target area (i.e. Tanga, Morogoro, Coast/Pwani and Dar es Salaam) and identify key regional priorities listed in their plans[28] and report back to the same group. The intention here was for RIU to learn from the Regional offices where such prioritization was done annually, as well as to align RIU's work with local and national priorities. The team was then asked to report back to the same national level stakeholders for final decisions.

While other regions produced a list of priorities, the Coast Regional Authorities had just one item on the list-'tackling laziness'. They described this problem as the root cause of all other problems as it was prevalent and deep-rooted in culture, attitudes and in the general social fabric of the Coastal community. According to RIU reports, the attitude was argued to be limiting involvement in both educational and economic activities while proliferating in the younger generation. RIU also came across numerous technical reports, political speeches, and oral presentations from experienced development actors who previously worked in Coast Region clearly raising the concern that the attitude and entrepreneurship capacities among the people in the Coast Region were too low to trigger, support or sustain any rural

[28] In Tanzania Regional Plans are developed through a consultative process from villages using a national planning approach called O&OD (Opportunities and Obstacles Development) Approach.

development initiative in the region. This understanding was also shared by local community leaders and the community in general. Thus it was understandable that RIU was consistently asked to tackle what was called *'uvivu'* in Swahili or *'laissez-faire'* attitude argued to persist among the 'Coast people' (i.e. *'watu wa Pwani'* in Swahili) during that time. At this point the RIU management had prepared to start an innovation process from such a social problem. It was not even RNRRS related.

6.5.2 Creating an 'innovation challenge'

In order to know what to do next, RIU facilitated another stakeholders meeting at national level to discuss priorities from the regions and out of them select 6 for implementation. The plan was to establish an innovation platform (IP) around each of the selected priority. It was fortunate that the programme was not specific on the type of issues to focus on as platform themes (although the spirit of the RNRRS was alive in the background reminding that whatever RIU did had to be linked to research outputs and to renewable natural resources) because it allowed itself to adapt to context. However, the management in UK had defined an innovation platform as a network of partners working on a common theme, which could be an opportunity or a challenge affecting a system. Therefore after thorough discussions the national level stakeholders in Tanzania selected 'dairy' as the theme for Tanga region; 'agro-mechanization' and 'post-harvest management' in maize and rice production for Morogoro region; and 'entrepreneurship for Coast region. This study and therefore in the sections that follow, focuses on the entrepreneurship platform which was first implemented in the Coast region and later out-scaled to other regions.

What is of interest here is how the problem of 'laziness' was translated into 'low entrepreneurship capacity' problem, and later linked to poultry. The meeting identified anti-business mind-set, extensive laziness and harmful traditions and beliefs as major causes of the observed prevalent low entrepreneurship zeal and consequently poverty. Interestingly, technological problems were not raised at this point but came out much later only at implementation stage. Moreover, what this community interpreted as problems were not even directly related to agriculture and therefore none of the perceived ready-to-use RNRRS outputs could be targeted at

that point. Rather what was perceived to limit innovation in the Coast region was considered intrinsic to the actors themselves.

The meeting arrived at the term ‘entrepreneurship’ after they linked laziness with poverty. The argument was that poor people are almost compelled to work hard in order to survive and if they don’t then there must be reasons beyond their individual means. During the interview one producer said:

> [“we just didn’t know what else to do. We have been fishing and farming all our lives and are still poor… I think we gave up trying.” (Interview with a Producer, September 2013)].

This implied the community had adapted to that level of productivity. So RIU was asked to design interventions to change mind-set and build entrepreneurship capacity. According to the meeting decision, Coast people needed to go through at least one business cycle aided then be left to learn on their own. The belief was, once they go through the process, they would gain new skills and taste the benefits of hard work. Then they would want to continue and work even harder, because nobody wants to be poor. RIU was also advised to focus on youths who were considered ambitious and with a higher possibility for change but they had neither land nor capital.

RIU was asked to focus on building entrepreneurship capacities for income generation and enterprise development which implied using business as the driver of implementation. It also set precedence for putting rural communities (producers) at the centre of the platform and of RIU interventions in general. This meant the systems to be worked with had to revolve around rural producers. With that in mind, two key concerns were raised and which needed attention when strategizing. First, the Coast people were not motivated enough to engage and invest in long-term agribusiness activities. Hence RIU had to choose commodities or activities which required little investment and which had a short business cycle. Second, Coast people had low capacity to engage and benefit from development interventions, so RIU strategies had to include persuasion and capacity building techniques.

As a response to the two concerns above, keeping indigenous breeds of chicken (or local chicken) was chosen over other livelihood activities based on several reasons. Local chicken enterprise was found appropriate because every household was already keeping some chicken and everybody could manage it. The enterprise also required very little land and capital and thus even the very poor could afford to. In addition, the market for local chicken and eggs was also understood to be large as urban consumers were already paying a premium price to buy them. More importantly, the business has a short production cycle (between 4 to 6 months) with profits realised soon enough to inspire an emerging entrepreneur. The activity also had a potential to impact on many people and therefore satisfied DFID's quest for widespread impact, which was a big plus to RIU.

The meeting also developed *'an innovation challenge'* for the platform. According to RIU, an innovation challenge defines clearly the scope and focus of what should be done i.e. how to eradicate the perceived problem. These actors were asked to define the system purpose. When developing the innovation challenge, participants used information from the previous discussions regarding entrepreneurship and what should be achieved. Therefore, information on challenges, opportunities, desires and intentions that came out during the previous meetings were used to coin the system purpose. The innovation challenge for the entrepreneurship platform therefore read, "*How to develop agribusiness entrepreneurship capacity among the youth for sustainable income generation and enterprise development in Coast Region"*.

From that statement, RIU was not set out to develop the poultry industry but rather to use poultry to build capacities. This meant that poultry and its technologies were only means to the end, and that the capacity to make things work was in the people. The statement also specified the target group to be youths and women, however, as we will find out later this was not the case as processes dictated differently.

6.5.3 Interpreting context and conducting a functional analysis

Before launching platform activities RIU needed to understand the socio-cultural and economic dynamics of the Coast Region in more depth. Hence the team organised a small brainstorming meeting involving 6 farmers, 2 representatives from NGOs working in the region, 1 staff from the Coast Regional office, and 2 representatives

from each of the 5 districts in the Region. Representatives from the Local Authorities were responsible for either livestock development or community development.

The brainstorming meeting was part of a stakeholder consultative process to identify opportunities and bottlenecks in developing agri-business entrepreneurship capacity in the Coast Region. The information from the meeting was later used to suggest strategic areas to be focused on and the geographical coverage within the Region. The meeting also identified functions required to meet the innovation challenge and listed actors who were already performing the functions in the target areas. The listed actors were the first to be contacted during the stakeholder mapping exercise that followed.

Understanding the context

Participants had to build a common understanding of the context in which RIU was to operate. Therefore they were asked to respond to the following question:

> ["Various technical reports, and oral presentations from experienced development actors who have worked in Coast Region and numerous political speeches have clearly raised the concern that the current **attitude** and **entrepreneurship capacities** among the people in the Coast Region are very low to levels that may not be able to trigger support or sustain any rural development initiative in the region. With regard to the above explanation, answer the following questions; (i) What **causes** this situation? What makes people in the Coast **less motivated** to engage and excel in income generating activities, particularly in agribusiness unlike what is observed in other parts of the country? (ii) What are the key **challenges** if someone is to change the situation? (iii) What are the **opportunities** for changing the situation? (iv) What are the possible **constrains** towards such a change? How and who can deal or manage such constrains? (v) What is the **role of technology** in effecting such a change?" (RIU Meeting Report, 2009: p.9).]

By asking these questions, RIU seized the opportunity to build a common perception of the problem with the community (represented by farmers), local leadership (represented by district staff), development practitioners (represented by NGOs), and the Central government represented by the office of the Regional Commissioner. This process also helped in creating a common position towards the implementation vision and strategies. The programme managed to make key actors see the problem

in the same way, as much as it could. Table 6-0 below lists the causes of low motivation for engaging in agribusiness activities as perceived by actors.

Table 6-0: Causes of low motivation for engaging in agribusiness activities

Cause	Explanation
1. Low levels of education at all levels	Limiting their capacity to understanding, interpret and make use of available economic opportunities.
2. Misleading cultural and traditional practices	Placing more emphasis on traditional practices rather than on development practices. For example, parents would rather marry off their daughters than taking them for further education. A larger part of their extra time is also being spent on traditional activities (like seasonal dances, rituals, etc.) than on income generating and developmental activities. They also have strong superstitious beliefs making them fear of being bewitched once they have attained higher economic levels.
3. Long term dependence on perennial crops	The long term dependence on crops like cashew nuts, coconuts, mangoes etc. has created a sense and culture of not doing any other agricultural or business activity during the un-productive seasons. They just wait to harvest.
4. Extensive laziness	Coast people do not like manual labour especially farming. They simply don't work on their own without being pushed. Also there are perceptions that hard work is only for people from other regions.
5. Lack of exposure to the outside world	Most people in Coast region (apart from a small number of youths) have never travelled outside their homes. This limits their knowledge of other places as well as activities and opportunities that may be available outside their areas. This limits their overall ability to learn and adopt best practices from other regions in the country.
6. Lack of capital	I.e. in form of land and finances to carryout sustainable agribusiness activities, this is true especially for the youth, who are ambitious, have experienced some form of exposure outside their areas, and understand the need for economic development.
7. Bi-annual rain season	Although this is an opportunity, it is being misused by Coast people. For example most farmers may not plant during the first rains knowing that they have the second rain season to do so, this reduces their productivity.
8. Gender roles and division of labour	Culturally, division of labour in the Coast community is highly gender based. Men mostly do small scale fishing, younger females do domestic chores at home and older females engage in both domestic and sometimes agricultural activities. This is unlike other regions where both men and women fully engage in agricultural or business activities.
9. Short term planning	Majority Coast people are satisfied with the little they earn, and mostly it is hand to mouth. There is no culture for long term production and planning, hence the production is in small scale and un-sustainable.
10. Urban migration (esp. of the youth)	A significant manpower is lost through urban migration. The productive population i.e. youths travel to cities e.g. Dar es Salaam during working hours to search for labour that will provide immediate cash. As a result most of the productive force is being unutilised.

Source: Analysed from RIU Meeting Report of 2009

From the above list, it was evident that RIU was faced by behavioural challenges more than technological. This added to the complexity of deciding what to do, how to do it and what to achieve given the duration of time available for the project. Actors were also asked to identify opportunities for improving the situation (see Table 6-1 below).

Table 6-1: Opportunities for changing the above situation as mentioned by actors

Opportunity	Explanation
1. Conducive climate for agricultural activities	Availability of fertile land as an immediate resource, and biannual rainfall
2. Proximity to the Dar es Salaam market	Which is very close to their production areas, and has a huge population.
3. Availability of labour and human resource	Especially youths
4. Presence of Natural resources	The regions is endowed with forests, ocean, and water sources i.e. rivers that can be used to facilitate several economic activities including, fishing, tourism, travel, and irrigation.
5. Presence of government ministries and departments, development organisations both local and international	With headquarters in Dar es Salaam which is a short distance from the Coast region. These also work on different development projects which can be integrated with other projects and activities in Coast Region.
6. Presence of Research Centres	Both for crops and livestock
7. Presence of local and international experts	Enhancing availability of expertise in different activities.
8. Presence of activities and projects that can deliver results and investment returns in a short time	example fishing, fruits and vegetable farming, tourism, poultry farming etc.
9. Presence of technologies to simplify work and increase efficiency	Most of the crops grown in the region have been widely researched and technologies tested in the field
10. Conducive policy	The decentralisation policy and a peaceful political environment
11. Presence of cash crops doing well in the region	Cash crops which are in high demand in the national and international markets e.g. cashew, coconut and mangoes
12. Functional infrastructure systems	The region has good roads (tarmac), presence of the harbour, and airport.
13. Multi-cultural society	People in Coast region are receptive to immigrants and people from other parts of Tanzania, and are willing to engage and work with them in many ways.
14. High poverty	which should compel people to work even harder and achieve more

Source: Analysed from RIU Meeting Report of 2009

The discussion on opportunities indicated that innovation in the Coast region did not have to necessarily start from technology nor research.

System Structure and functions

According to RIU, the functional analysis identifies all what needs to be done to make the system work efficiently. Therefore, these actors were asked to sketch the ideal system to solve the challenge, which was now the system purpose.

When listing functions needed to achieve that purpose, and therefore sketch the ideal system, participants used mostly their personal understanding on how the system should look like. So professional knowledge blended into personal views was used to visualise and sketch the ideal system, which to them it was more about visualizing the poultry value chain. The anticipation was that, if the system is assembled that way, and if it works efficiently, then the innovation challenge would be conquered. At this point RIU staff was not thinking about technologies and research outputs. Rather, they were focused on assembling actors and analysing the system. In other words they were establishing an innovation platform. The RIU role was therefore facilitation although to other actors it still looked like a normal project with funds and the power to decide everything.

When conducting a 'functional analysis' based on the above innovation challenge, the group started from listing what is needed to make an efficient and profitable poultry industry and worked in retrospect how to achieve them. They basically visualised roles to be played in an ideal industry (system). In this case participants started by simulating the perceived ideal poultry value chain and listed functions deemed necessary in each component (see Table 6-2 below). Hence they divided the industry into production and marketing components and analysed routines, inputs and services needed. As they did this they happened to arrive at three supply chains i.e. the input supply chain (for chicks, feeds, vaccine and veterinary drugs), the service supply chains (for extension, business training/services, finance, transportation, regulation, and research) and the technology and equipment supply chain (see figure 1 below). As argued by Norman Clark, they ended up dividing the industry into a socio-economic system and a knowledge system (Norman Clark, 2010).

Table 6-2: Functions and type of actors identified to meet the innovation challenge

Function component	Sub-functions	Actors
Production	- Keeping chicken	- Producers
Quality Breed: Availability of quality poultry breeds including their production, distribution and rearing	- Research - Keeping improved cocks - Extension Services	- Research institutions; Breeders - Extension workers - Local Authorities
Quality feeds: Adequate production, and distribution of high quality & affordable poultry feeds	- Research - Feed manufacturing (Wholesale) - Distributors (retail)	- Research institutions - Private feed producers - District level input sellers
Control of Diseases: Reliable and timely supply of appropriate and affordable vaccination and treatment methods and mobilisation of poultry farmers and communities to adopt preventive measures	- Research; Vaccine/ drugs production and/or importation - Retailing; Vaccination - Veterinary services + laboratory services; Extension Services	- Research institutions; - Drug companies; Drug importers - Vet shops; Local input shops - Central Animal Laboratory - Veterinary investigation Centre (VICs); Extension staff + LAs
Reliable chicken housing: Access to building materials and poultry equipment like feeders, drinkers, etc.	- Design and Building Knowledge and Techniques: - Selling building equipment	- Extension workers (LA) - Local (District level) hardware stores; Local artisans and contractors
Access to Markets: Reliable information about markets, searching and linking possible markets with poultry farmers	- Market information: Wholesale - Retail - Consumption - Regulation - Packaging - Transportation	- Hotels, Supermarkets, Local restaurants, food joints; Individual consumers; Food and drug authority - Food and health inspectors - Packing material producers and sellers; Transporters-buses, trucks.
Advisory services: Provision of competent advisory services on modern poultry farming techniques	- Research: - Extension services - Training in poultry	- Government extension - NGOs, Individual farmers, - Media e.g. radio
Transportation: Provision of reliable transport facilities, and reliable infrastructure, from poultry farms to markets throughout the year	TANROADS, LGAs, Local transporters	
Equipment and technology: Availability of appropriate equipment and technology for all activities	- Production and importation of equipment for breeding (Incubators), feeding and for carrying and transporting eggs, chicks and mature chicken, - Procurement of processing and value addition technology - Quality assurance	- Manufacturers, - Importers, - Local dealers - Hatchery owners - Local handicrafts, - District input shops - Quality regulators
Farmer mobilization: Formation and strengthening of poultry farmer groups and associations, forming linkages, advocacy/sensitization, and training to enhance performance	- Mobilization, - Training, - Registration	- Local Authorities, - Community Officers, - NGOs,
Utilities: Availability of reliable supply of utilities i.e. water & electricity throughout the year	- Water, - Power	- Water Supply company - Power supply companies - Local Authorities
Entrepreneurship /business skills: Provision of appropriate	- Developing modules - Training, - Producing and printing	- NGOs, - Local Authorities

entrepreneurship and business skills to poultry farmers		
Processing: Slaughtering, plucking and packaging	- Slaughter houses/slabs, - Packaging, Regulation	- Processors - Regulators
Consumption/ use of by-products: Consumption of eggs, meat, live chicken, feathers, manure etc.	- Eating eggs and meat - Using manure	- Consumers, - Gardeners, - Retailers
Financing	- Providing loans - Providing grants	- Banks, NGOs, Savings & Credit associations /cooperatives

Source: Analysed from RIU Meeting Report of 2009

Apparently, the above analysis was not specific to indigenous breeds, which implies that the group perceived the basic functions of an efficient poultry industry as breed insensitive.

After the functional analysis, the next step was to identify relevant actors to work with.

Mapping actors: Starting with whoever is there

After the functional analysis exercise RIU hired two consultants to map actors in Coast Region and in Dar es Salaam City based on the identified functions. Dar es Salaam actors were also mapped because of the city's economic dynamics and its proximity to the Coast region. Such actors were expected to be influencing the input and service markets, as well as the product markets because some of them could be providing services to the Coast region from the city. Geographical boundary was therefore flattened accepting that actors are not necessarily defined by their geographical locations. This exercise was random and identified actors based on asking who knew who, where. Thus one actor interviewed would mention another actor(s) he/she happened to know, and so on.

In this assignment, consultants were asked to identify actors, visit them to see what they do, assess capacities (both full and operational), identify structural gaps i.e. functions with no actors performing them and possible reasons, and then get actors' contacts and invite them for a meeting. This exercise took about 30 days to accomplish identifying 25 actors who were invited for the first brainstorming meeting which shaped processes that established the Entrepreneurship platform. In this meeting producer households were represented by farmers proposed by District Authorities who used their own criteria to select them.

According to the meeting report, the twenty five actors were; six farmers from five districts; two small scale hatchery owners producing chicks of indigenous breeds; five district level agricultural input shop owners; six representatives from Local Government Authorities (responsible for livestock); one large scale poultry inputs (feeds, drugs, vaccines, equipment etc.) manufacturer/importer and wholesaler; two representatives from organisations supporting rural producer groups; one representative from an organisation supporting development of small industries in one of the districts and therefore supporting fabrication of farm implements and equipment like low cost incubators, feeders, drinkers etc.; one business trainer; and a representative from Regional Authorities responsible for livestock regulatory and coordination functions at the regional level.

In principle, RIU did not influence the process of selecting initial actors to work with. When asked during the interview why they did not work more carefully to make sure only the right actors are selected to work with, their response was:

> ["It does not matter where or with whom you start, because things get reorganised somehow as you go along. After all, how would you tell who is the right one and who is not before you even start?" (Interview with ex-RIU staff, May 2013).]

While some might argue that some important actors like researchers, financial institutions and national level regulators from the Ministry were initially excluded, or that some of those present were less relevant at start, RIU staff explain in the interviews that at this point the intention was not to be exhaustive (or precise) on whom to work with. As it was mentioned earlier in the chapter, the process itself selects which actors to exclude and include.

Negotiating for space in the local context

It is worth noting that during these discussions RIU was not a passive actor which could not defend own interests. In particular, the RIU's decision to work in the Coast Region and to use the innovation approach for 3 years was non-negotiable. Actors had to therefore plan and make decisions within those limits. The meeting proceedings also show that participants in the meeting were clearly informed that the RIU programme had to be implemented in such a way that it had a high likelihood of impacting on the lives of many poor people; it addressed the needs and limitations of

the vulnerable groups e.g. women, youths etc.; it stimulated the use of research outputs; and it built sustainable systems that could continue even after the programme phases out. These RIU positions are not found to be limiting actors' interpretations of the context and definition of processes, at least not from what is presented in the content of what transpired during the two initial meetings. Moreover, RIU accepted change to its budget and funded the consultative visits to four Regions to identify priorities as a suggestion from actors. This activity was not in the budget but it was found useful and RIU paid for it. This means RIU allowed part of its implementation plan to be shaped by the stakeholders and therefore sought to become one with its environment and therefore create a shared goal with its context.

Therefore, programme interests were continually negotiated throughout the discussions. For example, proceedings show that cassava, mangoes and beekeeping were also among the activities initially considered for the entrepreneurship platform. However, RIU argued against mangoes and other fruits as they required a lot of time and long term investments which was beyond the capacity of RIU and timeframe. The RIU team also argued further that benefits from such products would be limited to a few people while RIU was looking for impact at scale. Cassava was also taken out of the list to avoid duplicating other projects in the same target areas. So RIU wanted to safeguard its identity and avoid clashing with other development projects.

6.6 Summary and conclusions

The chapter describes the initial process of a programme which sought to understand how innovation could be promoted in poor economies by actually doing the promotion. It describes how RIU, balanced the *'motives'* of the funder (DFID) and the *'unpredictable choices'* from the context. In fact, it is this process of striking the balance between meeting expectations set by development actors, and those set by the society where the programme intervenes that defines effective innovation facilitation or brokering. Often, development actors have *'motives and powers'* (both technical and financial)' to influence and direct innovation, while on the other hand the target community has *'texture and intrinsic powers'* (in terms of culture, knowledge, beliefs, skills, resources, etc.) which determine how the context will respond and emerge as a response to the programme influence. Apparently, both

'powers' play very important roles in initiating and shaping innovation processes needed to transform an industry dominated by subsistence producers. Both centres of power are necessary if transformation is to happen. Only a proper balance is needed to allow co-evolution of innovative processes.

The chapter also describes how *'innovation system thinking'* was practically used to guide programme implementation. It elaborates how RIU mobilised stakeholders and facilitated them to collectively identify the main problem and thereafter developed a strategy to address it. From this experience, the study confirms that knowledge and innovation can as well emerge from the society/users and not necessarily from research or experts. Therefore, RIU did not rely on a ready-made plan, but rather used local knowledge to conduct self-assessment, then sought solutions.

Although stakeholder mobilisation is a popular practice in participatory planning, it does not always lead to identifying an innovation system, or an innovation challenge. Therefore, what is unique to RIU is how dialogues were used to identify and interpret a socio-cultural problem into an innovation challenge. And from the challenge a functional analysis was conducted to guide the establishment of a network or system to work on, or start with. Thus, by knowing which problem to solve, and agreeing what functions are needed to solve the problem, the type of relevant actors needed to build the system and work together to make the system running was known. Additionally, the analysis shows that, an innovation process can start with whoever is available, as long as relevant actors are supported to join in as needed.

The chapter also makes it clear that stakeholders in the rural poultry industry in Tanzania did not think in terms of which technology was needed. Rather they articulated problems more socially than technologically. To them the problem was 'laziness' and not lack of technologies. And after further analysis they established that in order to solve that major social problem, addressing system failures was likely to be more effective than focusing on technology failures. And that is exactly what the programme did. Therefore, this is an example of an innovation process which started from a social problem, that later attracted new knowledge and technologies as solutions. Thus, the innovation system was connected to address a social quest.

Another important conclusion from the chapter is that planning to deliberately facilitate an innovation process means letting go of the well-established desire and culture to be in control of processes and eventualities, which are basically linked to the need to justify value for money. The facilitation also means flattening of professional demarcations so as to allow engagement of multiple actors in visualizing and managing processes. For example, RIU facilitated meetings involving different actors like researchers, government staff, private sector, and producers to meet and think collectively how to solve one problem. Therefore, the programme was able to visualise all actors and processes from a seamless web perspective.

The chapter argues that RIU was faced by more behavioural challenges than technological. This added to the complexity of deciding what to do, how to do it and what to achieve given the time frame provided. In principle, RIU was not set out to develop the poultry industry but rather to use poultry to build people/actors' capacities. This meant that poultry and its technologies were only means to the end, and that the capacity to make things work was in the people.

Chapter 7 Sketching networks to build trust

7.1 Introduction

This chapter continues from where Chapter six ended. It describes the RIU process of influencing innovation behaviours and structures in the rural poultry industry in Tanzania. The chapter explains how ideas and interventions gradually got shaped by what was happening on the ground. The chapter investigates the complex process of stimulating interactions among poor actors and the process of building networks and relevant systems capacities to innovate, as argued to have been adopted by RIU.

The chapter is organised into four sections. Section two describes how RIU facilitated processes to analyse the poultry industry and understand it as a system. It explains how the system was assembled by bringing relevant actors together to brainstorm and agree on the problems to be solved. It explains how RIU built a common understanding of the industry as a system among different actors, and how stakeholders conducted a system analysis to identify systemic problems. The section presents these as very important processes which brought cohesion among different actors who had different interests and capacities.

The third section explains how early trust was built among actors. It describes different processes which RIU facilitated in order to overcome different barriers at different levels. These included personal, cultural, organisational and even political barriers towards commercialisation of rural poultry enterprises. The section also describes how actors went through various negotiation processes before they could decide to engage and interact with each other. The sections ends by establishing the importance of creating a mental sketch of the envisaged network before actual interactions start. It also explains how important it was for RIU to meet the cost of sketching this network as no private sector would bear it. The study described it as the *'social cost'* of building the basic infrastructure for interactions to be practicable. Finally, the fourth section summarises and concludes the chapter.

7.2 Understanding the system and creating a shared vision

7.2.1 Mobilizing actors: Building a common understanding

In April 2009 RIU organised the first meeting involving 25 actors. These actors were identified during a stakeholder mapping exercise based on pre-identified functions listed by national level poultry stakeholders and experts. This was the beginning of RIU facilitation to promote innovation in the rural poultry industry in Tanzania.

The objectives of this meeting were: first, to let actors meet for the first time and know each other face to face, and know the range of functions performed by others in the same industry; second, to build a common understanding on the concept of innovation platform, i.e. how it works and what actors should aim to achieve together; third, to conduct a system analysis and identify bottlenecks and challenges preventing the industry from performing well, and also proposing solutions to overcome the identified challenges; fourth, to come up with clear strategies and commitment to overcome the main innovation challenge identified by the national level stakeholders i.e. "*How to develop agribusiness entrepreneurship capacity among the youth for sustainable income generation and enterprise development in Coast Region"*; and fifth, to agree on how to continue interacting as a platform.

According to interviews with ex-RIU team, this meeting was facilitated with the understanding that these actors would continue to operate as a platform and remain responsible for a continuous process of identifying problems, seeking solutions and utilizing proposed solutions. The anticipation was, as guided by the platform concept, that these actors would form institutions–formal or informal–which will guide the industry even after RIU's exist. However, due to different dynamics discussed in later sections, things changed and the platform idea was later abandoned.

In this meeting RIU sought to create a common goal with the actors and thus negotiate to harmonise its interests with those of the actors. While the invited actors got the opportunity to understand the nature and interests of the RIU programme, the programme also understood the system, individual actors and their interests. In addition, actors also understood each other and compared their individual interests

with those of others. At this meeting RIU secured its position within the system and gained the initial trust from actors because, as actors continued to analyse the system through explaining what is happening, challenges and opportunities, RIU understood the context and therefore was able to visualise its role regarding where to intervene and how. Therefore, RIU as a programme was relying on the cognition of the actors present in the meeting, and that of its staff to define what RIU should do. As actors were defining their positions in the system, RIU was also defining its own. It would have been counterproductive if RIU had opted to come with a blueprint on what to do.

According to the interviewed actors who attended this meeting, the discussions and arguments raised in this first meeting had a significant effect on how they later decided to act and interact with other actors. One participant, a representative of poultry producers, said clearly that other actors made her understand how her behaviour made them decide not to interact with her. On the other hand, other actors, specifically the input and service providers, compared the meeting with a market exhibition where they displayed their products to rural poultry producers and RIU, who was then supposed to help in making input deals possible. It is important to note that, the actors in the supply side of the industry were already interacting and doing business with other poultry producers in urban and peri-urban areas, so all they wanted was to extend their client base to include rural producers. All suppliers believed to have the capacity needed to interact with rural producers. To them the only problem was insufficient demand and logistics surrounding rural transactions, meaning that producers were the main problem. But as described in later sections, this understanding was later proved to be wrong.

7.2.2 Beyond meeting face-to-face

As mentioned earlier, twenty-five actors attended the first platform meeting with most of them meeting for the first time. They started by knowing and learning about each other as persons and what they do. The meeting process required that actors sit at a table with people they did not know well and find out from each other in 15 minutes, who they are, what they do and what they are really proud of in their personal and professional life. Then every actor kept on moving until he/she had met

all the 24 actors and had a personal chat. From this interaction actors were expected to have an idea of who is present in the room and type of work they do. During the interview one farmer said:

> ["I was surprised to know that there is someone making a living just from producing and selling chicks." (Interview with a Producer, September 2013)].

This farmer did not know that if such a specialisation existed. Some service providers mentioned learning about business opportunities by hearing what others were doing. Therefore, the face to face meeting initiated a learning process and from which information was processed at personal level and facilitated future decisions.

However, meeting face to face alone was not enough to change individual routines because at this point, any changes at individual level depended on a relative change on another actor's level. Therefore, if RIU had ended its work by just facilitating face-to-face interactions, innovation would not have happened because what hindered their interactions was beyond not *knowing each other* and *knowing each other's existence*.

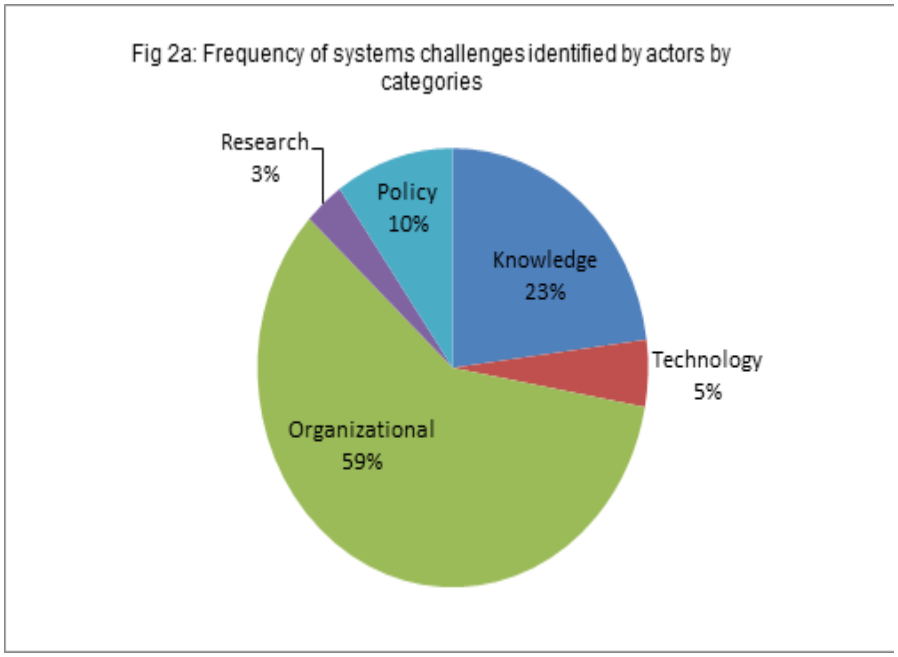
7.2.3 Systems analysis: What bottlenecks?

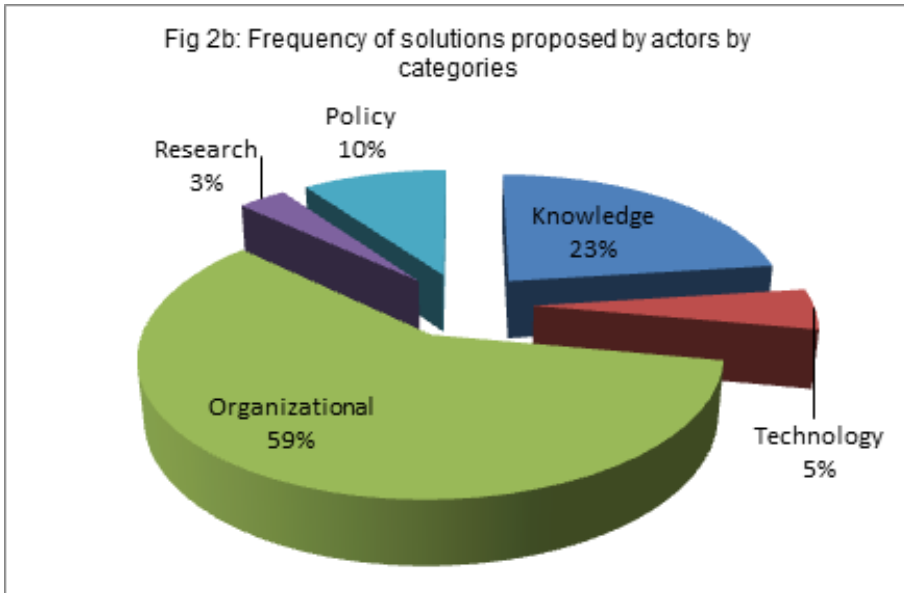
In order to know where to intervene, actors were asked to analyse each function and identify key problems they perceived to be limiting growth in the rural poultry industry, and propose solutions. Data presented in Table 7-1 below show that during the analysis, actors perceived the system to have more organisational (59%) and knowledge (about 30%) challenges than technological and research[29] related (see Figure 7-0 below). This is supported by the fact that poultry research is generally known to be well developed with numerous technologies available worldwide. However, these are not accessible to rural producers and have not been adapted to suit their contexts. Moreover, technologies such as those related to breeding, feeding, processing etc. were already present in Tanzania and used by commercialised actors (Msami, 2008a). The meeting therefore implied that, adoption and adaptation of such

[29] Note that research here is looked at as a service to be demanded and provided to the industry and not as "the" source of technology or knowledge. In this case technology and knowledge are considered to have their own sources and research could just be one of them.

technologies were largely limited by organisational issues and lack of knowledge (see Table 7-0).

Figure 7-0: Analysis of system challenges done by stakeholders





The analysis also shows that some problems had more than one solution, i.e. they proposed 76 solutions to solve 61 challenges. Meaning that, a problem could be technical but in need of organisational and knowledge solutions as well. The fact that

a problem can have multiple solutions from multiple sources creates the possibility for complex multiple interactions in a system.

Table 7-0: Frequency of systems bottlenecks and their solutions by categories

	Knowledge		Technology		Organisational		Research		Policy		Total	
	Gap	Sol	Gap	Sol	Gap	Sol	Gap	Sol	Gap	Sol	Gap	Sol
Breeding	2	3	1	1	1	1	1	0	1	1	6	6
Feeds	2	3	1	0	3	4	0	0	1	1	7	8
Disease control	4	4	0	0	3	2	0	0	0	0	7	6
Extension	0	1	0	0	5	1	1	1	1	2	7	5
Markets	3	2	0	0	2	3	0	0	0	0	5	5
Transportation	0	0	0	0	3	4	0	0	1	1	4	5
Equipment	0	0	0	0	4	4	0	0	0	0	4	4
Farmer groups	1	1	0	0	3	5	0	0	0	0	4	6
Utilities	0	3	0	3	3	3	0	0	0	0	3	9
Business skills	0	1	0	0	2	3	0	0	0	0	2	4
Processing	1	3	1	2	3	4	0	0	0	0	5	9
Use of by products	1	2	0	0	2	1	0	0	0	0	3	3
Financial services	0	1	0	0	2	4	0	0	2	1	4	6
Total	**14**	**24**	**3**	**6**	**36**	**39**	**2**	**1**	**6**	**6**	**61**	**76**
%	***23.0***	***31.6***	***4.9***	***7.9***	***59.0***	***51.3***	***3.3***	***1.3***	***9.8***	***7.6***		***76***

Source: Analysis of secondary data from RIU Reports, 2014

Knowing the problems identified by actors and their potential solutions was not enough for RIU to know what to do. Gaps and solutions listed were beyond individual efforts and therefore needed collective actions to solve. For example, improving availability and quality of breeds or a strengthening of the extension system required different levels of interventions and actors and not just from individuals. However, all actors had to act in one way or the other to create this collective effort - and the question was how.

So the next step was to find out why actors already performing those functions did not solve the problems to improve the situation. For example, why didn't chick producers improve the breed quality? Or why didn't feed manufacturers solve the quality and availability problems? The one clear answer that cut across all functions

was a perceived lack of 'incentives' to do so. Solving these problems required investment in terms of time, labour and financial capital which was not justified by expected returns. According to these actors, the level of demand and engagement, especially from rural producers was too low to justify any investment to increase quality or quantity. Government representatives also argued that the number of chickens kept in the villages – which was between 5 and 20 per household, was too small to trigger regulations or budget prioritization. Likewise, district level input suppliers mentioned that they did not stock poultry inputs in their shops because there was no demand. Therefore, demand was expected to pull supply and supply would pull knowledge, technology, policy, research and reorganization.

Then the next question was why there was no demand from producers? Producers in the meeting raised the following arguments; First, they did not know if they could use any of the poultry inputs and services in raising local chickens. What they knew was that indigenous breeds of chicken were free range and did not need any extra feeding, or special shelter, not even vaccines and drugs. This is how it is done in the villages, and inputs and technologies were for improved breeds (i.e., *kuku wa kisasa* in Swahili); Second, the number of chickens kept did not justify building a shed or buying inputs. Five chickens could just squat in the kitchen at night and go out in the morning. Likewise, why buy vaccines and drugs just for 10 chickens? Third, the cost of inputs and other services was too high for them to afford. Therefore, the main problems were around knowledge, production scale and affordability.

In raising the concerns above, producers argued that if extension service providers would have provided the information about the possibility of using the inputs to gain more income, and if input suppliers would have made them available at affordable prices, they would have considered increasing their production scale and produce more for the market.

The conclusion was therefore that, the system was facing a '**demand and supply deadlock'**. This implied that both '*supply-push'* and '*demand-pull'* strategies were needed to unlock it. Basically, this realisation shifted the attention of RIU and other actors towards the economic angles of the problem at hand. And the question was

how could actors on the demand side, and those on the supply side interact? And where could their interaction space be?

7.2.4 Discovering the 'my business doesn't know you' effect

As actors continued to interact and discuss what was limiting growth in the rural poultry industry, it became clear that the rural poultry production space was disconnected from the market where most other actors operated. Thus producers became outliers in the system separated from the critical *'interaction possibility space'* mainly by how they managed their enterprises and even more so by their physical distance. By not producing for the market, and by operating in remote areas, the rural chicken producers made themselves unattractive for partnerships with other actors in the system, including the government. This came out clearly as producers mentioned to have no reasons to interact with input suppliers because they did not need their products. Similarly, input suppliers expressed no desire to interact with rural producers because there was insufficient demand to trigger business ties. At this point the situation was clear that unless their enterprises were also in synchrony, knowing each other as persons was not going to change anything.

Clearly, all poultry inputs suppliers present in the meeting were already interacting with poultry producers at the input markets, where they exchanged commercial inputs. Therefore, for the rural producers to also interact with these suppliers, they too had to find their way to the input market. It occurred that both sides needed a common space where the interaction would be governed by common and mutually accepted rules, and the market was the best place because the *'individual production space'* was found too private for such a interaction.

The above discussion indicates that linking actors in a system also involves linking what they do. That is, finding overlaps between actors' preoccupations and establish relationships between them. In addition, the overlaps must be perceived by actors involved. Therefore, in order for actors in a system to interact, their businesses need to have the affinity for each other, and which should exist both at purpose and operational levels. Therefore, all enterprises in the industry had to be synchronised into one big orchestra, which though encompassing many and different instruments, had to stay in tune with each other. Like musicians and their instruments in an

orchestra, these actors' saw the need for their enterprises to 'need' each other in order to accomplish what they do as an industry. This was paramount because it is through the negotiations to satisfy such needs that interactions become economical. In fact, creating and consciously perceiving these overlaps were very important steps in establishing reasons for interactions.

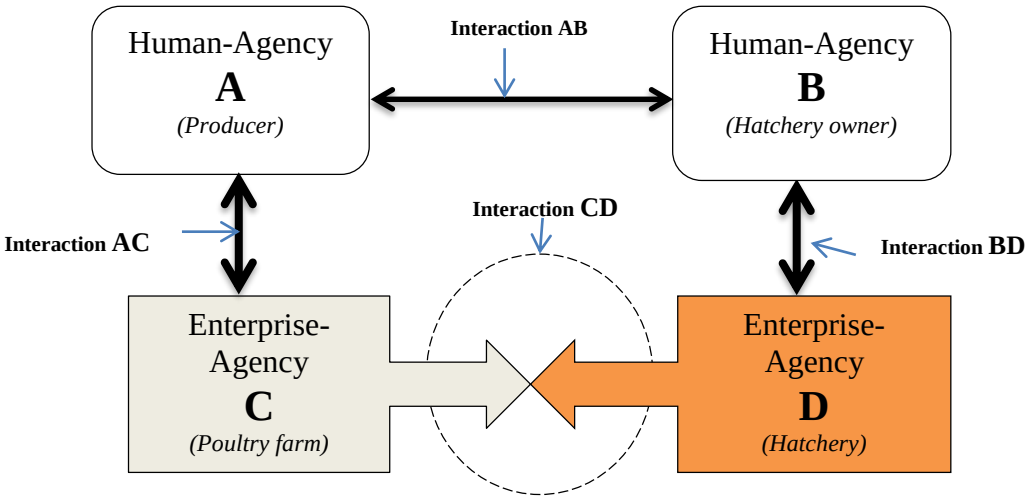
The argument here is that, within a socio-economic system there are two interdependent levels of interactions i.e. the '*human-agent interactions'* and the *'enterprise-agent interactions'*. Analysing the poultry industry case, shows that the human-agency interactions are needed to channel information and interpret it into choices and decisions. While the enterprise-agency is needed to give purpose to the interactions and produce value. For example, what is going on within a given poultry enterprise defines needs and subsequently defines the type of interactions needed to satisfy those needs. So the enterprise produces a need and the human-agency uses the information to make decisions on the type of interactions, select which supplier and then do the actual interaction with the counterpart human-agency (who will again interact with his enterprise) to satisfy the need (See Figure 7-1 below).

Without the enterprise, the human-agent would not have decided first to interact with any suppliers, and the agent would not have known which supplier (for chick or feed) to interact with. Once the decision to interact has been made, the human-agent will do the actual interaction and get the input, then the enterprise will utilise the input and give value to the interaction by producing output. Moreover, if the enterprise fails to produce value from the inputs (i.e. from what was gained from the interaction) the human-agent will use the information as a feedback to make another decision-either to change the supplier or change the product of the interactions (i.e. by a different brand of the same type of input etc.). For example, if producer administers a drug and the chick does not respond positively, then he would consider buying another brand or even changing supplier.

From poultry actors' perspective, '**interaction CD'** did not exist because '**enterprise-agency A'** was not producing for the market, hence did not need outputs from '**enterprise-agency B'**. Consequently, '**Interaction AB'** became redundant. I.e. both the chick supplier and the producer did not find the reason to interact with

each other because the producer was relaying on natural breeding. Likewise, '**interaction CD'** did not exist because what was shaping '**Interaction AC'** had nothing in common with what was shaping '**Interaction BD'**, i.e. the later was market driven, while the former was not.

Figure7-1: Illustrating the interdependence between 'human' and 'enterprise-agencies'



Source: Field Data Analysis, 2015

Therefore, in order to create a meaningful interaction, all interactions (i.e. AC, BD, CD and AB) must exist. This means adjusting the purpose and routines within '**enterprise-agency A**' to be market driven and therefore be in tune with '**enterprise-agency B'**. The adjustments are expected to consequently change '**Interaction AC'** and synchronise it with '**Interaction BD'.** Once '**Interactions AC** and **BD'** are both market orientated, then '**Interaction AB'** will exist to sustain **Interaction CD'** which is key in driving the system.

It was also reasoned that once the purpose of '**enterprise-agency A**' changes for the market, more interactions with other enterprise-agencies will be justified, and learning and innovation will be necessary. The workshop participants' assumption was, once enterprise-agencies (e.g. a poultry farm and a hatchery) interact, the need for new routines emerges and learning and innovation take place. Furthermore, as more enterprise-agencies get synchronised, technology and organisational learning becomes necessary.

Therefore, the entry point was to make farmers produce for the market. Hence decision was made to commercialise their poultry enterprises so that they demanded more inputs. The increased demand for inputs was expected to trigger demand for new knowledge on how to utilise/administer them, and consequently trigger competition and investment to increase quality and quantity of inputs and services. At this point, the supply chain was assumed to be sufficiently capable of responding to demand. However, this was later proved wrong as explained later in the thesis.

Therefore, all enterprises in the industry had to be synchronised to need each other (i.e. have ***'affinity'*** for other enterprises). Which means, what was going on in the farms, had to be linked to what was going on in the actors' units, e.g. hatcheries, feed plants, input shops, etc., And specifically, producers had to find their way to the input and output markets and create a significant presence. This meant a significant number of producers was needed to create significant volumes of both demand and supply.

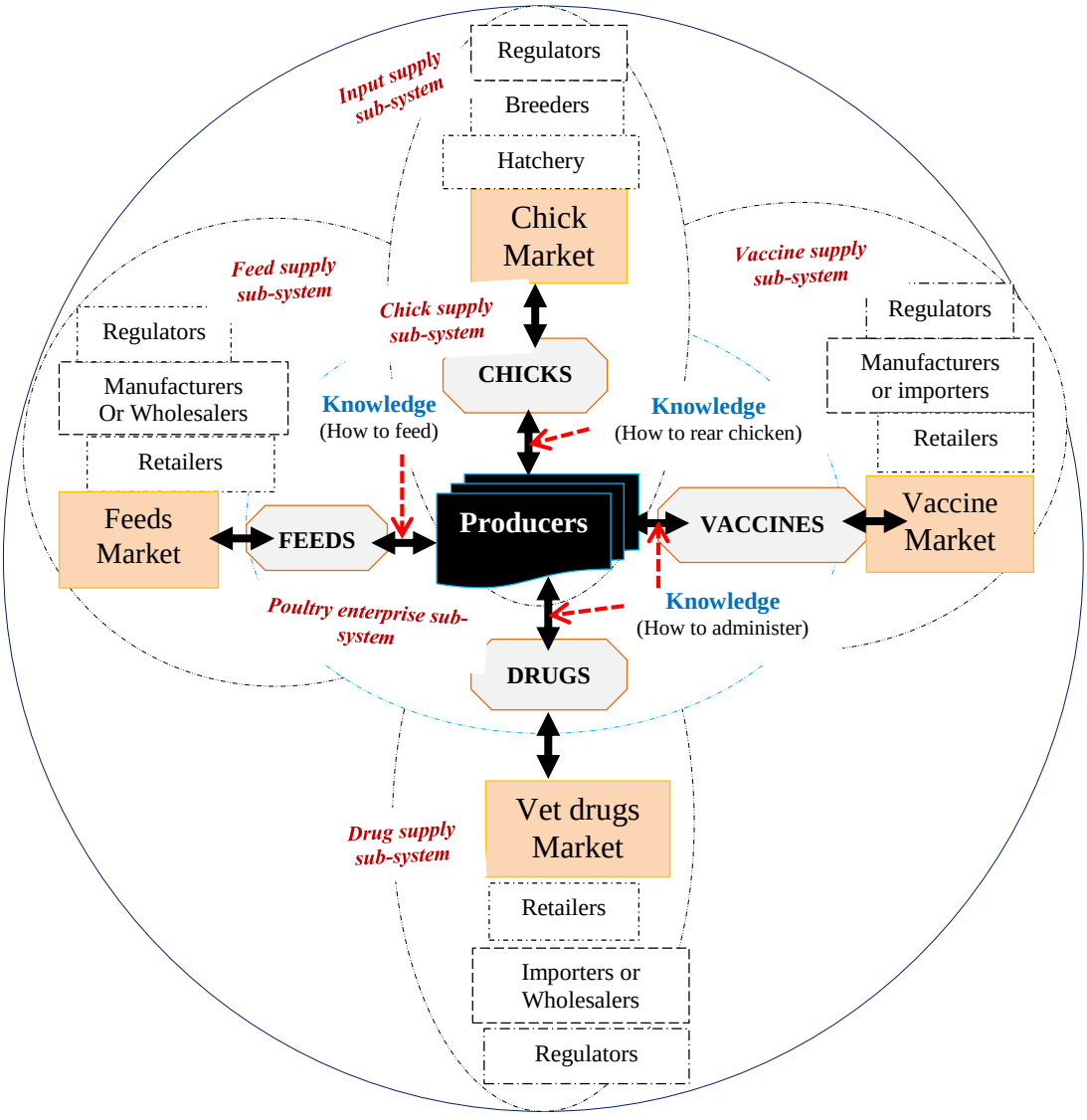
7.2.5 Visualizing sub-systems to identify initial entry points

In the process of developing strategies to promote producers' interactions within the industry, the workshop divided the industry into three main subsystems, namely (i) the **production subsystem** where rural producers keep chicken to maturity until they are consumed or disposed through selling or as gifts; (ii) the **input subsystems** where chicks, feeds, vaccines, drugs and other equipment are manufactured, imported and distributed; and (ii) the **product market subsystem** where poultry products are sold or consumed. Other functions/services like extension, training and regulation were put in all the three subsystems (See Figure 7-2 below).

Although it is not clear from RIU reports why such categorization was done, interviews with RIU staff show that actors analysed the functions in terms of supply and value chains. Then judged which parts of these two chains were critical and relevant for improving producers' present situation. So they first looked at producers' situation and reasoned they needed to start interacting with input markets in order to interact with all supply chains. This meant producing for the market.

Therefore, the meeting considered markets as interaction hubs where producers and suppliers could meet. They divided the input markets further into feed, chick, vaccine, and drug markets. According to them, these markets were organised and therefore behaved differently, hence producers were also expected to interact with them differently. This suggests that actors recognised the 'input markets' as not necessarily governed by the same conditions or rules. Further subdivision of the input market into individual inputs markets was done to create even smaller subsystems, i.e. for chicks, feeds, vaccines and drugs supply. See figure 7-2 below.

Figure7-2: Sub-systems identified during the first stakeholder's meeting



Source: Field Data Analysis, 2015

As discussed in the previous sections, the main challenge for the platform was to address the perceived problem of "laziness" by building entrepreneurship capacity and zeal. Therefore, supporting rural producers to produce for the market could not be more relevant to RIU. In this case, platform members had figured out that producing for the market would mean creating income expectations and therefore make producers learn and work hard.

Then the next question was, 'why were producers not in the market?'

7.2.6 Why are interactions currently low?

When discussing system challenges all other actors were discussed as individuals who could interact in the system and make significant changes. However, rural producers were discussed as a group whose collective behaviour had influenced the way other actors interacted with them. For example, having 100 producers keeping two chickens under traditional system made input suppliers not attracted to open input shops in their villages. Furthermore, opening an input shop in a village wouldn't have necessarily influenced how producers kept chicken in the villages.

Thus during the analysis, most actors, and especially poultry inputs suppliers and services providers expected producers to visibly demand their services. This meant changing the way producers kept chicken in such a manner that they start to use inputs. Therefore, making rural chicken enterprises demand inputs was mentioned to be the only way interactions between rural producers and input markets would increase. This meant making the enterprises need services from the markets.

A platform meeting report of 2009 shows actors concluding that relying on natural breeding made producers unable to decide on the scale of production, hence they were forced to keep very few birds. This gave no reasons to expand beyond the traditional system. The same meeting argued that producers were too poor to afford inputs even if they wanted to expand. Thus, poverty was concluded to be both a cause and effect of low innovation in the industry.

Input suppliers and other service providers argued that producers were too poor and too scattered in remote areas to do business with. Thus the cost of doing business with them was too high. Their behaviour was influencing the behaviour of other actors negatively. It was concluded that other actors in the industry could not

influence the behaviour of the producers by just adjusting their own routines, because a significant change involving a significant number of producers, all changing at the same time was necessary.

Therefore, a *'supply-demand deadlock'* was identified as the main problem. This was concluded because of the following; there were **actors** already engaged in poultry activities; **technologies** and **skills** were floating around (some already used by other poultry producers in the country); **poverty** was there to be eradicated as a motive, and **market** for local chicken was there to the extent that consumers were already paying a premium price to buy local chicken meat and eggs. So the question was why wasn't the sector growing? Suppliers complained of lack of demand for poultry inputs and services from rural producers while rural producers complained of lack of knowledge and capacity to use poultry inputs in keeping local chickens.

7.2.7 Selecting Commercialisation as the driving theme

After the discussions in the meetings, each actor was expected to make significant adjustments in their routines. Resources had to be reallocated and new habits and processes had to be adopted. For rural producers, the proposed change required them to take new risks including reorganising their labour and resources. They also needed to influence each other and gain the size and volumes needed to attract other actors into associating with them. They also had a lot to learn to be able to gain the anticipated income. More importantly, there needed to be **'trust'** that once they decide to take the risks on their part, other actors would not let them down.

So RIU facilitated process to stimulate producers' desire to explore new ways of doing things. RIU explained to producers the kind of changes required at production level, including in routines, attitude, skills, organisational, resource allocation, etc. Producers were also told how such changes would stimulate changes in the remainder parts of the system. According to RIU, this discussion was meant to prepare them for changes, some of which were unknown to RIU as well.

Additionally, before other actors like chick producers and input suppliers could reorganise their enterprises to fit in the requirements of doing business with rural producers, they needed the assurance that the quantities demanded would be sufficient and sustainable to justify the changes. They also wanted to be assured of

producers' ability to pay. Indirectly, they also wanted to be sure that rural producers would be able to effectively use their products and therefore find them useful and ensuring their continuous use. This means suppliers wanted to know how farmers would be supported to be able to utilise their goods and services.

Therefore both sides needed to negotiate before they could actually change.

7.3 Quantifying uncertainties and building early trust

The desire to quantify uncertainties associated with the proposed shifts was expressed by actors who required new investments or reallocation of resources in changing routines. This necessitated the programme to facilitate prior negotiations before any transactions or physical change in enterprise routines started. In doing this RIU found itself sketching the envisaged network by facilitating prior negotiations between and among actors. It turned out that this sketching process made actors gain some degree of trust and confidence on corresponding actors' behaviour regarding the anticipated changes. It is from this sketch that actors were able to visualise the collective move of changing routines towards a common goal. It gave actors the opportunity to ensure all relevant actors needed to complete the chain are lined up and the necessary arrangements have been set.

The sketching process made sure that basic capacities and structures needed for each actor to respond to changes made by others were in place. This was very important because no actor wanted to change routines without being sure that others would respond effectively. For example, poultry producers did not want to build new sheds and find no chicks or vaccines to buy, and hatchery owners did not want to invest in producing more chicks only to find very few producers ready to buy a few chicks. So the first key actors, i.e., producers, chick suppliers and input suppliers, whose changes in routines involved cash investment, wanted to be sure of other actors' ability to respond to the expected changes.

Sketching the network also had a cost which was fully paid by RIU. RIU organised meetings, visits, telephone calls and other logistical costs to facilitate dialogues between or among parties. The network had to be sketched in a timely manner, and relevant actors had to be ready for the anticipated changes. This included knowing how they were going to achieve what was expected. Although the sketching was only

conceptual, the decisions made out of the negotiations were very important towards the achievement of the activities that followed.

The RIU reports show different levels of interactions made to sketch the envisaged network. Those are; (i) interactions to internalise the commercialisation idea; (ii) interactions to overcome personal and socio-cultural barriers; (iii) interactions to ground the programme with local politics (i.e. seeking local political approval); and (iv) interactions to negotiate access to poultry inputs and services. As it will be described below, different actors interacted in different meetings aiming to build a common understanding, manage fears, and getting everyone ready for change.

7.3.1 Internalisation of the proposed commercialisation idea

RIU organised twenty village meetings (i.e. five in each programme district) involving rural producers, RIU team members, poultry input suppliers, and other professionals. The objective of these meetings was to elaborate to producers what commercialisation meant, what it would entail and what are the benefits. The meetings allowed producers to ask questions and express fears.

In these meetings major changes in the way producers kept chickens were discussed in detail. Reading from proceedings of these meetings, it is actually at this point when farmers started to get a glimpse of the magnitude of changes they had to make. They were informed about new routines associated with commercialising including the need to use different inputs and technologies. Specifically, they were informed of the need to start buying day-old chicks from hatcheries, keeping chicks warm and feeding them with special feeds until they are two months old when they would be able to go out and fend for themselves. They also learnt that they had to build sheds to protect chickens from predators as they would now be too many to share the main house with the family. They were also told of the need to control diseases though vaccination, proper nutrition and even treat them with drugs when they fall sick. This meant learning how to care for day-old chicks, feed, vaccinate and even detect disease symptoms; and that by doing so chicken mortalities would decrease and they would mature after 3 to 4 months instead of 18 months.

During these meetings producers had the opportunity to understand how their behaviour influenced those of other actors, and that all had to change if they were to

meet their shared and separate goals. Therefore, as producers interacted to understand commercialisation they also initiated a learning process towards changing their behaviours and consequently changing the dynamics of the entire industry/system.

Other actors present in the meetings also understood the potentials and possibilities of doing business with rural producers. Actors like input suppliers told producers what they needed in order to do business with them. It was during these meetings that producers understood why they needed inputs and why the right volumes had to be consistently demanded if someone had to make them available in their vicinity.

It is important to note that during these meetings producers were cognitively freed from fears and perceptions of limitations related to their subsistence nature. Rather they were facilitated to understand the shift and define the best way to engage and make the shift. What I am highlighting here is the tendency to pre-determine what the poor can or cannot do without giving them the opportunity to experiment beyond their current limits. Consequently, the possibility of creating mechanisms to support them to experiment other paths is largely overlooked and denied. So my argument here is that, what development actors perceive to be appropriate for the poor should not be the verdict. Rather, they should allow the poor to make choices and define their own development paths. This includes exposing them to options and providing support to experiment until they choose their best position.

Using perceptions on *'poverty status'* or *'vulnerability levels'* to benchmark types of technology or innovations to be introduced to a certain community in the name of seeking what is 'appropriate' for them is actually a form of discrimination because it underrates the cognitive ability of the poor to choose and adapt technologies for their suitability. For example, the current penetration and usage of mobile phones in poor communities was unexpected because the initial thinking was the technology was too expensive and required skills and infrastructure not available in those communities (May Julian, Waema Timothy M., 2014; p.4-6). Sadly, there was too much focus on what was lacking i.e. poverty, high illiteracy levels, lack of electricity and skills to maintain and repair than on the abilities within these people to shape and adapt. Therefore, what the RIU experience elaborates here is the possibility of

focusing on creating a mental shift towards setting new expectations, rather than being fixated on existing limitations; then later facilitate processes to innovate around the limitations.

7.3.2 Overcoming personal and socio-cultural barriers

After the village meetings, producers were given 90 days (approximately 3 months) to decide whether they wanted to join the programme or not. According to RIU staff, each producer had an opportunity to join the programme. The only selection criteria were commitment to build a simple shed using locally available materials, and to commit to the programme. It happened that producers maintained discussions among themselves and within their families which according to one interviewee (Interview 21) helped them make the final decisions.

These interactions among producers were triggered by the need for individual producers to overcome personal barriers and make the decision to raise chickens differently. According to interviewed producers, being new to the idea, they had to go through a negotiation process with themselves, their families and with the rest of the community. Apparently, three issues were mentioned during group interviews as the main concerns which occupied these negotiations. First was whether they would manage to raise so many chickens (personal ability doubts). Second was if there would not be problems with resource allocations at household level as time progresses (resource capacities). Lastly, was whether raising local chickens differently would produce results claimed by RIU and poultry input suppliers.

This process took producers a long time as they had a lot to deal with. During the interview it came out clearly that some farmers were quicker to decide than others depending on different factors, both personal and cultural. It appeared that, although most of them wanted to gain more income and get out of poverty, they did not believe keeping chicken could achieve that. This feeling was founded on socio-cultural and widely promoted scientific findings regarding the productivity and value of the indigenous breeds of chicken. For many years, science has argued that local chickens have low genetic potentials hence are not suited for commercialisation.

Apparently, those who were quick to decide took the responsibility of encouraging others because other actors, especially input suppliers had indicated the need for a

significant volume of demand before they could respond and supply. Consequently, RIU set a minimum of 25 households per village before the programme could work in a particular area. This need for volumes and specific numbers of producers intensified the farmer to farmer interactions which resulted into continuous interpretations of concepts and ideas into their own (local) language and meanings. Interviews reveal that producers who did not believe in commercialisation interacted within the community more intensely than they did before with some trying to learn and others trying to convince others out of the programme. These opposed ideologies led into building alliances among those who opposed commercialisation and those willing to try. The opposing side argued from the perspectives of what they have heard before about the poor performance of local chickens as well as from the past experiences of failed poultry development programmes. Therefore, to them the proposed transformation was too radical to be possible. Like one producer said:

> ["It was just another programme that comes and goes." (Interview with Producer, September 2013)].

They also found the proposed new ways of keeping chicken very demanding and therefore increasing household workload. The workload issue was important because the community used to let chickens fend for themselves and not feeding or fetching water for them. Therefore, the ability to allocate household labour and financial resources for the new poultry enterprise was very critical during the decision making process. However, as Mama Maimuna Mkongea said:

> ["The more we argued among ourselves, the more we understood how lazy we were, and kept on advising each other on why we had to change…" (Interview with Producer, September 2013)].

From the discussion above three areas of fear emerged, and those were, one, **reliability of the programme** *('it's just another programme"... "They are lying, there is no way of getting so many chicks of local breeds"*), two, **individual producer's capacity** *("..can we keep so many chickens? ... it's a lot of work..")*, and three, the **performance of the local chicken breed** *(".. these local chickens can't be commercialised").* As we will come to learn later, building producers' confidence in these three areas was very important before they could start keeping chicken as a business.

7.3.3 Grounding processes with local politics

RIU documents and interviews clearly show the importance of local politics in the programme activities. As a result, names of representatives from all Local Government Authorities (LGAs) where the programme worked are found in all proceedings of stakeholders' meetings. According to RIU staff, LGAs were very important stakeholders who had to understand and share the new vision together with other actors. They were involved from the very beginning as custodians of the society's order and norms. LGAs were also the employers of the government extension workers whom the programme had to work with. Therefore, before actual implementations started, they too had to be in harmony with the new vision.

After the initial stakeholder meetings in which two staff from each LGA attended, and which elected the district champions, one would have expected LGAs to have had a clear understanding of the intentions of the programme. However, they were yet to know their roles and further dialogue was necessary (Interview 30). Therefore further meetings between Champions and LGAs through the Departments for Agriculture and Livestock were organised. During these meetings, Champions represented their fellow producers to introduce the programme to the District Office and explained what they wanted to do and achieve as producers. The LGA explained what they expected in terms of communication and reporting. The LGA wanted monthly reports from champions through the Ward Extension Officers (WEO). The Rufiji district Champion, described this meeting as an obligation to inform and report formally to the authorities rather than a negotiation between producers and LGAs. She said:

> ["… I was just reporting to them so they would not complain in the future that RIU just came here and worked with farmers without informing them" (Interview with Producer, September 2013)].

Therefore, unlike other actors, producers did not see LGAs as actors to directly transact with but as routine authority figures. After these meetings, District Livestock Officers (DLO) (or District Agriculture and Livestock officers (DALDO)[30]

[30] Some Districts have only one person in charge of both Agriculture and Livestock i.e. DALDO, while some have two individuals one for Livestock (DLO) and another for Agriculture (DALDO).

depending on who was there) and District Veterinary Officers (DVO) officially became the link between the programme and LGAs.

7.3.4 Business negotiations and action planning

RIU reports show initial contacts between poultry producers and input suppliers. The first contact was during the stakeholders meeting where all actors identified during the stakeholder mapping exercise (discussed in section 7.3.4 above) were invited. During the meeting each stakeholder described his or her involvement in the poultry industry which gave producers the opportunity to learn the existence of specialization in supplying poultry inputs as a business. The Rufiji Champion said;

> ["It was during these introductions that I realised there were people who produced just indigenous chicks as a business. I didn't know that before" (Interview with Producer, September 2013).]

Therefore, these initial interactions helped producers to learn about existence of inputs suppliers from whom they could buy inputs on one hand, and helped suppliers to show case their capacity to supply different inputs and services to producers.

About ten inputs suppliers are reported to have attended the first stakeholders meeting. One of them was a company called Farmers Centre Ltd. (see also Section 1.3.2) involved in providing a wide range of services to both crop and livestock producers. Farmers Centre manufactures, imports, sells, and distributes feeds, vaccines, drugs, farm implements and even provides advisory services to farmers all over the country. The company sells to regional, district and other local input shops at wholesale and do retail sells to individual customers who visit their shop in Dar es Salaam. At the time of the meeting, the company was already working with small crop farmers through local input shops in remote parts of the country. So this was another opportunity for the company to expand its client base. Other suppliers attending the meeting were two chick producers specialized in producing chicks from crossbreeds of indigenous chickens. One of them was a public institution called Ruvu JKT (A National Service Camp) who had been in the chicks business for over ten years but mainly with urban and peri-urban commercial poultry keepers as their main clients. Another chick supplier present was a private entrepreneur going by the business name 'Kalambo Metals' who also fabricated simple incubators for sell. Kalambo Metals claimed to have a machine capacity to produce about 60,000 chicks

per week. Both suppliers claimed to be producing at below capacity because there was no demand.

RIU also invited district input suppliers who were expected to sell inputs to farmers. These suppliers were already selling agricultural inputs and selected livestock inputs, mainly for cattle, goats and pigs. With an exception of those from peri urban areas, most of them did not stock poultry inputs. Although some of these shop owners reported stocking maize bran which can be fed to chickens, they did not target poultry but pigs and dairy cows. When asked why they did not stock poultry inputs, the answer was because rural poultry producers did not use inputs. Hence the problem was lack of demand and not shop's capacity to stock and supply.

After the first meeting, three input suppliers, i.e. Farmers Centre, Kalambo Metals, and respective district input shop owner (of respective districts) attended village meetings (described in section 7.5.1 above) organised and chaired by District Champions. These meetings were meant to sensitize farmers to commercialise their chicken enterprises. These meetings were also attended by Ward and Village Extension Officers (WALEO and VALEO respectively) who presented an overview of basic poultry husbandry routines expected once producers decide to commercialise. The new husbandry routines include buying chicks, feeds for chick (chick mash), vaccines, and other drugs. The reasons why each input was needed were explained and farmers had the opportunity to ask questions. Input suppliers responded as relevant. In addition, extension officers already known to the villagers also explained their roles and how they would support them as part of their job.

During all these meetings producers remained the focus. All other actors were treated as means to helping farmers commercialise their poultry enterprises. RIU and other actors were made to believe that lack of effective demand was the only reason why producers and other actors were not transacting. Consequently, significant effort was put in articulating and stimulating demand from producers. Apparently, input suppliers made it clear that for them to do business with rural producers there had to be a significant number of producers keeping a significant number of chickens. This was meant to reduce transaction costs and RIU had to make sure a sufficient number of producers was mobilized to join the programme.

RIU innovation diaries show that it was after these initial interactions that the actual sketching of the network began.

7.3.5 Meeting the cost of sketching anticipated networks

As explained at the beginning of section 6.4, actors who had to invest or make major changes in their routines needed some kind of prior assurance. This required negotiations among and between actors before individual actors could make any adjustments. This process of facilitating negotiations and agreeing on tentative action plans is what is referred to in this study as *'sketching the anticipated network'*.

According to RIU, three major negotiations took place i.e. regarding chick supply, input supply (feeds, drugs and vaccines) and provision of extension services. These involved producers, Kalambo Metals (chicks), Farmers Centre Ltd. (inputs), and Local Government Authorities (extension). These negotiations are discussed further.

Linking producers with Kalambo Metals (Chicks supplier)

Kalambo Metals is a small private enterprise owned by two brothers. During stakeholder mapping conducted by RIU, their owners said the business had capacity to produce up to 60,000 chicks per week if assured of demand. RIU took the entrepreneurs' word and therefore did not assess to confirm this capacity.

The chick producers were very specific that they would only supply if assured of producers' ability to pay 600 Tshs per chick (about US$ 0.5), to collect chicks right from the hatchery, and keep on buying chicks every week. The negotiation report expresses Mr. Kalambo's doubt on producers' ability to pay 60,000 Tshs (US$50) to buy 100 chicks and still be able to pay for other inputs like vaccines, feeds and essential drugs. In principle, Mr. Kalambo wanted to know if farmers would be assisted to be eligible for a business partnership. On the other hand, farmers wanted to know how the quality of chicks would be assured.

According to RIU staff, the typical role of RIU here would be to organise the meeting and facilitate the negotiation process with the assumption that the two parties would reach an agreement. However, since poor producers were involved, RIU had the responsibility of innovating to compensate for the weaknesses of the poor producers' position. Otherwise the supplier would see no justification to

transact with them. Consequently, RIU had to negotiate with producers on what they could afford and how RIU was to help. The meeting report says:

> ["After negotiations, farmers agreed to pay 15,000 Tshs. and RIU agreed to top up the balance of 45,000Tshs. This loan was to be recovered from producers once they have sold the mature chickens after 4 months." (RIU, 2009; p.8)]

By doing this RIU was playing the role of a lending institution. The RIU coordinator writes in her report that:

> ["This decision was necessary and had to be spontaneous. Without providing this support commercialisation would not have started as no bank would have provided such a loan to such poor farmers. It was a risk that the programme had to take." (RIU, 2010; p.5).]

The next concern was how producers would pay for the chicks. The chick producer wanted the easiest and the cheapest way to collect payments from producers who were many and spread out in different remote villages. Producers had to innovate and agree on how best they could collect payments from farmers and pay for each order. Such a collective payment had never been required from these producers before (Interview 21). Moreover, they had to have all producers paying at the same time. According to the Bagamoyo Champion, this was a big challenge and they had to rely on RIU whom they considered to be neutral and was trusted (Interview 12). Therefore, producers recommended setting paying 15,000 Tshs as one of the criteria for joining the programme and for receiving chicks. The plan thus became that Champions collect money from producers and submit to RIU. Then RIU adds the balance and pays the chick producer. This was very convenient to the chick producer. However, another concern emerged on what would happen if chicks are hatched and farmers have not paid? RIU accepted to continue paying the chick producer and take the responsibility of collecting money from producers. The programme officer said:

> ["We had to do this to allow things to happen for actors to see and take over at a later stage." (Interview with ex-RIU staff, May 2013).]

By accepting this role, RIU was absorbing administrative costs related to chicks transactions. Then transport issues also needed solution. In this case, producers agreed to order collectively and share the cost. This meant hiring transport and

distributing the cost to producers whose chicks have been procured. After agreeing on payment and transport modalities, producers wanted to know how the quality of chicks would be assured. Regarding this RIU agreed to arrange for government inspection of the hatchery as per regulations and also promised a regular vaccination certification by District Authorities before transporting chicks to the villages. This meant indirectly adding the Central Government and the LGA into the transaction.

Linking producers with District input suppliers

Producers needed a close source of inputs and district level input shops were the best available option. These were identified during the mapping exercises and they also attended all initial meetings. However, a special meeting was needed between farmers and the dealers to negotiate the anticipated partnership. Thus RIU organised five district meetings, and the situation was different in each of them.

A unique negotiation experience is reported in Rufiji district, which was the first to be organised. The dealer in Rufiji was also a government extension worker whom producers knew well. His shop was known for selling other livestock (mainly cattle) and crop inputs. He also sold poultry inputs to a few commercial chicken producers who raised improved breeds of chicken in the township. During the meeting, he wanted to know how producers would pay for the inputs. His doubts were confirmed by producers who then asked RIU to help. According to RIU staff, giving loans was not in the programme's plan. One officer said:

> ["The programme was expected to **'promote'**, **'facilitate'** and **'build capacities'**. These words were everywhere in the programme documents but their exact meaning was unclear. But nobody thought giving loans was part of it. After all there was no such a budget line" (Interview with ex-RIU staff, May 2013)].

In the end, RIU agreed to give input loans to producers and an 'input voucher system' was later established. Again RIU had to complement producers' capacity if processes were to start. Apparently, their proof of faith in the process also reinforced the faith of other actors. For example, the Rufiji district Champion said;

> ["When RIU accepted to give us input loans, they proved to us that they truly believed keeping chickens was profitable. Otherwise how would they have accepted?" (Interview with Producer, September 2013)].

So RIU confirmed to the dealer that there would be a significant number of producers supported by the programme to buy inputs from his shop.

The next challenge arose when the dealer requested for extra capital to stock the inputs. He explained that, what the programme was doing was to stimulate many producers at the same time. This meant high volumes of each input would be needed at the same time. One producer said during the interviews that:

> ["We understood the dealer because he had to buy many doses of vaccines, many bags of feeds, and many drugs at the same time. While before he just bought a little of everything and replenished as they were sold." (Interview with Producer, October 2013)].

This meant the programme was putting extra pressure on the dealer's capital.

At this point, producers wanted to be sure of inputs supply before they decided to receive chicks. RIU had also the commitment to see the process through. Therefore, RIU discussed with the dealer and asked him to explore other options for getting the extra capital. RIU progress report of March 2010, reports that the dealer negotiated for a credit facility with Farmer's Centre (an input wholesaler who also attended the initial programme meetings), who accepted to sell inputs on credit under RIU's guarantee –in case the dealer fails to do so. Eventually, and after several meetings and discussions, RIU agreed to guarantee the dealer but also demanded to control the repayment of the loan. So RIU came up with the *'input voucher'* idea where farmers were given vouchers for buying feeds, vaccines and essential drugs. Then every month the dealer submitted used vouchers to RIU for payment, and deductions were made to pay the wholesaler. RIU staff learnt the input voucher idea from the National Agricultural Input Voucher system (NAIVS) programme which subsidized fertilizer and other agricultural inputs purchased by smallholder farmers in Tanzania (Hepelwa, Selejio, & Mduma, 2013).

RIU also agreed to be facilitating regular checks on the quality of inputs through relevant government regulatory authorities. However, producers were also asked to bear quality risks as they do with other products they buy in the market, like soap or cooking oil (Interview, 32).

The interviews with RIU staff explain that a number of lessons were picked from the Rufiji negotiations and were used in the remaining negotiations, i.e. in Mkuranga, Kibaha, Bagamoyo and Kisarawe Districts. Dealers in Mkuranga and Bagamoyo were also government extension workers who had been in the business for a while. But it happened that, although these remaining four district input dealers were also procuring most of the inputs from Farmers Centre, they did not ask for a guarantee from RIU. However, the input voucher system was recommended to all dealers and agreed to claim payments from RIU after they submitted used vouchers. RIU decided to adopt the voucher system across all district as a tool for ensuring every producer gets the right inputs, and quantities.

Linking producers with extension service providers

From the first stakeholder meeting, producers were very explicit on their lack of trust on the government extension workers. Who were very few and ineffective (RIU Report, 2009). According to RIU staff, the need for a functional extension delivery system became even more important to producers after their negotiations with chicks and input suppliers. The fact that they had loans to pay back to RIU made them very keen to get quality services (Interview, 32). This is also linked to their initial fears expressed during the producer to producer interactions described in sections 6.3.3 and 6.3.2. According to the Kibaha Champion (Interview,16), their main worry was on raising so many day-old chicks without the mother hen. They had neither done it before, nor seen anyone doing it.

Thus, although the Local Government Authorities had extension workers placed in all Wards, and some in villages, RIU had to consider producers' concerns on the quality of services provided. Producers were already interacting with them and they were dissatisfied. So a new solution was needed, and two options were explored, namely the 'Chicks Camps Approach' and the 'Household Caretakers Approach' (mostly known as '*Caretakers*') as elaborated below.

a) The Chick Camps

At this point, RIU's question was how best to impart knowledge (RIU, 2009). The common approaches in use were 'a one off training on poultry management' and 'Farmer Field Schools' (FFS). Apparently, some of the producers had previously

attended poultry training sessions organised by NGOs, donor programmes and the local government. But they did not find them useful (Interview, 32). Therefore RIU wanted producers to *'learn by doing'* and experiencing rather than sitting and listening. So an adapted version of FFS was chosen and establishing chick camps in Wards was proposed. The plan was to put all chicks meant for producers of particular villages in one camp and raise them together for 30 days. The camps would be supervised by trained professionals paid by RIU who would train farmers on daily basis on improved poultry management and husbandry. The camps would be well equipped with locally available equipment and producers were expected to visit them as often as they could especially during vaccination days, in order to learn and practice. The RIU programme officer said:

> ['This would have been like having an experienced large producer raising the chicks to one month old. Then later hand them over to farmers when it is less risky to keep them. It was also a kind of a farmer field school." (Interview with ex-RIU Staff, May 2013)].

RIU also imagined these centres to grow into poultry information hubs (RIU, 2009).

This idea was well received and agreed by producers and Local Authorities, and a hunt for such places started in every village (Interview 32). For example, in one of her progress reports, the Rufiji Champion reports that Folk Development Centre (FDC) which is a public institution for community development, and which had abandoned chicken sheds had been identified as the area for establishing the chick camp in Rufiji. The centre was later visited by RIU staff and negotiation started between producers and the government.

However, as searching for suitable sites for the camps progressed producers also kept discussing the idea amongst themselves. Specifically on how best they could learn to raise chicks. One producer explained during interviews:

> ["..in those days we knew we needed to get it right once and for all. Because you can't be looking for someone to teach you every time you buy chicks. So we spent a lot of time discussing about it...." (Interview with Producer, September, 2013)].

Therefore, producers in Rufiji raised the following concerns regarding the proposed chick camps; (i) How to help those who failed to visit the camps, (ii) How to

distribute chicks after 30 days when they are already of different sizes, weight and sex (note cocks fetched better price than hens); (iii) How to distribute loss if some chicks die at the camp (note all producers would have paid for 100 chicks); and (iv) how to deal with complaints in the future on low weight gain and diseases as producers could easily blame it on the earlier feeding and vaccinations. So, from the above concerns, they recommended to raise chicks individually from day one and take full responsibility of the chicks and inputs loan. They also wanted to learn by doing in their own environment. So the chick camp idea was abandoned and RIU was back to square one.

b) Household Caretakers (Caretakers)

After the idea to establish chick camps was abandoned, RIU and producers unanimously agreed that producers would learn better if assisted to raise day-old chicks themselves and be allowed to go through the daily processes while in their homes. This was also found appropriate for the circumstances of women, the elderly and those with disability (RIU, 2009). However, achieving this seemed very costly and there were not enough extension workers.

As RIU searched for solutions the Country Coordinator came up with the idea of using graduates from livestock colleges who were no longer employed by the government. By then about seventeen institutions were offering certificate courses related to poultry (livestock) and about 280 certificate holders were produced annually. Moreover, the government who was the main employer had stopped employing certificate holders as extension workers. The private sector was also not employing them (RIU, 2009). So RIU thought that using them would showcase these graduates to NGOs and private poultry farms. However, the question to RIU was how to identify and get them.

So RIU contacted the nearest college and learned about their curriculum, then asked for their graduates' contacts. During interviews the ex-RIU programme officer said:

> ["The first contact we made spread the news and within a week we had more than we needed." (Interview with ex-RIU staff, May 2013)].

These were then called for a meeting where they negotiated with producers (represented by District Champions). RIU also invited a poultry researcher from

Sokoine University of Agriculture (SUA), a veterinary drug seller and a senior officer from the Ministry of Livestock to present and facilitate discussions on; basic poultry management especially on disease management and control; current treatment drug lines and their administration; and on key policies and regulations.

Their role was established and the programme called them *'household advisors'* or *'Caretakers'*. Producers agreed to host them in their homes and feed them for 30 days. RIU agreed to enter into contract with them and pay a monthly allowance of 250,000Tshs (about US$200). The contract also covered transport and medical costs. Producers also proposed that one caretaker could live in one house and care for a maximum of nine close neighbours. So he/she would visit ten producers daily and provide hands-on training for a month. Every visit was recorded and signed by the producer.

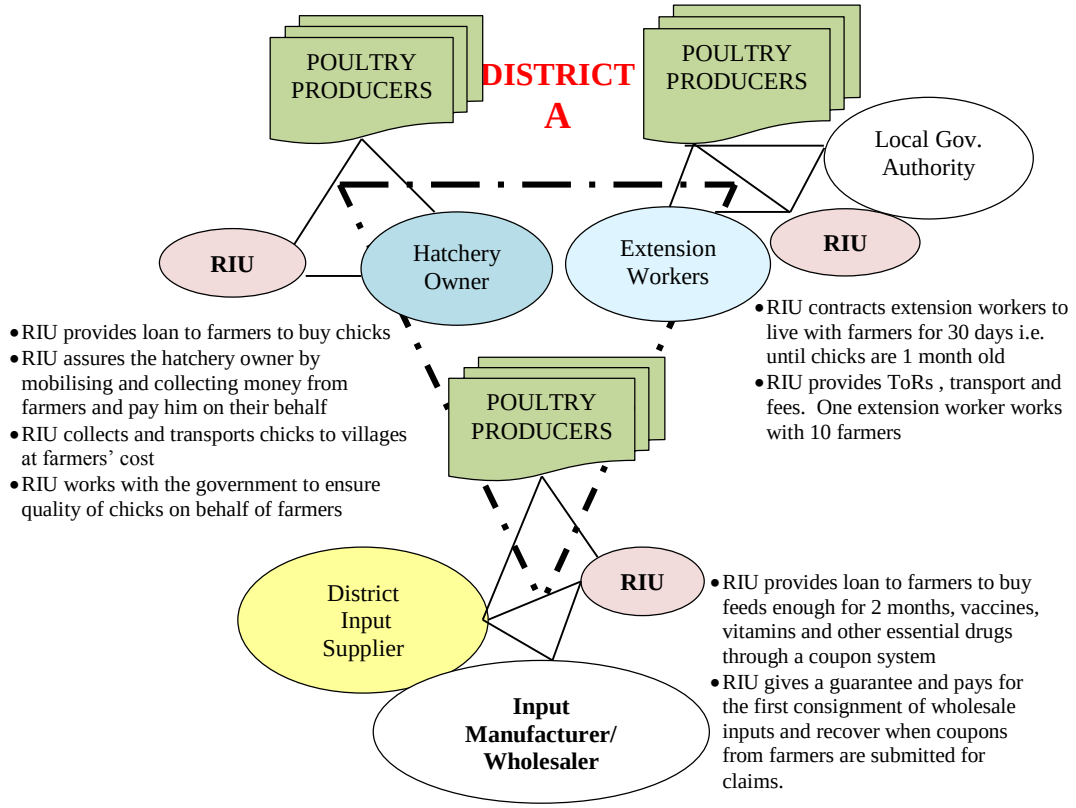
After negotiations an action plan was drawn up. Contract terms were written and Champions introduced them to their respective Local Government Authorities by submitting their certificates, terms of reference and a list of where each would work. According to RIU staff, introducing caretakers in villages brought conflicts in some districts, as a power struggle between public extension and the programme-led private extension (Interview, 32). In addition to recruiting Caretakers, RIU also compiled simple poultry management guides, vaccination schedule and feed ration charts to compliment and assist Caretakers in training producers.

The Caretakers arrived three days before chicks arrived and prepared the family to receive them. Preparations included inspecting and fumigating the shed, preparing feeders and drinkers, preparing brooders and sources of heat like charcoal, kerosene lamps etc. As explained by producers during focus group discussions, the presence of caretakers in those two days made producers confident. They also found going through the guides with Caretakers easier and more effective than attending training in a class (Interview, 40). Thus learning was more personalised and easier.

The negotiations presented above show how RIU was continuously learning and adapting as solutions were very context specific. RIU decisions seem spontaneous, context specific and relied on reasoning and wisdom backed up by experience and

both technical and non-technical knowledge. Below (Figure 7-3) is a diagrammatical presentation of the sketched network.

Figure 7-3: The initial sketch of the rural poultry network



7.4 Summary and conclusion

The chapter explains that RIU had to first mobilise relevant actors, who made initial plans. So based on the functional analysis results, stakeholders were mapped to know who was performing which function and where. The analysis also identified gaps. The actors identified during the mapping formed the group of people who established the network. With RIU support, the group designed and initiated processes.

The chapter further explains that engaged producers had never met before, and were even not aware of some of the functions like hatchery businesses, etc. It is explained that the first meeting made actors interact but it was still not sufficient to make them engage beyond meeting face to face. This is because barriers still existed which had to be understood and removed before any meaningful interaction became possible. Initial processes focused on creating a *'mental readiness'* through facilitating dialogues to build common understanding regarding what needed to change.

The chapter points out that for a programme like RIU to engage properly with the context, it has to negotiate and harmonise programme interests with those of the actors. This means facilitating actors to understand each other, programme interests and the industry (system) they operate in. The programme needs to understand the actors, their interests and the system. This builds a common ground in terms of vision and knowing where to intervene in the system. RIU as a programme relied both on the actors and that of its staff to define what RIU should do. This elaborates the importance of facilitating processes through which both the RIU and actors used to define their positions in the system. This challenges the use of programme blueprints to guide an intervention.

In order to create its plan, RIU conducted a system analysis and allowed actors to identify bottlenecks blocking the industry performance. The analysis revealed that rural producers were disconnected from other actors because they were not using commercial inputs and services. Therefore if producers were to interact with actors like input suppliers, they had to produce for the market and *'use'* commercial inputs and services. Most problems identified by stakeholders were social and organisational and very few were technological. This was probably because most poultry technologies were available in the country and adopted in commercial farms.

The chapter also argues that within a socio-economic system there are two interdependent levels of interactions i.e. the *'human-agent interactions'* and the '*enterprise-agent interactions'* which are necessary for innovation to happen. Farms operate as *'mutual constituencies'* of humans and agricultural commodities (produced as sources of livelihood). For example, poultry keeping is a mutual constituency involving the producer and the chicken, and the two relate through different husbandry practices. The way the producer (i.e. the human agency) relates with other human agencies like chick producers, drug suppliers etc., is influenced by how the poultry enterprise as a constituency relates to the corresponding enterprises (or constituencies) like hatcheries, drug businesses etc. If the two enterprises are not related, or have no affinity for each other, then interactions at human level are ineffective unless they interact to create the missing 'affinity'.

The next chapter explains how RIU triggered interactions among different actors.

Chapter 8 Inducing shocks to trigger interactions

8.1 Introduction

This chapter describes major triggers that RIU pulled to initiate practical changes in the rural poultry industry in Tanzania. The analysis looks at the programme as an external force that challenged the status quo and facilitated internal processes towards re-organisation. The main argument emerging from the chapter is that, promoting innovation in an industry dominated by subsistence producers means unlocking it from path dependency, and from multiple 'demand-and-supply deadlocks' like those presented in chapters four and six of this thesis. To achieve this, a *'mental shift'* needs to be created in a significant number of actors, followed by *'system shocks'* sufficient to stimulate co-movements and multiple interactions–then concentrate in solving *'after-shock capacity problems'* (discussed in next Chapter 9).

Therefore, using field data, and mostly from RIU reports and database, the chapter explains that after rural producers were sensitized and accepted keeping chickens commercially, a *'mental (or cognitive) shift'* occurred and opened room for negotiations towards interactions with other actors in the industry. At this point sensitized producers were ready to use commercial inputs, change husbandry practices and use poultry technologies like vaccines, etc. However, practical exchanges could yet happen as producers only became mentally ready, while actual interactions were subject to other practicalities. Gerd Schienstock (2004) calls this *'mental readiness'* a very important step towards creation of a new development path, because it makes actors ready to reorganise.

After the mental readiness, RIU facilitated *'negotiations'* among different actors which led to *'sketching of the envisaged networks'* (a process also referred to by Gerd Schienstock as *'visualization of the new path'*). During these processes actors clarified and managed uncertainties before they could start exchanging goods and knowledge (i.e. start transacting). After they accepted to commercialise, producers worked with other actors and planned how they would transact. This visualisation

process *'built trust'* among actors and highlighted where support (external help) was needed. At this point, the role of RIU shifted from only facilitating and organising meetings (negotiations), to also filling capacity gaps and cushioning risks to ensure rural producers could actually transact. For example when producers could not pay the entire cost of a hundred chicks at the beginning, RIU agreed to provide a 60% interest free loan. Likewise, when the district supplier could not stock all inputs, RIU provided a guarantee facility for him to take a loan from wholesale suppliers, etc.

Therefore, pre-planning (visualisation) was done to ensure mechanisms to support and cushion weaker actors were in place and were therefore accepted (qualified) for business partnerships. However, even after these negotiations, actual interactions could not yet happen. At least not until RIU injected money into the system and supported a significant number of producers to practically order significant volumes of different poultry inputs. These were large orders made at once and sent significant 'signals' to the markets. According to RIU (RIU, 2011a, 2011b), these orders overwhelmed the poultry supply system and induced it into an *'input demand shock'*. Data show that it is actually this shock that triggered re-organisation and multiple processes which led to innovation especially in the upstream part of the value chain.

As I previously explained in Chapter one, the study uses AIS as the main analytical framework where heterogeneous actors are argued to interact and co-determine innovation. The emphasis is therefore on the AIS's focus beyond agricultural research and extension systems (Klerkx, Laurens, Barbara van Mierlo, 2012: p.457 and 463) and which recognizes existence of other sources of knowledge, and triggers of interactions and learning. This chapter analyses RIU processes at the innovation network (system) level and identifies triggers of interactions and innovation that came from outside research. It then establishes how such triggers stimulated demand for new knowledge and technologies, and ultimately led to the formation of a poultry network which never existed before.

I have used the concepts of **'exogenous shocks'** and **'lock-in'** used in path dependency literature to explain how RIU unlocked the rural poultry industry in Tanzania from three types of lock-ins namely, the resource lock-in, political lock-in and cognitive lock-in (Perkins, 2003; Salamonsen, 2014; Ugaglia et al., 2011). I have

also used the concept of **'organisational thinness'** to explain how RIU acted as an exogenous shock to increase the number and type of actors engaging with rural poultry producers (i.e. reduced organisational thinness).

In cases of path dependence or lock-in, an exogenous disruption (particularly in the form of 'a demand shock') may trigger movements towards a new path. And particularly in this study, the force is explained as an *'input demand shock'* which was created by RIU through mobilizing and supporting a significant number of poor producers to demand significant volumes of different inputs at the same time. The chapter also makes it clear that, by inducing the shock, co-movements were triggered within the system as multiple actors tried to respond to the overwhelming demand. And as they did so, different capacity gaps were revealed, and in filling those gaps, a specific service and input delivery model to work with rural producers emerged.

The study shows that RIU as a programme and in its entirety acted as an exogenous shock to the poultry industry in Tanzania. Its presence and engagement in the industry disrupted the status quo by causing mental shifts, bringing new investments, causing re-organisations and changes in routines and use of technology. However, this chapter also pays a particular attention to the *'input demand shock'* which was induced when RIU injected financial resources into the system and changed the position of rural producers in the market. This new position which was caused by the new financial capacity of a significant number of producers, made them visible and attractive for business partnerships. It then attracted more actors (individuals and organisations) who increased investment in innovation.

The chapter is organised in seven sections, section two reviews the concepts of exogenous shocks, organisational thinness and fragmentation. Section three explains how RIU acted as an exogenous shock by changing producers' breeding strategies and supporting them to focus on regulating stocks. These changes increased producers' demand for new knowledge and innovation. The section also explains how new sources of knowledge and definite business cycles were introduced by RIU. In section four I describe how the demand shock was induced and how the system responded. Then section five describes the process of unlocking the poultry industry from the entrenched traditional production system into becoming commercially-

oriented by specifically discussing the unlocking of three types of lock-in, i.e. cognitive, political and resource lock-ins. Section six presents a discussion on industry level transformation that took place as a result of the shock, and how up-scaling was done. Then I close the chapter with section seven by summarizing and concluding the chapter.

8.2 Exogenous shocks and organisational thinness

As explained in Chapter 1, exogenous shocks are externally driven alterations described by (Newey & Zahra, 2009) Newey and Zahra, (2009; cited in Salamonsen, 2014, p.6) as external events with the potential to significantly influence the destiny of the firm. Salamonsen (2014; citing Grabher, 1993; Narula, 2002, and Doloreux and Dionne, 2008) explains that exogenous shocks function as a powerful means for reduction or disruption of lock-in, and are even a requirement to shake the system free of its history (Vergne and Durand, 2010, p.752; in *Ibid*, p.6).

Studies on exogenous shocks are more popular in business studies commonly used to explain causes and characteristics of business cycles. The leading theories include the real business cycle (RBC) theory which assumes that economic fluctuations arise from exogenous shocks and that the economic system is otherwise stable; and the endogenous business cycle (EBC) theory, which proposes that economic fluctuations are due to intrinsic processes that endogenously destabilize the economic system (Ghil, 2007). The two theories analyse the shock to capture its effect towards creating fluctuations and thus new business cycles, with the intention to capture and describe a system's vulnerability to shocks including natural disasters and macroeconomic policies in reproducing realistic business cycles (Ghil, 2007: p.15). Unfortunately, the two theories do not capture structural changes (i.e. change in interactions) or technological shifts beyond market responses.

Therefore, I have drawn on studies from the evolutionary aspects of regional innovation systems (RIS) to show that RIU programme acted as an exogenous shock to reduce organisational thinness, fragmentation and lock-in in the target industry. Although literature views RIS as 'a territory less than its sovereign state possessing distinctive supra-local administrative, cultural, political, or economic power and

cohesiveness, differentiating it from its state and other regions' (Cooke et al., 1998, p.1573 cited in Salamonsen, 2014: p.1), a description which the poultry network I work on does not quite fit, I still found the 'rural-ness' and the 'periphery-ness' of the poultry network that emerged out of RIU interventions linking well with the geographical localization emphasized in RIS literature. RIS is a localised network which has its unique sets of traditions, competencies and institutional composition and infrastructure facilitating innovation among producers and other actors in a region (Asheim, Coenen, Moodysson, & Vang, 2005).

My analysis is specifically built on, and adapting the basic argument for RIS that 'smaller peripheral regions often suffer from the absence of relevant actors with resources and capabilities to stimulate growth patterns' (Salamonsen, 2014), and thus explain that a donor-funded programme can actually act as an exogenous shock to stimulate the emergence of a rural innovation network.

Henceforth, the sections below illustrate how RIU created and moderated an exogenous shock to reduce organisational thinness, fragmentation and lock-in observed in the rural poultry industry in Tanzania.

8.3 Explaining RIU as the 'exogenous shock'

This section explains how RIU created the situation that functioned as a shock to alter existed routines, linkages, norms, attitudes, etc., which in the end forced the entire system to reorganise. At first *producers* were encouraged to produce for the market so they could gain more income. In turn it created an opportunity for *input suppliers*[31] to gain new clients and do more business. Additionally, *product market actors* and consumers saw the opportunity to get more reliable supply of quality products. On the other hand, *extension workers* saw this as an extra workload but also an opportunity to be useful to the community. And to the *Local Authorities* this was an opportunity for their communities to gain better incomes and therefore a new source of income from local tax. By supporting producers to produce for the market RIU created opportunities for other actors in the industry. In fact, RIU reports the

[31] In this case input suppliers include those involved in the business of supplying (i.e. producing, manufacturing, importing and selling-both whole sale and retail) chicks, feeds, vaccines and veterinary drugs. In this case therefore even chicks and drugs are treated as inputs

four actors listed above (i.e. producers, input suppliers, product market actors, extension providers and government) as major categories of actors involved in steering the commercialisation process.

The study also makes it clear that, when a significant number of rural producers decided to produce for the market (i.e. when they decided to change their production scale), they became *'self-insufficient'* and therefore sent significant signals to other sub-systems in the form of demands, which triggered various kinds of responses. What mattered was the *'significance'* (or 'magnitude') of the *'noises'* (Lorenzoni, 2009) coming from rural producers to the market. I first explain the key changes that enabled a significant number of producers to change their production behaviours and to generate the significant demand. I then explain how the system responded to this new demand, and how the response triggered industry-wide innovation.

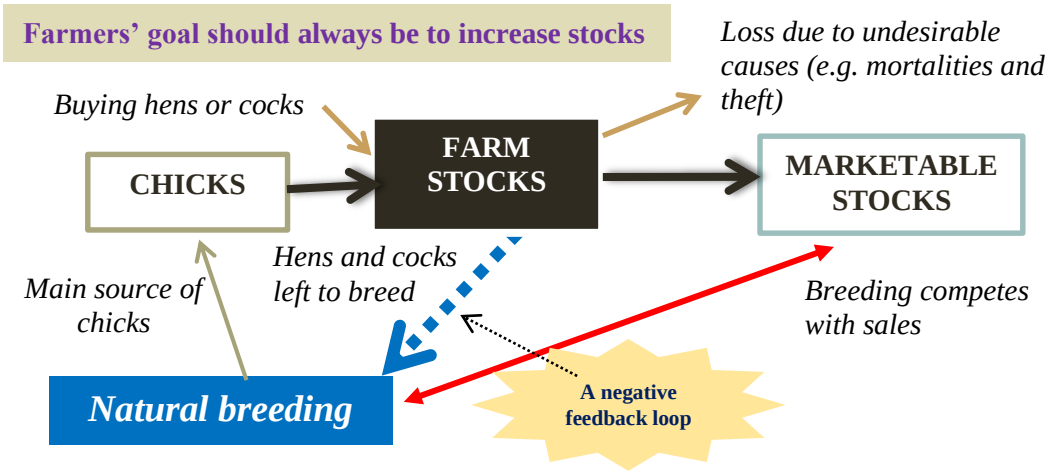
The key changes that took place are analysed and discussed below.

8.3.1 Changing the breeding strategy: Fixing negative feedback loops

As explained in previous chapters, producers had to start producing for the market and this led to significant changes in how they managed their enterprises. According to RIU reports, the most important change was to stop relying on natural breeding and start buying chicks at the beginning of every production cycle. This removed a negative (closed) feedback loop which caused inefficiencies and unreliability in poultry farm stocks. A closed loop is referred to as a system where part of the output, or information about it is fed back to the input so that the system's output can affect its input or some of its operating characteristics (Meadows, 2008).

Findings show that in the traditional poultry production system, where breeding is natural, mature hens are also the main source of new chicks to the farm. This means in every business cycle, part of the stock (i.e. mature chickens) which is ready to be sold is foregone as a breeder stock. Therefore, without an alternative source of chicks, attempts to commercialise rural poultry simply means introducing a competing system goal to the industry (Figure 8-0 below). This makes the system unsustainable.

Figure 8-0: Competing stocks goals in a poultry farm where breeding is natural



SO: Natural breeding does not favour sales. Thus any innovation that does not introduce a new source of chicks, will not favour higher incomes.

Therefore RIU introduced buying chicks into rural farms, which made producers self-insufficient in chicks supply. This justified a link with a new actor as a source of chicks. Moreover, buying chicks also introduced specialization in breeding where intensification through innovation became possible. Furthermore, buying chicks gave producers the ability to determine their scales of production, sourcing quality breeds of chicks, and making volumes of their end products more predictable; a trait needed when partnering with end market actors. Therefore, by simply introducing the habit of buying chicks, rural poultry farms became attractive for partnership with breeder farms, hatcheries and formal poultry product market.

However, relying on outside sources for chicks introduced a new investment cost to rural farms as well as creating dependency on other actors for quality and price. This meant subjecting producers to effects of fluctuations and instabilities in *'distant enterprises'* (i.e. enterprises that they have no direct control of). But nevertheless, it also meant linking producers to benefits resulting from growth experienced by other actors. For example, when research came up with a better crossbreed of indigenous chickens, rural producers were able to access it through the breeders, etc.

Literature presents an alternative option to what RIU did, where a group of rural producers could have been empowered to produce chicks as it is the case with the Bangladesh poultry model (Fakhrul Islam & Jabbar, 2005) and the Rakai chicken model (Roothaert et al., 2011) where associations of rural poultry breeders were established. In these two models rural producers are deliberately blocked from interacting with actors outside their communities and specifically from commercially oriented actors in urban areas. While the intention might be to lower transaction costs and even protect vulnerable producers from external shocks, the approach limits interactions and cross learning between rural and urban. It also promotes self-sufficiency within the same community with limited resources which in turn limits growth and innovation towards specialised breeding. It also relies on infrastructural capacity already existing in the villages. For example, since target villages in the Rakai programme (Roothaert et al., 2011) had no electricity, only incubation technologies that did not require electricity were possible. But in the RIU target areas lack of electricity did not determine the type of incubation explored. The programme used hatcheries in urban areas to supply rural areas instead. Furthermore, RIU promoted specialisation which gives more room for innovation.

RIU facilitation acted as an exogenous shock which pushed many producers to keep more chickens for the market, and relied on a new source of chicks which is more specialised. The push also introduced the element of cash investment at the beginning of every cycle by buying chicks, and thus created demand for chicks.

8.3.2 Supporting actors to focus on regulating stock flows

According to systems thinking literature, the behaviour of a system is determined by its flows (Meadows, 2008: p.18). Therefore, by analysing stocks (which are the elements of a system which can be seen, felt, counted or measured at any given time) we can understand the behaviour of a particular system and even work to influence it (Ibid). This is argued to be possible because stocks represent the accumulation of materials or information built up over time within the system. And from path dependency theory, such accumulated information has the potential to engrain a specific innovation trajectory and make it stick for long.

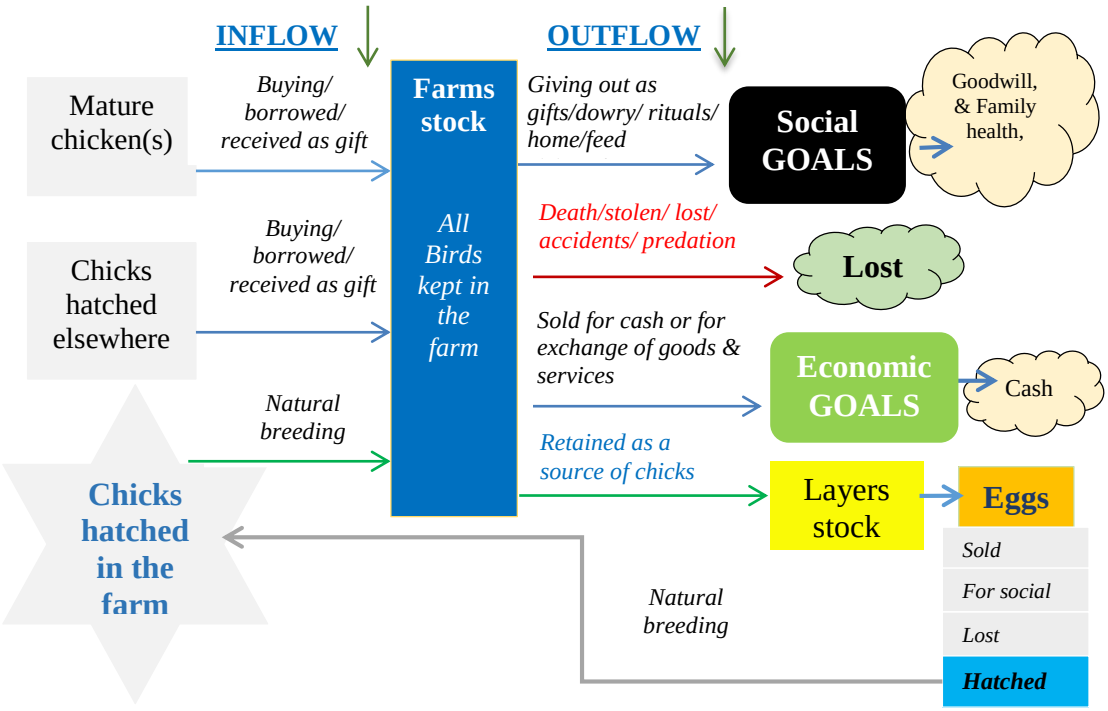
According to Meadows (2008; p.22) stocks can be increased by either decreasing its outflow rates or increasing its inflow rates. Therefore when regulating flows towards achieving a stock-goal, the level of stocks will rise if only the sum of all inflows exceeds the sum of all outflows; fall if the sum of all outflows exceeds the sum of all inflows; and stay at equilibrium level (i.e. not change) if the sum of all outflows equals that of inflows. This means humans can control stocks through manipulating flows. And that is where innovation emerges. On the other hand, if they lack the power or reasons to manipulate stocks, then they do not innovate.

Human goals for keeping chickens are embedded on stock levels in terms of volumes produced, sold, or lost, etc., and that strategies to manipulate such stocks are implemented through managing their flows. Therefore, my assumption here is that, the reasons for and triggers of interactions, learning and therefore innovation in the system (industry) are directly linked to the behaviour of the industry as it responds to the manipulation of stocks through its flows (both out and in flows).

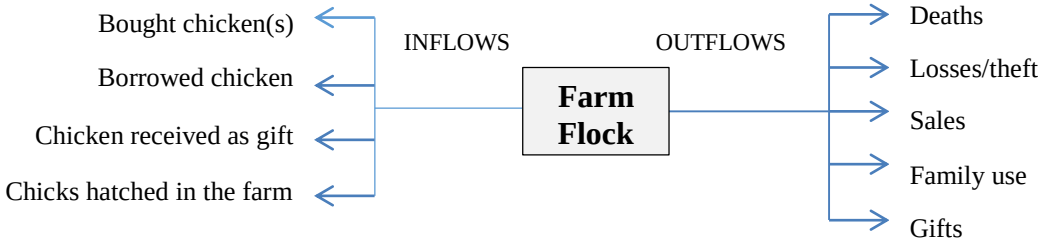
The figure below (Figure 8-1), highlights that, if for whatever reasons the number of chickens entering the system either as mature birds or chicks is smaller than those dying or disposed for different reasons, then the farm stock can easily get depleted. Because most rural producers rely on natural breeding as a source of new chicks to replenish the stock (Dinka, Chala, Dawo, & Bekana, 2010; Msoffe et al., 2010; Riise, Permin, & Kryger, 2005), they are not directly in control of their major source of inflow as they do not know how many eggs a hen will lay. Studies also show high mortality rates in village flocks specifically due to Newcastle infections. Particularly, chick mortality is reported to be very high. For example, FAO reports chick mortality rate of up to 80% in Tanzania.

RIU encouraged and supported actors to focus on monitoring and regulating stocks which triggered changes in routines. Consequently demand for new knowledge and technologies to reduce mortalities and to ensure proper nutrition for efficient weight gain and heath was stimulated. RIU reports state that when producers focused on regulating stocks, their demand for vaccines, veterinary drugs, feeds, and general knowledge on improved husbandry increased significantly. In this way they became viable for partnerships with other actors in the industry.

Figure 8-1: Stocks and flows in traditional poultry production



Isolating Flows:



8.3.3 Introducing new sources and flows of knowledge

According to RIU reports (RIU, 2011b), producers were linked to a resident household advisor to train them on basic poultry husbandry for the first 30 days. The household advisors (Caretakers) trained producers while practicing in their farms. This is in line with the argument that the benefits of adoption increases with the experienced gained through learning by doing (Arthur, 1989; Wolff & Recke, 2000). The intensive knowledge provided at the onset, and to many producers at the same, played a very important role in giving commercialisation a lead over the traditional system (Wolff & Recke, 2000)

According to RIU reports, producers were also provided with books (pictorial), hand outs and laminated vaccination charts to ensure consistency in the training provided

by the advisors. The whole household was able to read the guides together with the advisor to help educate the entire family. This meant all producing households who worked with RIU had their attitudes and skills changed. This contributes to disseminating new knowledge to a significant number of producers as the previous knowledge was deeply socially entrenched. This new knowledge was then easily passed-on through the same social channels.

In addition, input suppliers also became a new source of knowledge to producers. They gave advice as they sold inputs. For example, in one of RIU's video clip, a district stockist who is also a veterinarian is seen examining a carcass brought by one of RIU farmers. And she gives advice and a prescription. Producers also mentioned during group interviews that seeking information from input suppliers had become common. Drug manufacturers and wholesale suppliers also display product posters and leaflets in rural input shops, which provide information on diseases and drug administration.

8.3.4 Introduced definite poultry business cycles in rural farms

Besides changing the breeding strategy, RIU introduced technologies and practices to reduce stock losses and produce what the market wants. Specifically, RIU introduced clear business cycles where producers managed batches of equal age. Thus, unlike managing a flock with mixed categories and ages, producers were able to feed them properly and plan their disposal. One producer who worked with RIU said during interviews:

> ["Now when I buy chicks, I know how to feed and when to vaccinate them as chicks. And when they grow up, I change the feeding ration and vaccination doses. This is easier because they are many and are of same age. And when they are ready for sale, I have many of them to sell at once." (Interview with Producer, October 2013)].

RIU introduced an 'all-in-all-out' strategy where batches of chicks were procured, raised to maturity and sold all at once. This strategy gave producers the opportunity to earn a lump sum of money which allowed them to plan future expenses better. It also made it possible to link producers with buyers because unlike before, it was now possible to predict volumes and time to maturity. Furthermore, buying and marketing

of poultry products from rural areas became profitable and better organised especially when production cycles of a significant number of producers was synchronised.

Four key changes that led to creation of a significant demand for poultry inputs from rural producers, and which made them attractive for market linkages are; (i) producers stopped relying on natural breeding and started buying chicks from a new source (i.e. from a specialised breeder); (ii) producers actively focused on regulating stocks rather than letting them increase and decrease naturally (e.g. controlling time to maturity by controlling weight gain through feeding, reducing mortality rates through vaccination, controlling sales by determining scale i.e. choosing how many chicks to buy, etc.); (iii) RIU introduced new sources of poultry husbandry knowledge and producers accepted to utilise them (e.g. use of household advisers, meeting with input suppliers, distribution of printed materials, private veterinarian visits, field extension meetings, field visits to hatcheries, etc.; (iv) Introduction of definite business cycles i.e. raising batches of 100 or 200 birds after every four to five months. Previously they had no clear batches and each bird matured at its own time/pace. The definite cycles created continuity and regularity in sending input demand signals.

8.4 Explaining the input demand shock

This section departs from the understanding that before the coming of RIU, the rural poultry industry in Tanzania was facing a *'demand and supply deadlock'* (Refer Section 7.2.6 of this thesis) where for several decades, rural poultry producers have been unable to produce significant volumes due to lack of relevant skills for modern poultry management and limited access to essential inputs especially day old chicks, quality feeds and vaccines. Agribusiness suppliers, private veterinarians and marketing agents have not been keen to extend their businesses to rural areas mainly because of low demand for input supplies and services. This resulted in the observed 'chicken and egg' dilemma where producers required sufficient poultry inputs to be able to increase production scales, while agribusiness suppliers required assurance of sufficient demand before they could invest to serve such producers. It is the failure to unlock this deadlock that has been a major barrier to commercial expansion of the

rural poultry industry in Tanzania. This section explains how RIU induced a *'demand shock'* as a mechanism to unlock a 'demand and supply deadlock' in the rural poultry industry in Tanzania. More importantly, it describes the role of a public funded programme in achieving that.

Chapter six explained that rural producers were sensitised to raise more chickens for the market. They agreed to start with 100 birds so they could experiment and learn before adopting bigger scales. As a matter of fact, this change is almost twenty fold (i.e. from the average of five chickens kept before) and it thus created a significant demand for inputs and management skills by almost 100 per cent increase. For example, with the new scale, producers needed day old chicks, new husbandry skills, veterinary services, and inputs like feeds, drugs, vaccines etc. Apparently most of these were new and not accessible in rural areas but were available elsewhere in the country. This means traditional sources like relatives, neighbours, and even village extension workers could not provide what was demanded after the change in scale. Therefore, the new scale made rural producers and their networks *'self-insufficient'* in poultry knowledge and inputs, and so they needed new sources.

When producers were ready to keep 100 chickens, they built sheds using locally available materials and paid 15,000/- TShs (about US$ 10) upfront as a 40% down payment for the 100 chicks. Then RIU covered the remaining 60% which producers had to pay after they sold chickens (RIU, 2011; p.12). During interviews RIU staff mentioned that it was very important for RIU to take care of producers' purchasing power by providing soft loans in order to encourage work in rural areas. RIU also wanted producers to have the opportunity to experiment with the new scale. Moreover there was no existing financial institution which was ready to finance such producers (Interview with ex-RIU staff, May 2013).

RIU reports indicate that apart from the 60% contribution to the cost of 100 chicks, RIU also provided a soft loan of other basic inputs like feeds, vaccines and veterinary drugs (Ibid). The total loan value depended on local prices which included transport and local suppliers' margins. As a result, each district had different input prices and therefore a different total loan value. However, the average value in all districts was between US$165 and 216 (RIU Annual Report, 2009/2010). See Table 8-0 below.

Table 8-0: Variation in cost incurred per producer by districts (in TZS)

District	Rufiji	Bagamoyo	Mkuranga	Kibaha	Kisarawe
Distance from[32] Dar (km)	**138.4**	**65.6**	**65.9**	**64.9**	**95.7**
Chicks	100,000.00	100,000.00	100,000.00	100,000.00	100,000.00
Feeds (in Kg)	78,000.00	81,000.00	17,000.00	84,000.00	90,000.00
Vaccines doses	16,000.00	19,000.00	22,100.00	20,000.00	18,000.00
Drugs	14,000.00	25,000.00	60,000.00	13,000.00	22,500.00
Caretaker	40,000.00	55,000.00	26,000.00	30,000.00	75,000.00
Drinkers/Feeders	26,000.00	19,000.00	20,000.00	22,000.00	24,000.00
Visit hatcheries	13,765.00	11,260,00	11,400.00	11,920.00	-
Printed guides	14,900.00	14,900.00	14,900.00	14,900.00	14,900.00
TOTAL	302,665.00	313,900.00	271,400.00	295,820.00	344,400.00
TOTAL (USD)	**189.20**	**196.20**	**169.60**	**164.90**	**215.25**

Source: Analysed from RIU Database, 2013

Therefore, when producers were ready, their sheds were inspected and the paid the 40% down payment to champions. And when about 100 producers were ready (i.e. at least 25[33] in a village), chicks and input orders were pressed. This implied random orders being pressed from different districts whenever about 100 producers were ready to receive chicks. Table 8-2 below shows volume of inputs demanded within the first three months of sensitization, and which overwhelmed the supply system.

Table 8-1: The demand for inputs three months after sensitization

District	Number of Producers	No. of Chicks	Feeds (in tons)	Vaccines (in vials)	Vitamins (in 500g packets)
Rufiji	92	9,200	13,800	368	368
Bagamoyo	184	18,400	27,600	736	736
Kibaha	322	32,200	48,300	1,288	1,288
Mkuranga	595	59,500	89,250	2,380	2,380
Kisarawe	274	27,400	41,100	1,096	1,096
TOTAL	**1467**	**146,700**	**220,050**	**5,868**	**5,868**

Source: Analysed from RIU Database, 2013

Findings show that it was immediately after making the first orders when RIU realised that suppliers had no capacity to satisfy that kind of demand (RIU, 2011a). Suppliers were struggling to satisfy the demand and it affected quality.

[32] This is the distance from Dar es Salaam where wholesale is done to the district capital where district input dealers are based. However producers were living deeper into the villages and they had to come to these district centers to buy inputs. Some Ward level input dealers emerged and opened shops in more remote villages.

[33] The minimum number was chosen to minimize transport and distribution costs.

Unfortunately, the demand could not be spread out to a longer period because a significant number of producers was needed to transform the industry. Therefore, RIU opted to expand supply and not to regulate demand. Apparently, the suppliers had never been subjected to producing such volumes before. So, the opportunity to experience challenges associated with producing such volumes had not been provided. So the demand shock created the opportunity for capacity building by making the supply system reveal its weaknesses. Clearly, without the shock the input supply system would have continued in the same way. And suppliers wouldn't have known what to change. Therefore, the overwhelming demand from rural producers revealed capacity gaps in the supply systems, which led to multiple process of strengthening the system. Furthermore, RIU's presence created a room for experimentation when the system was reorganizing.

Basically, the role of RIU was twofold; one, to induce the shock and two, to support the system to respond and adapt. This means, public resources were used to stimulate demand for inputs from a significant number of poor producers, and which was enough to create a shock, and later build system capacities as actors were adapting to the new equilibrium. Up until this point, RIU work was more organisational than technological with most challenges faced in chick supply then followed by feeds and vaccine supply. In fact introducing these three inputs in the rural poultry production system was the biggest shock to the system.

Although RIU generally acted as an exogenous shock to the entire poultry industry in Tanzania by disrupting the status quo, this section pays specific attention to the *'input demand shock'* which was induced when RIU supported a significant number of producers to order inputs. This financial support changed the position of rural producers in the market and made them viable for business partnerships.

The next section explains how RIU acted as an exogenous shock and how organisational thinness and fragmentations were reduced.

8.5 Unlocking the industry and path creation

As earlier described in Chapter two and four, I consider the dominance of the traditional extensive poultry production system observed in rural Tanzania to be a

lock-in. And that makes understanding the reasons and mechanisms for the lock-in essential in predicting and promoting a shift in the industry. The previous chapter explains how the industry is locked-in and why. I have built on those findings and further used a dynamic approach (Dosi, 1993) to analyse technological changes that created the shift towards adopting more productive technologies and management practices. And to achieve that, I have analysed innovation both at farm level and in other parts of the industry (Possas et al., 1996).

Since traditional poultry production system limits opportunities for learning and growth, facilitating a shift towards a new system requires engaging with producers' psychology (Ward, Minja, Blackie, & Edwards-Jones, 2007) so as to create a mental shift towards embracing new practices that attract partnerships with others. This means encouraging them to start producing for the market where other actors will be involved. The next step is to create practical mechanisms that support multiple actors to engage and work with each other.

According to literature, *'path creation'* is a means to escape lock-in where a new path is left to gradually emerge side by side with the old path by building on inherent resource bases (Schienstock, 2004). This means that old trajectories don't have to be fully abandoned for a new path to be adapted. But actors can use previous knowledge while adding new technologies to create a new path, which Simmie (2012: cited in Salamonsen, 2014) describes as 'layering'. Literature also suggests diversification or upgrading as potential means for restructuring (Ibid).

What RIU data presents in the chapter is a facilitation process which involves combining tacit knowledge (skills) and mechanisms emerging from external support, to curb rural producers' vulnerability and as elaborated by Ugaglia and her colleagues (Ugaglia et al., 2011), such mechanisms generate *'switching costs'* and *'lower payoffs'* in farms. This is to argue that existing knowledge can be backed up with an external capacity (e.g. from a programme like RIU) to fill in any capacity gaps required to overcome path dependency. A new path gradually emerges without first abandoning the previous production system completely.

8.5.1 Unlocking the cognitive lock-in:

Agriculture is perceived by many in Africa as the occupation of the poor - the career of those without other options; the life choice of the failed. Villagers watch others with their children in good schools, owning transport and houses. Farming is associated with poverty and few feel pride in the profession of agriculture. In Covey's (1990) framework, producers have a dependent mind-set. They feel dependent upon others, problems are not their fault, and they cannot afford to take risks. This may well be related to the long term and continuing decline in the environmental and economic conditions in agriculture, and the perceived low status of producers in their local society and in the wider world (as exemplified by years of being looked down on and told what to do by researchers and extension workers). This is exacerbated by the fact that too much of the outside advice they have been given to improve their productivity has, in fact, been dreadful. This has left these producers highly dependent upon local technologies which have not been adapted to rapidly changing circumstances, innovation is stifled and best practice fails to spread.

RIU programme adopted a 'business unusual' approach, which focused on working with producers to enable them to find their own solutions and build their business. The emphasis went beyond improving poultry production to making individuals (and the community) believe they could do the kind of activities and business the educated and urban people do. It made them believe that they could use technologies and knowledge to make money differently from how they were used to, that they could do different things and that they are capable of learning and using new knowledge.

The emphasis in the implementation was on three areas; (i) building pride and confidence in rural producers' ability to learn and enter into partnerships with urban dealers; (ii) engaging the community into the habit of seeking and using new knowledge to improve incomes; and (iii) linking the act of setting new expectations and learning to solve every problem without focusing on individual economic weaknesses, but seeking to know how they can partner or interact with others to gain new skills and abilities.

Producers mentioned the value of the self-belief planted by the programme that despite being poor and illiterate, they could still keep as many chickens as they

wanted only if they were ready to try and learn. This is what gave them the first push and the confidence kept growing as they raised the first batch of 100 chicks under the constant support of the household caretakers who lived with them for the first thirty days. A lady said:

> ["Having the caretaker around was like when I had my first baby and my mother was around. I knew she was watching and nothing would go wrong. And after I raised the first child, I have the skills to raise as many children as I want on my own. The same is with chicks. I just need space and resources to do it." (Interview with Producer, June 2013).]

Therefore, after the first thirty days, producers became relatively more confident because they had gone through the process of raising chicks themselves, a stage which they feared most.

The initial sensitization and negotiation processes helped producers to gain confidence that they could keep chickens commercially even before experiencing actual processes. Then, the RIU support during the experimentation phase, coupled by the actual process of learning by doing made the mental shift permanent. One farmer said:

> ["Even if I don't keep chickens now with RIU, I will never keep one or ten chickens anymore. I have kept up to 200 chickens I can therefore keep even 1000. I already have the knowledge and a proof in my heart, that I once did it." (Interview with Producer, August 2013)].

Encouraged by their experience of raising 100 chicks producers started to actively seek quality services from the LGA and from the input suppliers. They also became keen on vaccination dates and quality. Some also started to look for private veterinarians.

Cultural changes

The most important cultural change is the integration of business principles and culture in the indigenous poultry industry. Programme actors were driven by business motives and principles as they demanded, supplied and utilized new

knowledge and technologies. The following are the key changes which were driven by business motives:

Stop relying on natural breeding and social sources of foundation stock

Rural poultry producers decided to keep more chickens so they could sell more and get more income. And to keep more chickens they had to introduce buying of chicks in their production system because business wanted them to produce predictable and consistently significant volumes. So they have to decide how many birds they wanted to keep and be able to sell them in batches to meet market conditions which want reliable and regular volumes.

Start controlling losses and reducing

In addition to buying chicks, they also had to reduce flock losses. This included learning to control mortalities due to predation, diseases and even accidents. This was also necessary if they wanted to have predictable volumes at maturity and gain more income. After all they also had a loan to pay. So they introduced themselves to the culture of building chicken sheds to protect them from predators and searching for skills and innovations to control and manage diseases. They therefore introduced vaccination and supplementary feeding to avoid nutritional disorders. Supplementary feeding was also necessary because relying on 100% scavenging was no longer possible given the increased number of chickens *vis a viz* the available scavenging feed base.

Reduce time to maturity and gain higher product market value

Apart from reducing nutritional related problems, new feeding strategies were also introduced to ensure chickens gain weight (i.e. above 1.5kg) in the shortest possible time i.e. within three to four months as opposed to previous eighteen to twenty months. This meant lowering management costs and risks, as staying with chickens for longer costs more especially on feeding, and the risk of losses e.g. due to theft, diseases or predation also increases. Previously weight did not matter as any mature chicken would be bought at a negotiable price. Thus weight was only estimated and used to determine price, now when they are actually weighed.

The reduced time to maturity also allowed producers to have three production cycles in a year (i.e. of 4 months each) unlike in the past when they had long and unclear cycles. Basically, producers needed skills, technology and organisational processes to have predictable volumes in order to access the market which was mostly in the urban areas where there was competition from other commercial farms. Importantly, they had to be able to predict the quantities and when the chickens will mature, and then be able to negotiate and develop marketing partnerships. They had to be attractive for such partnerships by being aware and abiding to certain business principles and culture.

RIU used the bottle neck approach to solve every challenge as they occurred in the entire system. This was done by (i) identifying key actors and existing problems in the entire value chain, (iii) Coordinate the solutions seeking process.

8.5.2 Unlocking the resource lock-in

RIU provided soft loans and facilitated the process of purchasing and importing large incubators for hatchery incubators. Chick producers were supported to invest quicker than they would have otherwise done as they would have to wait and speculate to see the reliability of producers' demand. Under normal circumstance no investor would have invested so much before the demand stabilises. With producers being new in the business their demand was unstable and unreliable, thus it would have taken time to trigger such a huge investment. Producers' demand would also not have stabilised if they did not have reliable supply of chicks to experiment with. Thus this was an example of a chicken and egg situation blocking investment in the industry and which justify public intervention.

RIU also provided in-kind soft loans to producers to procure chicks and basic inputs. This was a smart subsidy which was necessary to facilitate the transformation. Producers needed a new source of capital because they were not used to allocating financial resources to the activity. Therefore, for them to change and experiment with the new scales and technologies like vaccines and commercial feeding, they needed an external source of funds. Unfortunately, given their context, no financial institution was structured to fund them. This is because of how the service industry is structured and how it operates in Tanzania with biases against small producers. For

that matter, RIU had to innovate and fill in the gap to facilitate producers' transition towards becoming commercialised and possibly become attractive for partnership with financial institutions at a later stage.

Later, producers got financial support from Kukudeal by integrating them in a contract farming scheme where producers kept even more chicken (i.e. from 100 to 200 and up to 300) and received input support, extension services and market. They paid the loan after they sold chickens upon maturity.

8.5.3 Policy influence (policy-lock in)

Theodosius Kaijage[34] explains that the scale and sector-wide coverage of RIU's approach attracted the attention of policy makers unlike any initiative before. These policy makers then gained the ability to influence the Government of Tanzania to include indigenous chicken in the development agenda. Previously the government was biased towards exotic chickens, and had thus invested extensively in hybrid chicken R&D and the recommended husbandry practices and disease control innovations were not made easily available to indigenous chicken producers. Thus there was a policy bias on research, policy and practice. Knowledge was not disseminated to indigenous producers (RIU, 2011: p.8).

RIU used a three-pronged approach to commercialise the industry; (i) convinced producers to increase individual production scales, which then justified (ii) increased use of new knowledge and technologies among producers, and which stimulated (iii) increased investment in inputs and services provision systems. As a result, the government now regulates the industry for the operations of hatcheries and breeder flocks to minimize spread of poultry diseases and to ensure a smooth transition of the entire industry. The programme also provided the necessary evidence and justification for the government to develop and enforce regulations for

[34] Theodosius Kaijage is a Principal Livestock Research officer of the Ministry of Livestock Development and Fisheries in Tanzania. He wrote his analysis of RIU program in a case story titled *'New Dynamics in Policy Making are Paving the Way Towards Commercialization of Indigenous Chickens in Tanzania'*. This is one of 12 case stories written by different RIU Partners in a write-shop facilitated by Royal Tropical Institute (KIT) in April, 2011. The cases were printed in December 2011 under the title *'RIU Case Stories on Institutional Change'* and can be accessed at http://www.researchintouse.com/resources/riu040412-tz-case-stories-book-mail.pdf

manufacturing of poultry feed, traceability and animal welfare. Therefore, RIU has challenged the thinking that indigenous poultry could not be commercialised and fit the traceability criteria. I discuss this further in chapter 9.

8.5.4 Reducing organisational thinness

Before RIU the rural poultry industry mostly involved producers, public extension staff, a few chicken traders, research, and government (both central and local). Once in a while the government would conduct vaccination campaigns using its extension system and NGOs (or projects) would implement poultry development interventions in selected villages. These actors performed only a few functions and learning was limited. At the start RIU had to work with only a few actors who steered initial processes until it was viable for other actors to come in. New actors came in as new roles emerged – for example, household advisors (Caretakers) were brought on board after the need for an intensive on job training on chick raring was felt by producers. Other new actors joined in to perform old roles as demand increased-for example new chick producers came on board as more chicks were demanded.

RIU reports show that the programme facilitated processes to adjust farm operations and later supported a significant number of rural producers to demand inputs and services produced by other organisations. In turn, this increased the number of actors and roles played in rural areas significantly. Consequently, organisational thinness was reduced.

Before rural producers could interact with other actors, farm operations had to change in manners that needed inputs produced and supplied by other actors. When more producers used different inputs like feeds, vaccines, etc., knowledge to use these inputs was also needed. Thus relevant service providers emerged to provide such services in rural areas. As more inputs were being produced and supplied, intermediary services to transport and distribute inputs became necessary. This created a room for new actors (organisations) to emerge and provided services in new locations. This means that unless a significant number of rural farms are reorganised and capacitated to rely on other enterprises for inputs, services and knowledge, organisational thinness in rural areas cannot be reduced. The reasons for actors to interact must be embedded within the enterprises or farms.

Another approach discussed in this chapter is linked to the role of high transaction costs argued in the literature as one of the factors that hinders interactions and therefore causes organisational thinness (see Section 2.5.1). In the analysis I have looked at how RIU created mechanisms that cushioned (or lowered) transaction costs and thus made it easy for rural producers to interact with the market, and became attractive for partnerships with other market actors. When poor producers are innovatively organised and supported to lower individual transaction costs, specifically by taking advantage of their aggregate volumes (of demand and supply) they become attractive for partnership with other actors. This in turn creates opportunity for cross-learning and exchanging through business interactions. This approach has been widely reported in literature where bulking (of farm produce or input orders) is done though different mechanisms for accessing the markets like creation of marketing associations, marketing boards, contract farming, out-grower schemes, etc. (Ekboir, 2012; Fafchamps, Gabre-Madhin, & Minten, 2005; FAO, 2009; S Nederlof & Pyburn, 2012; Suzanne Nederlof et al., 2011; Shepherd, 2006; Zant, 2012).

Under these mechanisms aggregation is done to gain economies of scale and therefore lower transaction costs. Changes in producers' behaviour, specifically in relation to how they managed their enterprises, increased business volumes, which in turn triggered government interest to regulate the industry. This expanded the number and type of public organisations working in the industry. For example, the Tanzania Food and Drug Authority (TFDA) had to come in to regulate drug supplies in rural areas, the Central Veterinary Laboratory (CVL) joined the network to manage new diseases which emerged in rural areas as more chickens survived the Newcastle disease[35], and the Veterinary Investigation Centres (VICs) at different levels were later involved to manage the supply of non-thermal stable vaccines from the main supplier to the remote areas, etc. Increasing business volumes attracted regulators and quality control organisations to join rural networks, a demonstrable effect of the RIU intervention.

[35] RIU reports show that more diseases were isolated in the villages as more chickens survived the Newcastle epidemics. Basically the diseases like fowl pox and typhoid were previously there but the incidences had no economic significance justifying government intervention.

As more rural producers commercialised their farms, and as more private actors came on board in the upstream part of the industry, more engagement with the government was needed to create a favourable environment for investment. This also included the need to interact with the government for policy lobbying, example on tax issues and even in controlling poultry imports. This prompted the need for actors to create formal and informal stakeholder organisations as platforms for policy dialogue and negotiations. Having more actors and increased number, type and a size of transactions created the need for creating formal organisations for engaging with the government. This also reduced organisational thinness in the industry.

RIU initiatives increased the number of actors in the rural poultry value chain. For example, with the new breeding strategies where producers buy chicks, more actors emerged to produce fertilised eggs for the hatcheries, to run hatcheries, breeder farms and to distribute chicks. In addition, the change in production scale motivated producers to use commercial inputs, and since their demand was significant they motivated poultry input manufacturers and suppliers (distributors) to work in rural areas. The initiative made rural producers attractive for partnerships with often urban-based input supply actors. The programme also introduced a new cadre of poultry education (extension) providers who are certificate holders trained in livestock but are usually not employed to work with producers. Using them showcased their abilities and how they could be used by the government to fill in gaps where there is a shortage of extension staff. They can also be used by NGOs and donor funded programmes to help producers learn by doing. Some of these advisors are now employed by commercial poultry producers who keep improved breeds in urban areas. These commercial farm owners were not used to employing workers formally trained in livestock husbandry, and some say it is because they did not know such a cadre existed (personal comm.).

The increase in actors and its vigorous commercialisation persuaded the government to motivate and engage stakeholders to form associations to formally engage with the government to resolve challenges facing the poultry subsector. For example the Tanzania Poultry Breeders Association (TPBA) was formed with initiatives from indigenous chicken breeders who wanted to influence the new hatchery regulations

which were biased in favour of breeders who raised improved breeds. The Government was also stimulated to consider the development of a National Strategic Plan specifically for developing the indigenous chickens industry.

Since the RIU programme began, the network of partnerships and linkages has demonstrably increased to include more actors who exchange knowledge in the form of information, skills, goods like chicks, vaccines, inputs and services such as extension, veterinary, laboratory investigation and business training.

8.6 Up-scaling and industry level transformation

Key policy makers and policy influencing groups in agriculture and livestock sectors include the Ministry of Livestock Development and Fisheries; the Ministry of Agriculture and Cooperatives; the Parliament; and the National Livestock Research Institute. The programme organised field visits, round table meetings and submitted progress reports to policy makers at different levels to engage them and inform them of programme activities.

The programme has previously engaged with the Ministry of Livestock Development and Fisheries to work on waivers for import tax for breeding machinery. Breeding machinery was not included in the list of exempted agricultural inputs as required in the current procedures. This matter was first communicated to the Ministry's representatives through a roundtable briefing meeting on the programme's activities in the poultry sub-sector. The Ministry followed up with relevant government department and within a few months, the parliament passed a ruling to exempt import tax for incubators and other hatching machinery.

The ministry has also worked with the programme to introduce RIU supported hatcheries and producers to the new Animal Diseases Regulation for Hatcheries and Breeder Farms. The ministry was prompt to respond to the request by the programme. However, none of the stakeholders' comments could be used to amend the regulation. The ministry's poultry division is currently collaborating with RIU supported hatcheries in the process of enforcing the new regulation. The increased number of stakeholders in the poultry sub-sector as well as increased production scales has made it necessary for the government to closely enforce relevant

regulations for disease control. Meanwhile, local chicken breeders and hatcheries are in the final stages of creating their formal association. It is anticipated that as the sector expands, breeders and other stakeholders would need a formal organisation that can dialogue with the government on policy and practice matters.

Being aware that the poultry sector is now a promising economic sector and the challenges it faces, the government is in the process of developing quality standards and regulations for manufacturing poultry feeds, traceability and animal welfare. The government also considers the development of a National Strategic Plan specifically for development of the local chicken sector which will replicate the approach employed by RIU to other areas in the country.

At the district, ward and village level, the government extension workers are more engaged in providing advisory services for poultry keepers. This is influenced by the increased numbers of poultry in their areas as well as the growth of producers from small (between 1-100 chickens) to medium scale (between 150-500 chickens). Before the RIU intervention more focus was given to provision of advice for large stock keepers (cattle, goats, and sheep) and crop producers.

In research practice, the programme's efforts to lobby and push for a national perspective towards characterisation of indigenous chicken breeds, resulted into development of a proposal to carry out a study to characterise indigenous chicken breeds. The proposal was developed by the National Livestock Research Institute (NLRI) and has already been submitted to the Tanzania Commission for Science and Technology (COSTECH) for funding. The institute plans to breed and select the best indigenous chicken breeds which can be promoted for commercial production (eggs and meat) and promote their availability and multiplication through establishment of parent and grandparent stock farms. RIU through MUVEK was listed as one of the major collaborators in utilising the results of this study through the production system it has created (i.e. producers, egg producers, parent and grandparent stock farms and hatcheries).

Training institutions are also responding to the growth in the subsector. The Open University of Tanzania has introduced a Diploma course in poultry to cater for the

increased needs in the subsector. An organisation such as the Tanzania Social Action Fund (TASAF) has adopted RIU's scale i.e. distributing a larger number of chickens – up to 100 to producers. The Fund hasn't however gone beyond to broker or provide other services for producers as it was done by RIU.

8.7 Summary and conclusions

This chapter investigated the major tools that RIU used to initiate practical changes in the rural poultry industry in Tanzania. The chapter equates the programme to an external force that challenged the status quo and later facilitated internal processes towards re-organisation. The chapter explains that from the outset, RIU acted as an *'exogenous force'* that '*pushed'* actors in the industry to think and act differently. Its presence and engagement in the industry disrupted what was going on and caused mental shifts, brought new investments, caused re-organisations and changes in routines and use of technology.

As an exogenous shock, RIU promoted new tendencies that encouraged use of new knowledge and adoption of improved husbandry practices. Specifically it stimulated producers to keep more chickens and consequently increased their demands for skills and inputs. Rural producers were introduced to buying chicks from specialised hatcheries and encouraged them to focus on regulating their stocks and stock flows in order to maximise gains. This also triggered changes in management routines and consequently stimulated multiple interactions with different suppliers of knowledge, technologies, services and inputs. Basically, by encouraging all actors to focus on stock flows, RIU stimulated both organisational and technological innovations. The chapter therefore argues that, by focusing on regulating stocks, rural producers became viable for partnerships with other actors in the industry. And this reduced organisational thinness and fragmentation previously experienced in the industry.

Specifically, the chapter establishes that commercialisation created a significant demand for poultry inputs and services which attracted suppliers to do business with rural producers. However, the demand from rural producers was overwhelming and a need for new capacities to supply emerged. It is the process of responding to the emerging capacity needs that triggered innovation in the supply system. Innovation

in poultry production was triggered when producers commercialised and demanded new skills, inputs, services and technologies. In the supply system, innovation was triggered by the overwhelming demand from rural producers and which forced the system to reorganise.

The main argument emerging from the chapter is that, promoting innovation in an industry dominated by subsistence producers means unlocking it from path dependency, and from 'demand-and-supply deadlocks'. It is clear from the chapter that, after the *'mental shift'* occurred, RIU supported many producers to demand and procure larger volumes of inputs. The chapter explains that these orders re-define producers' position in the market and more actors were attracted to do business with them.

It is explained further that, in cases of path dependence or lock-in, an exogenous disruption (e.g. in form of 'a demand shock') may trigger movements towards a new path. The shock triggers co-movements within the system as multiple actors respond to the new demand from a large group of producers. However the shock also revealed multiple capacity gaps which required strengthening before a new equilibrium was obtained.

I discuss how RIU built capacities after the shock in the next chapter.

Chapter 9 Building capacities after the 'shock'

9.1 Introduction

This chapter continues the discussions in chapter eight. It analyses what happened after the system was induced into a 'demand shock' when RIU supported a large number of producers to order and procure different inputs. This chapter would show that, after the demand shock, different problems emerged randomly and there was no single approach that could solve all of them. So RIU staff revised the programme strategy from focusing on developing an 'innovation platform' to solving problems as they emerged. They called this approach a '*bottleneck approach*'(RIU, 2011a).

With this approach, RIU supported relevant actors to engage in even smaller groups to address problems in different subsystems. Basically, the shock made it necessary for RIU to support multiple meetings and processes to solve multiple problems in production, input supply and marketing. Therefore, RIU had to work with multiple actors, using multiple strategies to solve multiple problems which led to growth in the industry. The demand shock created co-movements in the industry and gradually shifted RIU's focus from mainly empowering small producers to developing the entire subsector. Therefore, regardless of where the programme started, the entire industry got involved. This emphasizes the point that subsistence producers cannot be developed in isolation.

In the chapter I will explain how different problems emerged in different subsystems and how RIU supported actors to solve them. Specifically, I have analysed problems that emerged in chicks and feed supply, provision of extension services, managing poultry diseases, building business skills, in marketing and regulation. The discussion makes it clear that intervention areas emerged as actors continued to interact. This means they could not have been pre-determined. It also explains that need articulation and solution seeking were continuous processes that led to innovation. The chapter also highlights that innovation facilitators need to be ready to work with different actors, handle multiple processes, be flexible and ready to play

different roles. They should also have access to flexible resources, and more importantly, stay at the centre of all processes to ensure all relevant roles are played.

The chapter is organised in ten sections. The next section explains how the shock caused problems in chicks supply and how RIU worked with different actors, old and new to solve the problems of volumes, quality and price of chicks. Section three describes the challenges that faced the feed supply system and how they were addressed. This included engaging with actors beyond the poultry industry. Then, problems which faced the extension and the veterinary systems particularly on managing diseases are presented in sections four and five, respectively. Then in section six I have explained how RIU built producers' business and entrepreneurship capacity after they were found to miss the skills and thus failed to manage their new enterprises appropriately. Section nine explains how contract farming emerged to improve producers' access to capital. Regulatory challenges are analysed in section nine, where I also discuss how RIU approached them. Section ten draws conclusions from the chapter.

9.2 Solving the chick supply paradox

RIU reports explain that when the first order to supply 20,000 day old chicks was made the supplier could not satisfy it. He only managed to produce 2000 chicks which is only 10% of what was needed (RIU, 2011a, 2011b). The report explains further that, when the situation was analysed, it became clear that there were serious capacity problems beyond that particular supplier that needed long-term solutions. Consequently, RIU's focus shifted from supporting an individual supplier into developing a chick supply system (RIU, 2011b).

Solving the chick supply problem was not straight forward because commercial breeding for indigenous chickens was almost non-existent in Tanzania. All commercial poultry breeding farms produced exotic chicks (Match Makers Associates, 2010; RIU, 2011a). As mentioned earlier in Chapter 4, the government of Tanzania supported establishment of commercial hatcheries to produce exotic chicks. The government also distributed improved cocks to cross breed with indigenous hens through natural mating. Some projects like the Swiss funded Rural livelihood

Development Programme (RLDP) implemented in central and Northern Western Tanzania promoted synchronised natural breeding where eggs are manually collected and given to selected hens to hatch (Match Makers Associates, 2010). This model was adapted by RLDP from the famous Bangladesh model (Fakhrul Islam & Jabbar, 2005) and which they now call the Bariadi Model[36].

Another strategy which was adopted later in the mid-2000s introduced artificial incubation in selected rural areas, but at very small scale. The strategy was championed by the World Bank-funded Tanzania Social Action Fund (TASAF) who promoted use of small kerosene incubators. So TASAF distributed kerosene incubators to poultry producer groups in the villages and members were asked to collect eggs from their farms and incubate them collectively. Therefore, no commercial hatcheries were supported to produce indigenous chicks.

Studies show that both the synchronised breeding which used selected hens to hatch eggs collected from the same flock (i.e. foregone for consumption or sales), and the use of kerosene incubators (an initiative which failed) could not bring significant changes to the rural poultry production system (Match Makers Associates, 2010; RIU, 2011a). In my opinion, the two approaches failed because; first, both strategies relied on the same family flocks (which were small) as sources of fertilised eggs. And as I elaborated in Chapter 5, natural breeding sends negative feedbacks to the farm because part of the output becomes responsible for the continuation of the enterprise. As a result, any decision to increase the number of breeder hens, means forgoing direct gains from sales or consumption. In fact it creates two competing goals in the system, i.e. the goal to expand the enterprise, and the goal to dispose and earn income. Second, both approaches did not create new partnerships to channel-in new skills, investment, or exchanges of any form. In fact, both strategies relied on local resources and capacities which were already very limited.

Commercial production of indigenous chicks was underdeveloped in Tanzania. Particularly, the production of fertilised eggs which could be incubated and hatched was a big problem. During that time some traders used to import crossbreed chicks

[36] This is a name after the first district RLDC worked in Shinyanga Tanzania.

from Zambia and Malawi and sold them to urban and peri-urban commercial producers. Clearly, producing sufficient volumes of quality indigenous chicks was a challenge because procedures for establishing indigenous parent stocks were unclear. Most breeders raised chicks from their own hatches as parent stock. However, RIU anticipated that, with the new demand for indigenous chicks it should have been relatively easier to attract new actors and convince them to invest in the business. So the first task was to attract new actors.

9.2.1 Expanding the supplier base: Looking for new actors

When it was clear that the selected chick supplier could not meet the demand, RIU made a public call and invited new actors. About twenty five people responded and all were invited for a meeting. This meeting revealed individuals who owned small incubators and produced indigenous chicks for their own purpose. They kept small parent stocks and had basic hatchery management skills. So RIU decided to capitalise on, and supported them to expand. This means some capacity already existed and what the programme did was to build on it. According to RIU staff, at this point the programme was more concerned with getting the needed quantities, and thus paid less attention to quality. In fact, the idea was to gradually develop the supply system from whatever level it was.

Apparently, the pressure to supply chicks was higher during that time because many producers were already sensitized and had invested their scarce resources to build sheds. As a matter of fact, getting the chick supply operational was very crucial and without it the whole programme would have failed (Interview with RIU staff, June 2013). So, no screening was done before the meeting, and as the RIU programme officer explained, they had no criteria for pre-assessment. Seemingly, they thought the best way was to meet and talk to them in a group (i.e. have an open dialogue). After all, RIU staff and champions (producers' representatives) already knew what was needed (Interview with RIU staff, May 2013). This explains that, when developing systems in industries dominated by subsistence actors, one has to start with whomever and whatever capacity is available because there is not much to choose from.

The meeting report shows the main agenda was to: explain what RIU was doing and the emerging demand for chicks; establish the capacity to produce chicks present in that meeting; identify challenges and their solutions; and negotiate price and other business arrangements. Therefore new negotiations regarding chick supply took place, and this time different suppliers proposed different prices. This prompted the meeting to calculate costs and established the price at TZS 1000 (approximately US$ 0.63) per chick. Other logistics were also discussed and a livestock researcher from Sokoine University of Agriculture (SUA) discussed breeder stock management, hatchery management and hygiene (in order to avoid spreading diseases). He also elaborated on the performance of different indigenous chicken breeds.

By the end of the meeting thirteen suppliers agreed to join the programme under the agreed price, but on condition that RIU coordinated orders and payments. This was concluded after suppliers made it clear that contacting individual farmers located in different villages would be very costly and impractical. This was also necessary to producers because suppliers were also many, produced different volumes of chicks at different times and places, and were therefore difficult to coordinate from villages. In fact, this added a new role to RIU (RIU, 2011b). Therefore, the meeting identified new actors and then set *'rules of engagement'*. This shows that negotiations among actors is a continuous process, especially where new actor are involved.

Actually, the number of hatcheries that produce chicks of indigenous breeds has increased from fourteen in 2011 to twenty six in 2015. This is according to the country profile data of 2015[37].

9.2.2 Stimulating new investment

Finally RIU worked with thirteen hatcheries where eleven existed prior to RIU and two were newly created in Dodoma and Iringa regions (i.e. about 502.3 and 502.2 km respectively from the business capital Dar es Salaam) to facilitate programme up-scaling. The initial capacity of the eleven hatcheries was between 500 and 2000 chicks per week, making a total average capacity of about 4,500 chicks per week (RIU Annual Report, 2009/2010) which was way below the anticipated demand from

[37] http://www.sapoultry.co.za/pdf-statistics/tanzania-country-report.pdf

the growing number of producers recruited for the programme. Moreover, the supply was inconsistent and unreliable.

So even with the larger number of suppliers, the volumes supplied were still low and unreliable. It later became clear that more machine capacity was needed as well as a larger and reliable source of fertilised eggs. This meant procuring bigger incubators and establishing bigger parent stock farms. Therefore, RIU selected five hatcheries and supported them financially to expand. These were selected because owners were ready to invest and expand. After negotiations, RIU provided matching funds to purchase larger and technologically advanced hatchery equipment each with a capacity to produce up to 10,000 chicks per week (these were procured by RIU from China). Part of RIU funds were also used to purchase parent stock and expand farm infrastructure (RIU, 2011b). The remaining eight hatcheries received smaller loans to expand their parent stock or procure hatching eggs. The new investment in hatcheries took long to mature (about six months later) because of delays in importation and clearing of equipment from China. The parent stock also needed about six months to mature and start laying eggs.

Apparently, RIU had initially explored possibilities of getting loans from banks but all fourteen hatcheries did not qualify. So RIU had to provide the needed financial support because sufficient chick supply was key to the programme to work. This reveals that building innovation networks in subsistence-based industries requires less bureaucratic funding. It is also evident that some capacity must exist to keep processes going while waiting for new investment to mature..

The study establishes that promoting innovation in subsistence based industries involves addressing multiple capacity gaps which tend to reinforce each other, and which require spontaneous investment decisions made with less bureaucracy. This is to call also for innovation facilitators with access to flexible funding.

9.2.3 Managing production delays

While waiting for the investment into chick supply mature, RIU had to ensure actors' enthusiasm, especially from producers is maintained. So RIU organised field visits of 358 producers to the hatcheries to help them understand the challenges of raising

parent stock and what it takes to establish and run a hatchery. This created a bond between producers and hatchery owners after they understood processes of producing chicks, including selection, care and storage of hatching eggs; parent stock care; types of indigenous chicken; and even production costs. What emerged from the visits was that producers understood how hatcheries are managed and thus necessary for tolerance and patience in times of production delays. Additionally, some had time to interact with workers in the breeder farms and confirmed the usefulness of the new management routines recommended to them. Thus producers used the visit to learn and clear any remaining doubts about new husbandry practices. One producer in Kibaha said:

> ["When I went for that exchange visit, I asked the workers how they feed, vaccinate and keep chicks warm. I was happy to know that I am taught what I can do even with a larger flock." (Interview with Producer, October 2013)].

Field activities were reorganised to allow a slower distribution of chicks depending on the supply from the old machines and parent stock. Delays in chick supply had negative impacts to the programme. For example, reports show that some producers who had built sheds and were ready to receive chicks lost interest in keeping chickens commercially. The situation was worse for those who borrowed money to build sheds expecting to pay back within four months. The RIU experience shows that when strengthening system capacities, delays happen. Therefore, creating an environment where parties understand each other's operations makes negotiations for managing such delays more effective. However, the facilitator needs to have resources to continue encouraging actors during delays, so as to maintain the energy and momentum for change.

9.2.4 Solving the chick quality crisis

As the demand for chicks increased, the quality of chicks kept dropping. This was mostly caused by the poor quality of fertilised eggs. In fact, as chick producers waited for their new parent stock to mature, they continued sourcing fertilised eggs from different and unregulated sources. Consequently, they produced diseased chicks which caused high mortality rates in rural farms, i.e. from only two per cent to thirty per cent in two months (RIU Annual Report 2009/2010). So, RIU requested the

Central Veterinary Laboratory (CVL) of the Ministry of Livestock Development and Fisheries (MLDF) to visit producers and hatcheries and investigate the problem. The CVL mission report shows that most of the problems were related to hatchery management and less with producers' management practices.

Furthermore, the mission established that problems in the hatchery were linked to the sources of fertilised eggs including the breeder stock. Therefore, RIU recruited a consultant to train hatchery owners and staff on hatchery and breeder stock management. The consultant was asked to stay in one hatchery for a week and observe all processes and train all workers on job. The consultant report shows a high cooperation from hatcheries probably because the training was timely and the losses experienced by owners were visible given the ready market for chicks available to them. It is also reported that hatchery owners accepted to change routines and adopt new ones. They agreed to incur costs of buying equipment and chemicals to maintain high hygiene levels. Some hatcheries had to get rid of the entire parent stock and start afresh with clean sources (Hatchery management training report, 2010).

During interviews with RIU staff, it was clarified that RIU had decided to recruit the consultant instead of letting hatcheries handle it individually because the programme wanted to ensure all hatcheries are trained and motivated to change routines. It was also meant to ensure consistency in the skills imparted: If they had let hatcheries look for advice individually, it might have been difficult to ensure all hatcheries have learnt all the basics. So RIU prepared the consultant's terms of reference in collaboration with hatchery owners and CVL staff. The consultancy report was also shared in a meeting to ensure clarity and adherence to what was recommended. This reflects a need for ensuring consistency in type of knowledge shared to create common values and understanding. So basically, RIU played the role of information disseminator, ensuring that basic knowledge is accessed by all relevant actors at the right time in order to instil common values. What emerges here is a process of synchronising a group of actors within a subsystem to function as a unit.

9.2.5 Linking hatcheries with the Government for regulation

The need to regulate hatcheries for biosecurity, biosafety, price and general quality of chicks including their genetics was evident. So the programme consulted the

National Livestock Research Institute (now TALIRI), and The Ministry of Livestock through the CVL and asked them to advise the fourteen hatcheries' on disease management and efficient breeding. This was meant to enhance the hatcheries capacity to comply with government regulations and be able to compete in the industry. RIU also organised field visits to all hatcheries by representatives from the ministry of livestock. RIU report (Annual Report, 2009/2010) describes this visit as part of initiatives to directly link the Ministry with hatcheries, as well as to showcase the emerging changes in the industry. Apparently, this initiative created a strong bond between the ministry and hatcheries, who are now engaging through the Tanzania Poultry Breeders Association (TPBA) which was created under RIU's facilitation.

RIU reports show that, after the field visits, a meeting involving breeders, hatchery owners, livestock researchers, representatives of rural poultry producers and government officials from the Ministry of livestock was organised to discuss the newly enacted Hatchery Regulations of the Animal Disease Act. In this meeting various gaps were identified and discussed. Specifically, it became clear that the Regulations were biased against indigenous breeds including cross breeds. Therefore, the meeting proposed some amendments which were later incorporated.

Therefore, it is evident that commercialising rural poultry production created demand for chicks which triggered innovation in hatcheries and breeder farms. Particularly, hatchery management skills and techniques were adopted to increase efficiency in invested in machines with larger hatching capacity and of improved and automated technology. In addition, an out-grower scheme emerged where hatchery owners contracted small and medium-scale farms to produce fertilised eggs. Furthermore, quality regulation became necessary and hatcheries that produced indigenous breeds were formally introduced to the government for regulation. After they were formally recognised, relevant regulations were amended accordingly to accommodate them.

RIU identified more hatcheries as implementation continued. So the chick supply problem created a business opportunity for new actors (suppliers) to work with rural producers. It also created new learning opportunities for chick suppliers and poultry producers to interact with a livestock researcher. Additionally, it was an opportunity

for urban chick suppliers and rural producers to negotiate and agree how to do business together, i.e. setting norms and rules of engagement.

9.3 The feed supply crisis

Initially, RIU supported district input suppliers to buy larger stocks of feeds to supply rural farmers. The programme stood as a guarantor for the district suppliers (agro-dealers) to collect goods on credit from feed manufacturers. Financial assistance (loan) was also provided to the district supplier in Coast region and enabled him to increase his stocks based on the new demand. Therefore, in all districts farmers were introduced and linked to district agro-dealers, who were linked to feed manufacturers.

9.3.1 Addressing trust issues

Plans to introduce feeds supply systems through local agro-dealers up to ward level did not succeed. This was due to infrastructure problems which drove feed prices up, and the difficulties in controlling the quality of feeds during distribution. For example, it happened that feeds were tampered with along the distribution line by being mixed with maize or rice bran, or other materials. This reduced nutritional value and in some cases weight was also reduced and producers ended up paying more for less. These problems were beyond RIU and producers' control, so direct feed delivery from manufacturers to producers at ward level began. This removed the district agro-dealers in the RIU feed supply chain.

According, RIU field notes, the decision to by-pass the district agro-dealer was first reached in Rufiji District after producers refused to work with him. It happened that there was no one to replace him. So RIU took the responsibility of linking the feed manufacture to supply directly to producers. This change pushed producers to mobilise themselves and organise deliveries. They identified Ward leaders who coordinated orders and other logistics. The approach was later adopted in other districts, and was used to deliver chicks, vaccines and services. Apparently, this was the beginning of formation of producer groups specifically for service and input procurement.

9.3.2 Local feed resources were not enough

Reports show that the initial plan was to introduce industrial feeds during the first two months only, then let chicks out to free-range. In that regard, producers were expected to compound feeds from locally available resources and feed for the next two months to maturity. This was specifically meant to lower production costs during the producers' experimentation period. Producers were therefore trained to produce alternative feeds including how to breed termites and maggots as cheap sources of protein. Basically, what is observed here is a process where an old strategy is not fully abandoned, but new knowledge and routines are gradually added towards a new strategy. In this particular case, new and old feeding strategies are initially allowed to co-exist before producers choose to abandon them completely. This initial co-existence of old and new trajectories is also discussed in Gerd Schienstock (2004).

As the number of producers and the number of chickens kept per household increased, it became difficult for individuals to produce sufficient feeds. In fact, it is reported that producers' capacity to collect essential ingredients for feed production as well as balancing feed formulas declined. This led to significant low growth and reduced weight gain rates. So RIU identified two private feed manufacturers and engaged them with poultry feed professionals from research and the ministry to produce cheap but balanced feeds that could be used by rural producers. A special *'concentrate'* high in proteins and minerals was then produced for feeding 'growers' of local breeds. The concentrate is usually mixed with maize bran and other scratch grains before it is fed to chickens. A similar product is also used in Kenya (called *kienyeji*[38] mash) as a special feed for local chickens.

Efforts were also made to produce cheap industrial feeds should rural producers choose or be forced to use exclusively industrial feeds (e.g. in case of bad grain harvests). The efforts to introduce new cheap feeds through supporting selected feed producers reduced the price from Tsh 25,000 to Tsh 18,500 (i.e. from US$15 to 12) per 50kg bag of feed. This allowed more producers to afford commercial feeds and permitted them to concentrate on rearing chickens than spending their limited time and financial resources on compounding own feeds. The availability of cheap feeds

[38] 'Kienyeji' means 'local' in Swahili

provided producers with alternative feeding options, i.e. to industrial feeds as supplements or as the only strategy. In fact, the introduction of commercial feeds initiated a move towards specialization where producers gradually got relieved of performing certain functions like chick production (breeding) and feed production and began to rely on other actors who specialise on performing them.

With time, the few selected feed manufacturers who specialised in producing *'concentrates'* for local chickens could not meet the demand. So RIU encouraged more feed manufacturers to use the formula and produce specifically for the rural market. Consequently, the demand from rural producers attracted more actors to do business with them. Apparently, the growing demand and the growing number of feed suppliers brought new challenges regarding both quality and quantity.

9.3.3 Addressing feed scarcity, price escalation and deteriorating quality

As more producers raised more chickens, availability, quality and affordability of poultry feeds became a major challenge. Fluctuations in feed prices affected producers' production costs. Feed prices increased during the dry seasons due to scarcity of major feed ingredients which lowered quality. In some cases it created delays in feed manufacturing and delivery. Such delays interfered with distribution schedules to producers where feeds were sometimes delivered late causing frustration among producers. On the other hand, delays made it very costly and thus discouraging for suppliers to work in remote areas. The programme continued to identify and work with more manufacturers and in some cases loans were provided to boost their operational capital used to purchase and store ingredients like maize, sunflower seed cakes, fish meal, soybean, etc.

RIU reports show that, even with above efforts, the problem escalated and feeds became scarce, prices went high and quality went down. So RIU issued a public call to identify more feed manufacturers and distributors. A national meeting was held involving thirty feed manufacturers and distributors, five representatives from the Ministry of Livestock Development, and seven from research institutions. These met to identify challenges and propose solutions to ensure availability and accessibility of

quality and affordable poultry feeds in the country. It appeared that the entire poultry sector including the commercial industry was facing the problem.

With the increased demand for feeds, some manufactures used new knowledge and technologies in formulations to increase nutritional value and storability. This includes use of acidifiers for controlling salmonella, and use of enzymes and premixes to increase digestibility and access to nutritional elements of the feeds. Furthermore, and for the first time, feed manufacturers in Tanzania started to use alternative feed ingredients such as soya to replace fish meal. They also began to produce special 'breeder's mash', which is now being used in parent stock farms of indigenous chicken. About 10 of them have installed machines that produce pelleted feeds, something they did not do before.

9.3.4 Developing the feed industry: Linking with other sectors

During the second year of RIU, the feed scarcity problem escalated and almost threatened the programme. At that point, the demand for feeds, which came from both rural and urban producers overwhelmed suppliers and the industry was on the verge of collapsing. So RIU commissioned a quick study to understand the situation. Results showed that existing arrangements and capacities in the feed sector included for; (i) production of grains (like millet, sorghum and maize), soybean and oil seeds (like cotton, sunflower, etc.); (iii) post- harvest handling; (iii) compounding technology that ensure production of quality products (e.g. producing pellets vs. mash); and (iv) for regulations to ensure quality control. This did not guarantee safety and profitability of investment in feed manufacturing and distribution. Therefore, the poultry feed sector was mostly affected by weaknesses in other industries (sectors) beyond poultry.

It became clear that the scarcity and high prices of feeds resulted from a shortage of major feed ingredients such as maize and fish meal due to competition with human food needs. It should be noted that maize (corn) is a major ingredient in poultry feed and at the same time a staple food to most Tanzanians. Therefore, inconsistencies in production and supply of maize seriously affects poultry feed production. It was also learned that feed manufacturers lacked the financial capacity to procure ingredients in bulk during the harvest and store them throughout the year. As a result, they were

buying small amounts throughout the year which subjected them to price increase during off season. In addition, use of fishmeal as source of animal protein in the formula also made feed prices and quality very unreliable. Lastly, feed producers use very poor compounding technologies in terms of machinery, formulation, quality testing, weighing (measurements), storage or ingredients (i.e. controlling moisture, etc.) and even packaging and distribution.

Therefore, there was a need to: mobilize relevant actors and facilitate processes to trigger development in the maize value chain; introduce soybeans in the feed formulations which includes developing the soybean value chain; support feed manufacturers to access proper feed compounding technology including soybean extruding and pelleting technologies; support access to feed formulation knowledge for nutritious and disease free products; build financial capacity to enable feed manufacturers to procure ingredients in bulk when prices are low; build storage capacity; and strengthen marketing and regulatory capacity.

As a facilitator, RIU organised high level meetings involving the government, research, development partners and the private sector. RIU also sent a notice in the media to attract investment in the feed industry. The major breakthrough happened in 2012 when USDA approved funds to develop the soybean value chain, and when the government approved yellow corn in the country which is expected to be cultivated specifically for livestock feed. These initiatives are still going on and through the Tanzania Association of Feed Manufactures (TAFMA) public and private sector actors are experimenting with different solutions to develop the feed industry. Currently production volumes and quality of poultry feeds have significantly increased, but prices are still high. According to an interview with a feed manufacturer, availability of maize, soybean and fishmeal is still problematic and costly. Transportation cost and unreliability of power also affect production.

9.3.5 Seeking solutions from research

RIU facilitated processes involving research to come up with alternative ingredients in order to reduce competition between human food and poultry feed production. Specifically, RIU organised a meeting involving 30 participants representing research institutions, academic institutions, government ministries, the Commission

for Science and Technology (COSTECH) and private sector actors such as input manufacturers and importers, seed agencies, breeder farmers and hatchery owners. The explored use of alternative ingredients like sorghum, pearl millet, etc., to replace maize, and use of soybean to replace fishmeal in feed formulation. The focus was to increase production of selected alternative ingredients.

Afterwards, RIU piloted a contract farming model for sorghum production with a feed manufacturer called TanFeeds Company limited. However, serious challenges were faced especially regarding availability and quality of seeds, pest infestation and post-harvest losses. Therefore, RIU provided feedback to the Ministry of Agriculture and Food Security (MAFSC) and requested that they continued as RIU was ending. Unfortunately, no follow up was done (Interviews with ex-RIU staff, May 2013).

During the time of writing this thesis, a number of initiatives were on the ground to develop the feed value chains. Both public and private investment has been increased especially in building national feed testing capacity supported by the US Grain Council under the Food for Progress initiative (see http://grains.org/worldwide-offices/tanzania), developing the soybean value chain done the by the Catholic Relief Services-fund by USDA (visit http://tanzania.usembassy.gov/pr_12032013.html for details).

9.4 Solving the extension service problems

As discussed in section 7.3.5, when RIU started all producers expressed lack of experience in raising day-old chicks. At the same time the extension services in Coast region were generally poor and the number of extension workers in the districts was not enough to deal with the increased demand for advisory services. This required the programme to look for alternative ways of providing advisory services to producers. Conventional training methods through theory classes and farmer field schools were found appropriate neither in meeting the knowledge demands nor fitting into the different learning capacities of rural producers, especially to women who had heavy workload.

Therefore, RIU contemplated different approaches and finally decided to use *'caretakers'* or *'household advisers'* who are certificate level graduates trained in

poultry husbandry. From their training background, caretakers have relatively more hands-on experience in poultry management but are not immediately integrated into the government extension system because they do not meet the minimum requirement i.e. a Diploma. The use of caretakers enabled RIU to: (i) reach out to more poultry producers; (ii) train them for a longer period of time; and (iii) satisfy their demand for basic knowledge and capacity enhancement needed to keep chickens commercially.

The programme therefore used caretakers to provide intensive on-job training (i.e. for 30 days) to a significant number of households which facilitated the entrenchment of the new poultry husbandry knowledge into the social knowledge channels such as relatives and neighbours. Producers regarded the transfer of knowledge through caretakers informal and easier because they lived together and performed the routines together. This helped the families to internalise the new knowledge almost in the same manner as they previously learned how to keep chickens traditionally. One lady producer said:

> ["Having the caretaker in my house felt like we were raising the chicks together. I observed, asked questions, practiced, and listened to her. Learning was easy. I did not expect to raise so many chicks. But now I know and it is not easy to forget what I have learnt." (Interview with Producer, September 2013)].

This way of learning (i.e. learning by doing or on-the job) is argued to be participative and it allows a rapid accumulation of knowledge towards creation of new routines (Cowan & Gunby, 1996). It also intensifies the new knowledge which is regarded as important for other (new) processes to occur (Perkins, 2003; Wolff & Recke, 2000). In RIU experience, it was necessary that all producers knew how to rear chicks if interventions in other parts of the value chain were to happen. So, intensive learning was needed at the beginning, and RIU made it happen by facilitating it and meeting the cost.

When RIU realised that there was a limit to how the programme could influence the public extension system, it created a temporary system (i.e. of using caretakers) to run parallel to the government one. The expectation was, once producers have

commercialised and grown in numbers, they would put pressure and change the government extension system, or create a good market for private extension system. What actually happened is that producers enriched their tacit knowledge, and supplemented it by paying for private advisory services. Therefore, RIU presents another role of innovation facilitators, which is to create temporary structures and mechanisms needed to anchor processes (or provide services) before sustainable structures (or mechanisms) emerge.

9.5 Poultry diseases challenge

In 2011 the number of producers recruited by the programme in the Coast Region reached 3600. These kept about 760,000 birds in total. RIU progress report explains that, during this time most producers were in their second cycle of batches of between 200 and 300 birds. So they had sufficient basic knowledge and experience in flock management. However, in this same period the number of disease incidences escalated sharply. RIU reports a mortality rate of up to 100% in some farms. These were vaccinated birds and were three months old and almost ready for the market. The problem was first observed in Rufiji District and later spread to the remaining three districts. Since hatcheries were properly regulated for hygiene standards, the breeder flock was regularly screened for diseases, and a comprehensive vaccination programme was done on all the farms in the villages, RIU had to seek advice from the Ministry of Livestock.

RIU contacted the Central Veterinary Laboratory (CVL) who conducted a detailed analysis of the situation. Their findings showed mixed sources of infections including hatcheries, feeds and general poor husbandry practices at farm level. The team also isolated strains which were previously not common in rural areas. Those included diseases like *Escherichia coli* (E.coli), Salmonellosis, Paratyphoid, Fowl Cholera, Gumboro, Fowl pox, *Coccidiosis* and *pullorum*. In the report, CVL team identified the following as reasons for the increase in disease incidences: the number of chickens raised in the villages was higher creating room for multiple infections; poor extension and veterinary services; possibility of poor quality, handling and administration of vaccines; feed contamination and poor feeding; poor handling and

administration of veterinary drugs; presence of counterfeit drugs in rural markets; and poor disease diagnosis capacity in rural areas.

RIU worked with relevant actors to address these problems and during the process of seeking solutions new knowledge was demanded and innovation took place. Different actors were involved and several organisational solutions were also adopted. For example, RIU organised a higher level meeting with representatives from the Ministry, producers, hatchery owners and input suppliers to address the drug and vaccine quality problem. The ministry explained that drug quality control and regulation required a higher intervention that included other regulatory authorities and government departments beyond the Ministry of Livestock, including the Tanzania Food and Drug Authority (TFDA). This meant engaging and influencing more actors beyond the Ministry of Livestock.

Since the drug quality control and regulatory system was weak, and time was needed to strengthen it, the programme decided to select one trusted drug supplier to work with. This was an immediate solution to control and track the quality of drugs distributed to producers. It also created a possibility to sue or claim for compensation. Bytrade Tanzania Limited, a large scale vet drug importer was therefore selected and introduced to producers. The company's veterinarian visited all producers, inspected their sheds, held village meetings and conducted training on disease management especially on how to reduce incidences of common poultry diseases. He also discussed the major poultry diseases, their treatment, and drug handling and administration.

The company was also linked with hatchery owners, feed manufacturers and breeder farms to supply veterinary drugs, disinfectants, and feed additives, etc. They also supported district stockists to sell Bytrade products and established linkages with producers for treatment and provision of veterinary advice through their trained veterinarians. Basically Bytrade established an intensive outreach programme as part of company's business strategy. And as their veterinarian said during the interview, working with rural poultry producers was possible at that time because the organisational dynamics among the producers was higher, the business volumes were significant, and their purchasing power was also appropriate. Working with Bytrade

exclusively reduced mortality rate significantly and it was effective in ensuring only high-quality drugs were supplied within the network.

Another solution involved working with the Ministry to improve the capacity to diagnose diseases in the field. The focus was to help producers and extension workers to know the symptoms and act accordingly. So, RIU worked with a small technical team and developed a comprehensive manual on poultry diseases. The manual describes the major poultry diseases, their causes, symptoms, treatment and control/prevention. Basically, the manual is also meant for rural producers so the language used is simple and with lots of pictures. The measurement units used are also simple and easy to understand. Such a role has never been played by the Ministry before, and neither has such a localised manual ever been produced before in Tanzania. The manual is now distributed and used by different programmes and actors in the country. Producers were also linked to the Veterinary Investigation Centre (VIC) in Dar es Salaam (which is responsible for the Eastern zone) for detailed laboratory examination, diagnosis and post-mortem checks.

9.6 Producers lacked business and entrepreneurship skills

At the beginning of RIU, and during the first stakeholders' meeting lack of entrepreneurship spirit and zeal was identified as a major cause of poverty in the Coast Region. RIU used poultry as an entry point to change the situation (Ref. Section 6.5 of this thesis). It was obvious that producers lacked business and entrepreneurship skills and they were not used to producing chicken for the market.

After producers went through the first business cycle it became clear to RIU that most producers lacked basic business skills. For example, some producers sold all the chickens and spent all the money, with nothing left as capital for the next round. Others sold at very low prices to traders because they could not negotiate based on production costs. So RIU decided to conduct an entrepreneurship course specifically tailored to poultry business. This was a four-day training on how to run a poultry business. They also acquired knowledge on enterprise management, record keeping, pricing, marketing, saving and reinvesting.

The training consisted of a special component which focused on addressing attitudes, individual competency and personal development. After the experience with the first batch of producers, RIU decided to train all producers approximately a month and a half after they received chicks. Reading from the different training reports, this approach made it easier for producers to learn because they were already in the business. They looked for solutions during the training rather than only absorbing what was being taught. They closely participated in sessions and guided some of the content with regard to what they preferred to learn according to their experiences. Such interest to learn and participation (citing own experiences as examples) might have not emerged if the training was delivered before producers started their enterprises.

Reports show that the content of the training kept improving with time as more sessions were ran. This happened because RIU used one trainer who kept learning from producers' circumstances and adjust the training accordingly. The content of the training is now used by other rural poultry programmes in Tanzania.

9.7 Solving the marketing paradox

Most producers did not have enough capacity to negotiate with urban markets and traders. In most cases producers fetched very low prices while middle-traders made larger margins when selling in urban areas. RIU linked producers directly with the wholesale buyers (holding centres) to help them get a profitable wholesale market. RIU supported producers in marketing because staff wanted to ensure that producers paid back the 60% loan which was used to pay for the chicks. So representatives from each village were supported to visit different buyers in the city and negotiate for business. The ex-RIU programme officer said during the interview:

> ["We let them experience the market and know how it behaves. They heard what consumers want in terms of weight, etc. It was important that they experienced the problems with logistics and even pay the marketing costs. They faced the risks of chicken dying during marketing. This experience helped them a lot when they later negotiated with a wholesale buyer who went to collect chickens right from their villages." (Interview with ex-RIU staff, May 2013)].

Finally, it was agreed that RIU would buy all mature chickens and put them in a holding ground for buyers to buy from. So RIU created a small unit called KukuDeal which was responsible for collecting and marketing live chicken from programme villages. This arrangement demanded organisation in the field and specific administrative procedures. RIU field reports and innovation diaries reveal that, several meetings were organised with producers to design the arrangement. Finally it was agreed that, a week before collection, all chickens will be weighed, sorted and recorded. Then RIU would send a truck to collect those that passed the market weight, and RIU would pay instantly. This was meant to shift the marketing risk to KukuDeal and allow producers to start a new business cycle. It also meant to aggregate volumes and attract consistent (regular) buyers.

RIU reports mention four challenges that emerged from the above arrangement as follows; (i)the weight of mature chickens could not be controlled as weighing and sorting was not properly done; (ii) the collection process took a lot of time and chickens died in the process; (iii) carrying cages were poorly made and caused unnecessary death; (iv) moving with cash and paying producers in the open was risky; (v) holding ground costs were high because some birds needed feeding to gain market weight. As a follow up, RIU organised village meetings and the following solutions were proposed; (i) RIU distribute weighing scales and champions would weight and record. All under-weight birds should not be sold to KukuDeal. (ii) Collection will be done from specific collection points, not from producers' homes; (iii) RIU imported chicken cages from China; (iv) all producers opened bank accounts and RIU paid through the accounts. This introduced the use of delivery notes signed by producers upon collection; and (v) buyers will be informed before collection, and only chickens with the appropriate weight were collected.

Implementing the above solutions marked the beginning of a special service delivery model where producers received inputs and service from RIU, then RIU through KukuDeal would buy the end products from producers. In fact, this approach led to the current KukuDeal poultry contract farming scheme (I discuss this scheme later in the chapter). So a meeting with 14 poultry traders and small scale buyers was held in Dar es Salaam and informed them of the new volumes of mature chicken coming

from the RIU target villages. The buyers were also introduced to KukuDeal and the holding grounds. The meeting agreed on the price and working mechanisms.

9.8 Improving access to finance: Contract farming emerges

By May 2010, about 932 producers had gone at a least through one production cycle with RIU's support. However, very few managed to go to the second cycle on their own. This was due to lack of capital for re-investment. Moreover, it was evident that the role played by RIU, especially in coordinating input procurement and delivery was very relevant if the network which had emerged was to continue. So in June 2010, RIU through KukuDeal introduced poultry contract farming, and supported rural producers to keep batches of between 100 and 200 birds, with up to 3 cycles in a year. The approach was used by RIU to upscale the programme to other regions. This approach is still used by KukuDeal and has also been adopted by other organisations who work with rural poultry producers in Tanzania.

Through contract farming, KukuDeal acts as a private aggregator who provides services to rural producers through the network of chick producers, drug and vaccine suppliers, feed manufacturers, extension service providers and a business trainer. Basically, RIU pays for all inputs and delivers them to the rural areas, then buy 75% of all outputs (25% is left for family consumption and for rural markets) and sell to the formal urban markets. Then RIU deducts the loan and pays producers through bank accounts linked to mobile money accounts on their mobile phones.

KukuDeal mobilised producers to keep between 200-300 chickens in order to obtain substantial numbers of matured chicken that could be used to develop an organised and integrated marketing system for indigenous chicken. The contract farming model was also seen as an avenue for development of the overall sub-sector which is inclusive of more small and medium producers (producers and hatcheries). Through contract farming producers have increased their production cycle from 1 to 3 cycles per year. The number of chickens raised per household has increased from 5-10 to 100 and now to between 200 and 300. At the end of each production cycle producers are able to sell and get lump-sum payments thus earning an additional income of

approximately TZS 900,000/- (about $600 for 200 chickens) just from poultry (These figures were extracted from the RIU End of Project Report, June 2012).

Therefore, through experimentation, a service delivery model emerged and which is now replicated in other places and with other agents. Of particular interest here is the observation that, there are basic features of the process which have not changed even with the contract farming model. Those include; (i) sensitization is done to a larger community to create a mental shift before a programme runs in a new area; (ii) negotiations for input supply are done before orders are pressed; (iii) a significant number of producers is still a requirement before the programme can start; (iii) intensive learning by doing is assured by contracting an extension service provider to visit producers daily for 30 days when they received their first batch of chicks; (v) entrepreneurship training is provided at least after 45 days after receiving chick.

In Tanzania contract farming is more popular in crop farming but not in poultry. RIU tried the approach with rural poultry producers and encouraged their growth in the industry. The all-in all-out RIU contract provided producers with the necessary inputs and support services. It also provided the market where producers' gained a lump-sum income from wholesaling. Lump-sum payments triggered the need for banking services among producers. It also encouraged producers to do financial planning, budgeting, and saving. Previously over 90% of smallholder producers working with the programme did not own bank accounts or use banking services (RIU, 2011a).

9.9 Addressing policy and regulatory issues

As the number of actors and volumes traded increased, it became necessary for the government to closely monitor and enforce regulations in the industry. This included regulations around disease control, creating a conducive business environment, promoting fair trade and in assuring the quality of inputs, veterinary drugs, and vaccines. The industry also became viable and relevant for government funding and support particularly in research, training and extension. So meetings with government officials were organised to address policy challenges and also lobby for government support specifically in poultry breeding research. In addition, these

meetings provided a platform for the government to elaborate on existing regulations. For example, poultry breeders were introduced to the new Animal Diseases Regulation for Hatcheries and Breeder Farms, and they had opportunity to review and propose amendments. They also lobbied for import tax exemption for incubators and other hatching machinery.

Poultry stakeholders also lobbied and pushed for a national perspective towards characterisation of indigenous chicken breeds and the government accepted funding of a characterisation research programme through the Tanzania Commission for Science and Technology (COSTECH) and the then National Livestock Research Institute (NLRI) now TALIRI. The objective of the programme was to breed and select the best indigenous chicken breeds which could be promoted for commercial production (eggs and meat) and also to facilitate their availability and multiplication through establishment of parent and grandparent stock farms. The Research is still going on with additional funding from the Bill and Melinda Gates Foundation under the African Chicken Genetics Gains (ACGG). Visit http://africacgg.net/about/ for details about ACGG.

Furthermore, engagements with the government and the increasing volumes of transactions in the industry attracted attention of high public offices. For example, the President of Tanzania H.E. Jakaya Mrisho Kikwete requested to be briefed about the progress and achievements made in the poultry subsector. And as a result of the meeting, the government is now paying special attention to the industry. This was also echoed by The Prime Minister Mr. Mizengo Peter Pinda's directives made to the Parliament in June 2012 to commercialise rural poultry as a strategy to trigger innovation in the entire poultry subsector and therefore reduce poverty. Consequently, and since then more actors both from public (including development partners) and private sector have been attracted to invest in the industry. The approach used to develop the industry has also changed from focusing on subsistence production for household nutrition to also include producing for the market to gain income.

The policy dialogues also prompted stakeholders to mobilise themselves into strong associations to engage with the government on policy and practice matters. The

following associations have been created; The Tanzania Poultry Breeders Association (TPBA); The Tanzania Feed Manufacturers Association (TFMA); Tanzania Commercial Poultry Association (TCPA); Tanzania Poultry Professionals Association (TPPA); and initiatives are underway to form an apex body. There are also numerous rural poultry producer groups registered by Local Government Authorities. As the sector expanded the government role became relevant both to the actors in the industry and to the government itself. It also drew attention of the high level offices for inclusion in national poverty reduction strategies which changed how the industry was perceived and developed. Gradually the urban bias is being reduced and therefore the industry is being freed from the political lock-in.

9.10 Summary and conclusions

The chapter makes it clear the shock explained in Chapter 8 enabled RIU and other actors to know exactly when and where to intervene. And it thus became possible for RIU to rely on the context to determine what to do. It elaborates that, after the shock RIU adopted *'a bottleneck approach'* to solve problems as they emerged. This led RIU to manage multiple processes to articulate needs, seek and utilize solutions, which became the major determinants of innovation processes in the industry. It was after 'the shock' when capacity gaps were revealed at different levels. And as actors sought solutions to fill in these gaps, innovation happened. Some of these solutions were organisational, and others were technological. And many came from the RIU program itself.

In the chapter, I have described how this became a continuous process which created a myriad of processes that stimulated demand for new knowledge, technology and organisational forms. In fact, the chapter makes it very clear that it was when actors utilized these solutions, like applying new husbandry practices and technologies like vaccines; investing in new hatchery technologies and practices; designing new input distribution and logistics in rural areas; etc., that the unlocking, and creation of the new path (i.e. the transformation) took place.

By describing the different challenges facing the supply system after the demand shock, the chapter demonstrate how problems emerged randomly as growth

unfolded. Most of the problems could not be predicted in advance, and could not emerge before certain events have occurred. The chapter emphasizes the importance of developing the industry as a system where every challenge is addressed regardless of its sectoral or thematic label.

Chapter 10 Analysis and Conclusions

10.1 Introduction

This thesis is about promoting agricultural innovation in poor economies where agriculture is the main source of livelihood, and where most farming is small scale farming. The focus is therefore on how to transform an industry dominated by subsistence producers to increase learning and productivity. By transformation I mean the process of making visible shifts away from the unproductive organisational and technological trajectories which are responsible for the current high levels of poverty and inequality. This perspective therefore, makes creation of new technological and organisational trajectories central to my thesis.

This chapter summarises the findings of this study and locates them within wider research and development debates in 'agriculture' and 'innovation' for poverty reduction. I first present the general discussion on key issues emerging from the analysis, then summarise main conclusions including a reflection of the journey I walked to produce the thesis.

10.2 Analysis

The thesis has presented an in-depth analysis of innovation behaviours in the rural poultry industry in Tanzania and identified mechanisms for the observed persistence of the traditional production system, a system known for its subsistence tendencies. It also analysed the RIU facilitation process which promoted interactions and learning in the industry. The study was inspired by the work of a DFID-funded RIU programme in the rural poultry industry in Tanzania which I coordinated for four years. The programme achieved significant transformations which attracted more actors and investment to the industry. The aim of this research was therefore to investigate the work of RIU and establish how innovation can be promoted in industries dominated by subsistence producers and achieve equitable growth, and more importantly, to clarify the role of the public in all that.

The next section presents the analysis of innovation behaviours in rural poultry production.

10.2.1 Explaining subsistence behaviours

Before RIU intervened, poultry production in rural Tanzania was mainly subsistence and innovation was generally low. As it was made clear in the introduction, 94% of poultry production is under the traditional system, and most rural households keep between 1-20 poultry birds. The current demand for poultry products is higher than domestic supply and imports satisfy almost 60% of urban demand. This raises the question: Why are rural producers not producing for the market to earn more income? This question links to the fact that poultry technologies are available in the country, and commercialisation is already happening in urban and peri-urban areas. Moreover, the same rural producers who manage poultry as a subsistence activity have commercialised other commodities like coffee, cotton, rice and sunflower. So the first research question for this study is **'why is innovation generally low in the rural poultry industry?'**

The above question was contextualised within a broader enquiry of why subsistence agriculture persists in poor countries despite the advances in agricultural technologies, increase in food demand, expansions in trade and markets, and more importantly, after over fifty years of support and investment in agricultural research and development in those countries. According to the World Bank Report of 2013, about 80 per cent of farms in Sub-Saharan Africa (SSA) excluding South Africa are small farms of close to subsistence nature. In fact, Frank Ellis (2005) warns that 'the persistence, and even deepening, in SSA of a type of small farming that is getting smaller all the time, and which demonstrates an even greater orientation towards low level subsistence than was the case twenty or thirty years ago, should be of great concern to all those working on poverty reduction objectives in the continent. He argues further that much of rural Africa is sliding into greater vulnerability where the slightest disturbance in the normal rhythm of the seasons causes quite disproportionate food security crises (Ellis, 2005; p.1).

To answer that question, literature explains that high poverty levels which cause low affordability of inputs and services, high transactions costs, poor access to markets, poor infrastructure and high risk nature of agriculture in such countries are the major barriers to exit subsistence production (Cadot et al., 2010; P. Pingali et al., 2005;

Shepherd, 2006; Zant, 2012). Actually, Wouter Zant explains that these factors reinforce each other to create what he called a *'subsistence trap'* where it becomes even harder to exit (Zant, 2012). But these explanations do not explain why a large number of producers would commercialise other commodities like coffee, cotton, maize, etc., but consistently choose to keep poultry as a subsistence activity despite the growing demand for poultry meat and eggs.

This thesis departs from the premise that rural producers operate within complex smallholder production systems which constitute a myriad of possibilities to provide for their livelihood needs which tend to influence production decisions in a very complex way. This makes reasons for the persistence of subsistence tendencies equally vast and complex, such that it is difficult to identify a small number of factors to explain it. Therefore, in the light of path dependence theory, this study integrates various explanations provided by the literature to describe the persistence of subsistence (low innovation) tendencies in rural poultry. In agricultural research, path dependence and lock-in have been used to study the adoption of pest-control strategies (Cowan & Gunby, 1996; Ugaglia et al., 2011; Wolff & Recke, 2000) where chemical crop protection (CCP) and the integrated pest management (IPM) were treated as competing technologies. In this thesis, I have treated the traditional and the commercial poultry production systems as competing trajectories. I then established why the traditional system dominates in rural Tanzania.

Analysing the lock-in from assessing actors' behaviours involved examining existence of three types of lock in, i.e. the cognitive, structural and political lock-in. And analysing from the 'systems structures' involved studying interactions (extent and type) in the industry as a proxy for innovation. I then used the concepts of *'organisational thinness'* and *'fragmentation'* to explain why interactions are low. Findings on the latter are discussed in section 10.2.2 below.

Using the Path Dependency (PD) Theory (Arthur, 1989) the study explains why rural producers are not switching from the traditional system despite the known economic benefits of commercialisation. Results show that producers are locked-in the traditional poultry production system because of three major reasons. First, the low-cost and social nature of the traditional system itself is impeding the switch to the

commercial system; second the dominant actors in the rural innovation space i.e. government extension, NGO's and donor projects are deliberately blocking the switch by encouraging natural breeding and discouraging use of external inputs; and third, society is reinforcing the social nature of the activity including how it is managed, how products are disposed of, and how knowledge is shared. This is contrary to the theory of innovation where cross-learning from heterogeneous actors is paramount. Similar findings are reported by Cowan and Gunby and Ugaglia and her colleagues who found that switching from chemical pest control lock-in in tomato growing in Ghana and from pesticide lock-in in grape growing in France respectively, was blocked by the inferior technology itself (Cowan & Gunby, 1996; Ugaglia et al., 2011).

The study analysed feedback loops in the poultry production system and established that reliance on natural breeding hinders scalability and that growth in such a system is not assured without introducing an external source of chicks. The analysis also highlights that production in the traditional system is socially driven thus limiting its market structures. For example, pricing mechanisms are socially determined and less directed towards profit oriented production. Reliance on social sources of foundation stock and husbandry knowledge also makes the community self-sufficient thus locking it within the limits of its own abilities and means. Furthermore, the tendency to allocate fewer resources for poultry makes switching difficult, and any attempt to push for more resources to be allocated needs to either introduce a new source of such resources or facilitate reorganization of existing household priorities, which is in itself a very complex process.

The study elaborates further that certain '*mental frames'* and *'cognitive paradigms'* exist based on scientific findings regarding the low genetic potentials of local breeds, and society's desire to feel self-sufficient in knowledge and inputs. Such mental frames are found to play a significant role in shaping the current innovation behaviours in the industry, including those of researchers and policy makers. The research findings have created a bias against use of certain technologies and innovation. The thesis therefore emphasises that exploring the role played by such factors when analysing innovation in smallholder agriculture is paramount.

High transaction costs were also found to cause the 'lock-in' because in rural areas poultry is considered a subsistence commodity almost by default, thus majority producers are not investing in it. This creates insufficient demand for inputs and services needed to lower supply costs. As a result, individual attempts to commercialise face high transaction costs making switching prohibitively costly and unattractive.

10.2.2 Explaining interactions

The thesis starts from the premise that innovation co-evolves as actors interact in a very complex manner. And that low innovation implies low interactions among heterogeneous actors. Therefore, to ask 'why innovation is generally low', is also to ask 'why interactions are low.' As an attempt to answer those two questions, the study analysed both 'the actors' and 'the system' (or the industry).

The study used the agricultural innovation system (AIS) framework to articulate the interaction space within the traditional poultry production system. This includes investigating routines and perceptions which lead to interactions within the poultry enterprise (as an agency) and the poultry industry in general. The study equates 'interactions' to 'knowledge flows' and 'exchanges of any sort'. This is based on the assumption that whenever an interaction occurs either knowledge flows (or utilised), or goods and services are exchanged (e.g. inputs) and trigger demand for knowledge associated with using the exchanged goods or services. By establishing what triggers knowledge to flow, it was possible to know what triggers interactions, and vice versa. Since the AIS framework emphasises studying innovation as a process of accumulating and applying knowledge between and among heterogeneous actors within a system (Spielman, 2005; p.1), the study traced retrospectively why and how knowledge was accumulated, applied and shared within a single poultry producing household and across the community. Then linked these processes with human purposes (and expectations) of keeping chickens. By doing this it was possible to isolate and analyse interaction triggers.

The analysis considered the rural poultry industry in Tanzania:

- to be like any other innovation system with unique sets of traditions, competencies and institutional composition;
- an industry with institutional infrastructure to facilitate innovation among different actors like producers, input supply firms, and support agencies like extension and research institutions;
- a composition of dynamic innovation processes where heterogeneous actors interact as they use knowledge to generate products and services;
- an industry generally characterised as a non-knowledge intensive industry where firms/actors possess less-developed innovative capabilities;
- an industry considered to be located in the periphery of the national poultry sector hence with a limited capacity to innovate and stimulate growth patterns; and,
- an industry which suffers from the absence of relevant actors with rich resource bases and technological capabilities (Abdelqader, Wollny, & Gauly, 2007; Kitalyi, 1998; Mack, Hoffmann, & Otte, 2013), causing the industry to exhibit organisational thinness (Salamonsen, 2014) because of low interactions and learning abilities of its key actors, as well as because of its periphery location.

Existing literature considers the industry to be technologically weak because of three factors; (i) the type of breed handled which is perceived to be of low genetic potential (Malago, 2009; Rodríguez, Herrero, & Baltenweck, 2011), (ii) the poverty characteristics of the producers who are perceived to be risk averse and unable to meet costs of commercial inputs (Kitalyi, 1998; Roothaert et al., 2011), and (iii) the remoteness of producers' geographical locations where transaction costs are argued to be very high, and which make learning and exchange of goods and services very costly and unaffordable to most producers (Minga et al., 2001; Rodríguez et al., 2011). Literature also explains the sustenance and dominance of subsistence poultry production as the result of producers' inability to exit due to high costs associated

with the decision to produce for the market (referred in the literature as *'switching costs'*)(Cadot et al., 2010; Pingali et al., 2005; Zant, 2012). This makes causes of low innovation in the industry a result of factors related to the links between the nature of the **chicken** (as a commodity) and characteristics or abilities of the **producer** (human) in relation to their **environment** (i.e. social, economic, political and physical).

Linking agricultural commodities with system behaviour

The RIU experience shows that the nature and type of agricultural commodities like poultry influence the structure and behaviour of agricultural systems of which they are a part. Therefore influencing such systems involves influencing both human and nonhuman components of the system. This study establishes that, what makes it a 'chicken' is what fulfils human needs and is also what drives human decision regarding how to produce and use its products. Chickens, like other agricultural commodities tend to influence how different actors engage with them from production to consumption. This is the case even after breeders have manipulated their genetics to acquire different humanly preferred traits like early maturing, high yielding, drought or pest/disease resistant (thus turning their seeds and embryos into technology). The '*maize-ness'* and the *'chicken-ness'* continue to influence decisions and processes along the respective value chains –though not necessarily as technologies, but as a unique species with a specific nature and life cycle.

Producers decide whether or not to engage with a certain agricultural commodity based on perceived traits (or characteristics) of the crop linked to other cognitive criteria (social, cultural, economic and ecological, etc.) like soil type, rainfall patterns, perceived economic value, labour requirements, nutritional values, etc. Characteristics of these commodities also influence decisions on choices for agronomic practices like planting time, use of certain inputs, size of the plot to be cultivated, as well as on how much to invest, etc. Therefore, as they influence production, marketing and utilization decisions, agricultural commodities tend to determine types of interactions needed to effect such decisions. For example, cassava requires specific inputs (e.g. planting materials, pesticides, harvesting tools etc.) and knowledge which is different from those needed in tomato farming. Hence, it is the

"*cassava-ness*" that demands the farmer to interact with a cassava researcher, cassava trader, or a cassava flour miller instead of interacting with a horticulturist or a chicken breeder.

Agricultural commodities also determine what is exchanged during interactions, e.g. vaccines vs. herbicides; and knowledge on how to feed chickens vs. how to apply fertilizer. Based on rationalization and cognitive reasoning a farmer decides which cassava researcher, trader or a miller to interact with, when and how. The farmer also decides which vaccine, which brand of fertilizer and which market to go to, etc. Therefore, had it not been for chickens and their nature of reacting to Paramyxovirus 1 (PMV-1) and suffer the Newcastle Disease, poultry producers wouldn't have sought to interact with vaccine distributors, nor would there be such a vaccine invented (research), produced (manufacturing), promoted (extension) or distributed (traders) in the first place. Likewise, had it not been for the poultry producer, chickens wouldn't have been domesticated, researched, vaccinated, nor would vaccines been produced and utilised after all. Therefore, it is neither the human nor the chicken (commodity) alone that determines an effective interaction. Rather it is an outcome of fusing that which is dynamic in a human actor and that which is dynamic in a non-human actor (or *actant* as called by Brunor Latour) in a particular agricultural enterprise.

From the study, it is explicit that chickens have needs set by nature as conditions for them to meet producer's expectations. Where the producer is not self-sufficient in providing them, he/she is forced to either choose not to provide them at all, or get them from elsewhere. And that requires an interaction. Even the knowledge about these conditions may come from external sources such as fellow producers, friends, families, extension staff, or media. Thus the 'chicken-ness' entails specific needs, which necessitate interactions once the producer opts to fulfil them as means of meeting his/her own expectations. Therefore chickens have set conditions if they are to fulfil their side of the bargain, and through those conditions they influence how producers choose to interact. So any external decision (e.g. from a politician or NGO) to limit producers from providing such needs limits what the chicken could have produced as benefits to the producer.

Commodities like chickens also determine types and number of systems a particular farmer gets involved in. Two agricultural commodities therefore provide a possibility for one farmer to operate (interact) in more than one system. And the producer may behave differently in each system. For example, he/she may be business orientated in one, but subsistence in another. This challenges tendencies to define rural producers based on their behaviours observed on single commodity chains. Another example is that, the same producer can be aggressive in seeking and paying for dairy extension services but not for poultry. So concluding that such a farmer cannot afford extension services will be wrong. Commodities also dictate how and when the farmer should interact in a particular system. Moreover, certain interactions happen just once in a season, e.g. during the planting season, or during harvesting. Therefore, while there are many factors that determine interactions in an agricultural system, the nature of agricultural commodities also plays a role which should not be ignored. As Watson wrote "There is no '*bird-watching'* without the *'bird'* and the *'birder',* although both existed before the hybrid bird-watching evolved (Watson, 2010; p.3).

In her book *'Thinking in Systems',* Donella Meadows defines a system as a set of things interconnected in such a way that they produce their own pattern of behaviour over time i.e. an interconnected set of elements coherently organised to achieve a purpose. By things she refers to people, cells, molecular '*or whatever'* implying that objects, humans and animals can be active parts of the system (Meadows, 2008; p.2). Thus in her definition, agricultural commodities like crops, livestock, inputs, etc., are components of agricultural systems. In her view, most persisting problems in society are intrinsic systems problems resulting from undesirable characteristics of system structures that produce them. Hence solving such problems needs human courage and wisdom to restructure systems. However, she warns that while a system may be influenced by outside forces, how the system responds to these forces is purely a characteristics of itself, and a complex phenomenon in the real world (Meadows, 2008; p.2). The author argues that systems behaviours emerge from their structures of both human and nonhuman components.

Linked to Donella Meadow's view, is the actor-network theory (ANT) originally developed in mid-1980s by Michel Callon, Bruno Latour and John Law which

explains the role of '*nonhuman actants*' in influencing type, direction and rate of innovation (including interactions) in socio-technical systems. Literature has not demonstrated how agricultural commodities influence structures and behaviours in agricultural systems. Most studies treat agricultural commodities as passive actors and as subjects of human choosing and manipulation with little or no '*self-determined'* influence in the innovation processes. However, the analysis of RIU reveals the active role played by chickens to influence innovation processes as elaborated below.

Theorizing the active role of a chicken in poultry systems

A chicken farmer exists because he/she keeps chickens. Separate the two, and the chicken farmer ceases to exist. Therefore, a chicken farmer can be recognised as a dynamic unit involving the *keeper* (human), the *kept* (chicken) and the process of *'keeping'* chicken. Arguably, what determines this relationship is the interaction between man and chicken achieved through the process of keeping, and how the chicken responds to the "keeping". This means in this particular context, while the decision on whether or not to relate to the chicken and the reasons thereof (e.g. whether to keep it as a pet, or for family food or as a business, etc.) ultimately lies with the farmer his or her ability to actually interact does not. Rather, the ability to interact is embodied in the husbandry processes (and related technologies or artefacts like vaccines and feeds) and the physiology of the chicken (how it feeds, what makes it fall sick, how it reproduces, etc.), which in essence shape the "keeping". Therefore, the chicken keeper's decisions to interact in the poultry system are influenced not by human behaviour alone, but also by the nature of the chicken (what it needs), the ecology (what is available as feed or what affects the chicken) and how he/she keeps the chicken (husbandry practices). Thus the producer's ability to relate with the chicken towards fulfilling his or her own expectations lies on his **ability to interact with husbandry processes** determined by the physiology of the chicken as well as with **sources of poultry inputs and services** provided in the physical and socio-economic environments.

The final outcome of the farmer-chicken relationship (with respect to the goals set by the farmer) principally relies on how the chicken responds to the 'keeping", i.e. how

it responds to vaccines, feeding, treatments etc., Therefore, this study argues that being non-human does not make the chicken a passive actor in this relationship, but rather as an agent sharing the power to influence the emergent behaviour of the network (or system) in which it is a part (Watson, 2010). Therefore, focusing on developing producers alone, without considering the nature and needs of the chicken and the environment where the activity is carried out (including the various sources of knowledge, inputs, services, etc.) as a system, is bound to produce limited results.

A look at poultry research literature shows significant investment in studying the chicken in order to influence its response to the environment and therefore fulfil human needs. Most attempts to influence this relationship towards making specific targets have often been by either: (i) adjusting /improving the keeping through better husbandry practices or by use of technologies (which might be done through educating or changing the ways of the farmer)(Boki, 2000; Dwinger & Unger, 2006; Riise et al., 2005); and/or through (ii) influencing/improving how the chicken responds to the keeping (e.g. through manipulating the biology or physiology of the bird) (Grobbelaar et al., 2010; Malago, 2009; Minga et al., 2001). Whereas such initiatives have created valuable information and technologies, they have not helped rural producers to use poultry as a tool for alleviating poverty.

This study highlights that poultry management processes are basically determined by both human-related quests and the nature of the chicken. On one hand, the purpose of keeping chickens (i.e. for household nutrition vs. for commercial purposes) influences the decision on scale of production, investment in technologies and even how to dispose of its products. While on the other hand, the nature of chickens, e.g. being a live animal with specific needs and ways of living, as well as the perishability of its products (i.e. meat and eggs) demand that certain routines are strictly followed if chickens are to survive and be productive. Such demands include, feeding, keeping chicks warm, vaccinating against certain diseases, selling eggs or meat within a certain period (else they go bad), feeding chicks immediately after they are hatched as they can't be stored, etc. These natural characteristics of the chicken make poultry management unique and call for specific logistical arrangements on transportation, quality control, storage, marketing etc. The breed of the chicken (i.e.

local vs. improved) also influences production choices (traditional vs. intensive), perceptions on values (social vs. economic), research focus (low vs. high innovation), consumption habits and even marketing strategies and prices.

Therefore key innovation decisions around poultry production, marketing and consumption, including how and when to interact with others in the industry, are potentially influenced by why and how chickens are kept as well as the nature of chickens, and that of its products. This makes analysing rural chicken keeping as a *human-chicken constituency* helpful in understanding factors determining innovation in the rural poultry industry beyond technology and science.

Analysing 'mutual constitutions' in agro-industries

The study used the rural chicken farm as the unit of analysis. This proved to be more appropriate in understanding how interactions happen and what causes them to happen. The farm is representing a mutual constituency involving humans and chickens (as a commodity). In this constituency both man and chicken are considered to mutually shape the innovation process as they influence each other using what is embedded in the *'chicken keeping'* or poultry husbandry. The study used the mutual constituency as the unit of analysis mainly for two reasons. One, it was useful in explaining how the behaviour of rural chicken farms is shaped and is being shaped by society, and which is mostly determined by how society perceives the nature of the breed as being 'local' and not 'improved'. And two, looking at a poultry farm as a constituency made it possible to explain how the collective behaviour of producers (as they represent different farms or constituencies) determines the behaviour of other actors in the industry, who must relate with them as constituencies and not only as individuals. The study makes it clear that it is the inter-constituency relationships which determine the general behaviour of the industry.

Literature describes *'mutual constitution'* as a social construction standing between and away from social and technological determinism by regarding neither society nor technology as sole determinants of effects of technology. Rather, it recognises the interdependency between humans and technologies, and their non-deterministic contribution in creating an emergent phenomenon whose nature is not predictable. It

therefore recognises *"The co-evolution process among that which is technological, and that which is social"* (Sawyer & Studies, 2013; p.4). This study learns from the sociotechnical systems literature which argues that whatever influences the human also influence the linked relationship between the human and the technology, and not the technology itself, and vice versa. So the analysis looks at poultry keeping as a constituency where both man and chicken determine types, rates, level and impacts of technological decisions in the industry. For example, in a chicken-producer system, whatever influences the chicken, will not influence the human/producer as an object of the system, rather it will affect how the farmer relates with the chicken. This means changing the breed of the chicken will not change the physiology of the farmer rather it may change how the farmer feeds or vaccinate this new breed of chicken. Consequently, if the change in breed results in increased productivity, then this is a result of both the change in feeding on the part of the farmer, and the feed conversion ability of the chicken as a result of its new genetics. Thus neither improving the breed of the chicken leads to increased productivity, nor is improving feeding alone.

Literature describes the interdependence and inextricably linked relationship between features of an object or system and the social governing factors, and involvement of a broad range of human actors as the premise of sociotechnical research (Sawyer & Studies, 2013). Apparently, most studies on poultry production have hardly analysed this interdependence. Existing poultry studies tend to focus in isolation, the behaviour of the producer, of the chicken, and the technological issues surrounding the keeping in order to influence the former. This study however, explains that analysing the *'mutual human-chicken constituency'* is more informative than looking at the producer *(human agency)* and the chicken *(commodity agency)* separately.

Section 7.24 of this thesis explains that there are two interdependent levels of interactions which are necessary for learning and innovation in rural poultry industry. Those are the *'human-agency'* level and the *'enterprise-agency'* level interactions. The RIU experience shows that, industry-wide innovation in subsistence-based industries is determined by the collective behaviour of a significant number of individual producers to form a collection of agencies which constitute the need to

interact and innovate. A further analysis of the '*enterprise-agency'* shows that it emerges when humans (human agency) relate with commodities (commodity agency) in a specific way. Therefore there is a relationship between humans and a specific commodity through which innovation occurs as a construct of a *'mutual human-commodity constituency'* and of how the constituency relates with what is outside itself (including other constituencies) to meet specific goals and expectations. Thus, it is the inherent goal seeking processes within similar and related constituencies that shape innovation processes within a given industry.

Based on discussions above, the study introduces the concepts of *'human-agent'* (i.e. a chicken producer, a farmer, or hatchery owner) who interacts with a *'commodity-agent'* (i.e. the chicken, rice, maize, goat, chicks, vaccines, etc.) in a particular way to create a human-commodity constituency or the *'enterprise-agency'* (i.e. chicken keeping, maize farming, chick production/hatchery, feed manufacturing, any other business or enterprise) around which the human agent has built expectations and purpose. The identity of the *'enterprise agency'* emerges from blending characteristics of the *'human agent'*, the nature of the *'commodity agent'*, needs, expectations, and all processes within the enterprise, as influenced by the environment. The process may also involve utilization of different commodities and processes as inputs, technologies and skills. Examples of enterprise agencies in a poultry system are hatchery businesses; vaccine manufacturing or distribution; and feed manufacturing. These represent mutual constituencies of humans and certain commodities. It is therefore the interactions between and among multitudes of heterogeneous but related *'enterprise agencies'* that makes an agro-industry. And unless such agencies have affinity for each other, interactions and innovation will not happen, even where the human agents from those enterprises know each other. As explained in Chapter 7 of this thesis, if a rural poultry farm relies on natural breeding, making the farmer meet the hatchery owner does not alone guarantee innovation.

The thesis therefore supposes an innovation process which starts without cognizance of existence of innovation demand or supply. Rather, it starts from perceiving needs to create expectations followed by a myriad of decisions (both inside and outside the

constituency) to pursue these expectations. This portrays innovation as unconscious processes to small producers where innovation demand, supply and utilization co-evolve as multiple decisions are made within the *'enterprise agency'* (i.e. the *'producer-commodity constituency'*), and multiple interactions are then made with the rest of the constituencies in the industry. This makes pursuing expectations as the conscious process and which could be the focus for innovation facilitation. This is contrary to the traditional extension-based rural development approach where communicating information on management and technology to make producers aware of innovation options available is advocated as the main approach for rural development. Again, informing the poultry producer (human agent) about a vaccine alone does not guarantee its adoption. Other constituencies to supply the vaccine must be present and able to work with such particular enterprises.

Basically, the study suggests that what triggers an innovation process in rural-based agro-industries is not the knowledge of, or presence of technology or innovation, but the reconstruction of expectations within different *'enterprise agencies'* and the process of re-organising them to gain capacities to meet new expectations. This includes synchronizing and harmonising multitudes of expectations of *'human agents'* and their constituencies, both individually and collectively. The study thus proposes that agricultural innovation is analysed as constructed by relationships between humans and agricultural commodities (to create a farm or an agricultural activity/enterprise); and between that which emerges as humans relate to agricultural commodities and other enterprises in the sector. This makes triggers for agricultural innovation more social (organizational) than technological.

The study also argues that, without re-organising a significant number of rural *'enterprise agencies'* to mirror economic purpose and expectations, promoting innovation to increase profitability in subsistence –based agro industries is bound to fail. This is particularly because new innovations are likely to introduce competing goals in subsistence-based livelihood systems. For example, introducing commercial goals and the subsequent technologies in poultry farms which rely on natural breeding is inefficient because part of the marketable stock has to be left behind as a breeder stock. This means foregoing part of the sales from every production cycle as

future inputs. Therefore understanding the nature and dynamics within a particular *'producer-commodity constituency'* (enterprise), and the role they play in initiating and defining how rural innovation networks are created, provides insights of how agricultural innovation can be facilitated in industries dominated by poor producers.

While the '*human-agency'* level interactions are needed to channel information and make choices and decisions, the '*enterprise-agency'* gives purpose to the interactions and produce value. It is therefore the *'enterprise agency'* that produces a need and the *'human-agency'* which uses the information to make decisions on the type of interactions, and carry out the actual interaction with other '*human-agencies'* (who also represent the interest of their enterprise) to satisfy the need. This means making a hatchery owner (i.e. human-agency A) interact with a rural producer (human-agency B) who relies on natural breeding is meaningless. The situation will remain so until the two enterprises (enterprise agencies) relate, i.e. need each other. The study therefore identifies creating the relationship between rural poultry enterprises and other enterprises in the industry as the pre-requisite for promoting innovation in the industry.

The analysis also explains that the collective behaviour of a significant number of similar *constituencies* (enterprises) determines how the rest of the system behaves towards them. For example, if a majority of producers do not use external inputs, then input suppliers will not open input shops in those villages. This means changing a significant number of rural enterprises (constituencies) is necessary to facilitate interactions in rural industries. The study demonstrates that, facilitating such a change requires the creation of new expectations within the constituencies. This will then create new needs that synchronise with those of other related constituencies (agencies) present in the industry. The new needs will make human agents in such enterprises perceive self-insufficiency in inputs and services, and justify creation of mechanisms for continuous interactions, exchanging and learning. I discuss this further in the next section.

In addition, by grounding the analysis on how producers reason and act both as individuals (i.e. in individual constituencies) and as a group (i.e. as a collection of constituencies), the study argues for a development process which starts by building

producers' individual and collective capacities to influence relevant institutional arrangements in their favour. This recognizes the power of rural producers to influence behaviours in agro-industries of which they are a part. The study argues that such powers can be unleashed using external facilitation to create institutional arrangements and innovation structures which are friendly and useful to small producers. This way of positioning rural producers in the analysis departs from the perspective where traditional (or poor) producers are seen as 'weak' or 'vulnerable'; and as mere recipients of modern knowledge about farming techniques (Barrett, Carter, & Timmer, 2010; p.448). As a contrast, this study considers rural poultry producers to have the upper hand in shaping their innovation trajectory if provided with rigorous smallholder friendly facilitation and brokerage services. The facilitation can consolidate their individual abilities into one big powerful actor who can send noticeable signals into the market in the form of input or service demand, or supply of output. The study refers to this kind of consolidation of demand as creation of an 'input demand shock' where a significant number of producers are supported to demand inputs and therefore become significant players in the input market.

Re-thinking self-sufficiency and diversification

The study is grounded on wider systems thinking, and specifically on innovation systems theory focusing on interactions and learning. The AIS framework is used with more attention paid to the enterprise domain to illustrate how producers have set their expectations on poultry as a livelihood activity and how those expectations define their behaviour towards the activity and as an agricultural commodity. By interrogating existing poultry management routines and behaviours, and how these are defined by the pre-determined social roles of chickens, the study explains that the perceived *'self-sufficiency'* in knowledge and technology among rural producers hinders innovation in the industry. Moreover, research, policy and development practice are currently reinforcing the perception by promoting the idea that 'self-sufficiency' is 'good' for the poor as it cushions them from shocks and market instabilities. Consequently, they isolate them and block interactions with other actors.

At this point the study distinguishes *'output self-sufficiency'* from *'input self-sufficiency'* arguing that each affects farm decisions and the entire industry

differently. However, they also tend to influence each other to some degrees. In the study, output self-sufficiency refers to household or farm producing to satisfy consumption needs, e.g. producing own foods, etc., and being input self-sufficient refers to sourcing most (if not all) production inputs from within the farm. While both types of self-sufficiency externally promote diversification and therefore reduce specialization at industry level (as everybody tends to produce everything), as well as diminishing scale (as the same resources especially land and labour are thinly allocated to produce various products), *input self-sufficiency'* has relatively more implications on the level of interactions in the poultry industry. The more producers perceive, or aim to be input self-sufficient, the less they interact with other actors in the poultry industry. When other actors in the industry perceive that producers are operating as input self-sufficient, they reinforce that tendency by withdrawing from supplying inputs. Once, producers choose to change and source inputs outwards, they are initially faced with a supply and demand deadlock, which makes the shift to commercial production difficult and very costly unless a significant number of producers make the shift together.

I also argue from the study that, perceiving input (including knowledge) self-sufficiency promotes *'pseudo vertical integration'* where producers believe that they can source (or are sourcing) all inputs and knowledge they need from within the farm (or from within a closed community), when in actual fact there is no sufficient supply. It also leads producers to exclude technologies and innovations which are beyond what they know or have. As a result, the input self-sufficiency impression hinders opportunities for interactions while leaving the farm still unproductive. It thus promotes organisational thinness as fewer actors are needed to satisfy farms' needs. Therefore, given the small size of these farms and their poor resource bases, it is arguable that perceiving *'self-insufficiency'* can actually trigger interactions, learning and growth. The very same shocks that poor producers might be protected from could be potential sources of innovation and growth if well supported to deal with them.

Excessive diversification at household level can be a strategy to manage risks, but this also hinders specialization in production which in aggregate should lead to

increased productivity (Smith, 1976: Vol.1). It limits social division of labour as everybody in a village produces small amounts of everything. According to Adam Smith (ibid), specialization of labour leads to a complex social division of labour which leads to society's wealth. Small production of everything by everybody does not facilitate extensive technical division of labour. While diversification by small poor households in rural Africa may cushion them from risks but in aggregate it hinders the growth of the society in general. Therefore, this reductionist view of focusing at the growth and productivity of an individual poor household as if isolated from the growth of the entire society or industry is among the causes of low innovation and low productivity. It hinders specialization and therefore hinders accumulation of society's wealth. According to Smith, 'division of labour is a consequence of a certain propensity in human nature…. the propensity to truck, barter, and exchange one thing for another' (Smith, 1976: Vol.1: 25, cited in Payne and Philips, 2010: Pg. 13). More exchanges of goods are needed to create a stronger division of labour which the poor producers need in order to strengthen their presence in the market, a presence they inevitably need given the current global forces.

Regarding organisational thinness and fragmentation, results from the innovation context analysis show existence of only a few organisations promoting use of new knowledge, and later triggering investment in innovation in the rural poultry industry. Actors in the knowledge and intermediary domains (i.e. research organisations, NGOs, and extension service providers) were found to be the major cause of organisational thinness and fragmentation observed in the industry because they discourage producers interacting with commercial input suppliers. Having the majority producers operating under the traditional system is also found to cause fragmentation especially in the enterprise domain where commercial exchange of goods and services is central in connecting actors. Therefore, the thesis argues that it is the routines embedded in the traditional production system itself that cause fragmentation in the enterprise domain, as well as between producers and actors in the demand domain and in the support services cluster. This means that, in order to reduce organisational thinness and fragmentation, the persistence of the traditional production system has to be altered to create affinity for other enterprises in the

industry. This includes introducing the '*business element'* as the motive for interactions.

10.2.3 Explaining 'unlocking' and 'path creation'

The analysis of the RIU programme clearly shows that despite their indeterminate and unpredictable nature, complex agricultural systems can be deliberately influenced to produce desired *'emergent'* behaviours. There is a window provided by complex systems through which human intent is embraced to become part of complexity that steers processes that form desired *'emergent'* behaviours. Short-term human determinism is allowable when influencing complex systems, though only as one of many inputs and possibilities that produce systems behaviours. From the study RIU managed to facilitate and manoeuvre processes until the commercialisation behaviour emerged as desired. This was achieved by facilitating producers to change their *'expectations'* and their *'relationship with poultry keeping'*. The system was then induced into an *'input demand shock'*, followed by what RIU called a *'bottleneck approach'* to articulate needs emerging from the shock. Using the approach, RIU sought solutions to specifically build actors' capacity to satisfy the new demand. In the process of doing that, a new economic equilibrium was achieved and adapted by actors in the system.

Through facilitation, linking, creating partnerships and cushioning small producers from risks, the programme managed to build networks, promote learning and transform the Tanzania rural chicken industry from being dominated by subsistence-based backyard activities, into a commercially viable industry that improves rural income as well as attracting more actors and investment to upgrade processes and technologies. Although the context is temporary and therefore unpredictable over time, and that innovation emerges from a complex web of interactions, the study shows that it is indeed possible to initiate and manage innovation processes and achieve broad objectives such as poverty reduction.

Commercialising subsistence agriculture

Increased per capita income and urbanisation are increasing the scope for economies of scale in food marketing and distribution. At the same time, the size of the market

for distributors and retailers is increasing because of the reduction in their transaction costs. As a result the volume of food marketing handled by supermarkets has increased, pushing for substantial organisational and institutional changes throughout the food marketing chain (Dolan and Humphrey, 2001). Such changes also include the setting of private grades and standards for food quality and safety, and the adoption of contracts between buyers and sellers at various points along the food marketing chain. Consequently, sub-contracting for products of specified quality and traits is emerging as the new form of interaction between retail food chains and producers (Pingali, Meijer, & Khwaja, 2005; p.1). These trends of changes lead to the risk of power concentration on a few food retailers and large market intermediaries which threatens the existence of small traders and small businesses. It also means the gradual disappearance of smallholders who are unable to meet the private standards on health and safety set by the market (Dolan and Humphrey, 2001; Reardon and (Berdegué, 2002a; cited in Pingali, Meijer, & Khwaja, 2001).

Changes which are happening in the marketing and consumption sides of the food systems have already set commercialisation in motion. Producers are left with almost no other choice but to fit in if they want to survive with farming as their source of livelihood. Subsistence producers have to **'choose'** (as it will not happen by chance) to participate in the market. The question is therefore, what makes subsistence producers choose not to produce for the market? And what has the potential to make them change? I have tried to investigate how RIU triggered the desire to commercialise the indigenous chicken enterprises in Tanzania and what were the barriers they had to overcome. While answering those questions, analysing this brings to light what was actually constraining commercialisation and consequently innovation in the industry.

What hinders commercialisation?

Pingali characterises food production systems into subsistence, semi-commercial and commercial systems (Pingali and Rosegrant, 1995, cited in Pingali et al., 2001) and in another paper, Pingali et. al., (2010) argues that what hinders commercialisation in subsistence agriculture is related to their choice of crops (including the ability to switch between crops), high transaction costs, and their inability to meet specified

market requirements in terms of quality, quantity, and delivery standards. They therefore argue that, given the trends in food marketing, it is far more important for small producers to gradually transit towards producing commercial staple crops because commercialisation has changed the structure of food systems and the cost of exchange for producers of both types of crops has significantly increased. Moreover, commodities are increasingly differentiated based on particular requirements causing new transaction costs to emerge and inhibit small producers' entry into competitive markets (Ibid).

Apart from recognising that there are contrasting opinions regarding the value of commercialising smallholder agricultural production in poor countries, that is, there are opponents and proponents of the idea (see Ellis, 2005 for the debate), I have not established an opinion on whether commercialisation is good or bad for small producers. However, I have come down in favour of commercialisation because there are small producers in Africa whom, given the opportunity, would prefer to switch (referred to as *'switchers*[39]*'* in Cadot, Dutoit, & Olarreaga, 2010) than otherwise. And by making this choice, I am emphasising the right to choice of development path by the small producers themselves. Literature presents cases of small producers who switched from subsistence production once presented with the opportunity to do so, even if it meant switching for just a short period. See Berkeley, Vakis, Sadoulet, & Janvry, 2003; Byerlee, Janvry, & Sadoulet, 2009; Cadot et al., 2010; Otte, 2005; Riise, Permin, & Kryger, 2005.

Agricultural commercialisation as a development 'issue' is not new and the move away from traditional self-sufficiency to producing based on market trends is increasingly being witnessed in most developing countries (P. L. Pingali & Rosegrant, 1995). In the literature commercialisation is often portrayed as an 'inescapable' choice to smallholders if they are to survive. For example, Pingali et. al., (2010) mention that with increasing economic growth, small farm production systems could only survive by gearing themself up to some degree of commercialisation and not remain static (p.3). Wouter Zant argues that

[39] These are producers who overcome the barriers to exit subsistence agriculture by overcoming risks and transaction costs. See Cadot, Dutoit, & Olarreaga, 2010

commercialising the overwhelming subsistence agriculture is inevitable if poor countries whose economies are agrarian-based must come out of poverty. He says:

> "the widespread subsistence farming leads to low productivity and low growth in agriculture. And since developing countries have large agricultural sectors with a comparative advantage vis-à-vis non-agricultural sectors, large multiplier effects from agriculture to the remaining sectors of the economy and few alternative growth strategies (de Janvry and Sadoulet, 2010), a stagnant agricultural sector is likely to obstruct the economic growth potential of these countries.(Zant, 2012)"

The authors also explain that the process keeps changing and becoming even more apparent and challenging to smallholders. The process now entails much greater integration between producers and the output market with a strong emphasis on standards in relation to quality and safety. This means commercialisation in this context is about *'making subsistence producers fit for market'* which means facilitating changes and adjustments at the producer side rather than from the market side.

The question is therefore who is excluding who from the market? Is it the nature and demands of the market that out rightly exclude the subsistence producer? Or is it that the subsistence producer has chosen to exclude him or herself by not producing what the market wants? This study concludes that subsistence producers have to negotiate their way to the market by organizing a significant number of them to signal the market (i.e. send significant noises to the market), so that the market can re-organise and accommodate them. The study also makes it clear that achieving that has a social cost which should be paid through facilitation, brokering and cushioning risks until producers are strong enough to be on their own.

This study provokes discussions on whether promoting less-resource intensive technologies and innovations among the poor is the best strategy for lifting them out of poverty, rather than seeking to gradually upgrade their capacities. Putting the question differently, I ask, should strategies for improving agricultural performance for poverty reduction in Africa continue to focus on choosing appropriate technologies for the poor, or on upgrading their expectations (i.e. causing positive

mental shifts) and capacity to choose and utilize better technologies? As explained earlier, this study emphasises on upgrading rural producers' expectations coupled with initiatives to build their capacities to pursue them as a way to improve their technological choices and abilities.

Promoting innovation from a victim perspective?

The performance of African agriculture is now a concern to the global community more than it was a decade ago (AGRA, 2013; Bates & Block, 2013; de Janvry & Sadoulet, 2010). It is increasingly blamed for causing global poverty as it fails to sustain the lives of Africans who depend on it for livelihood. According to economists, the current production systems in African agriculture are inefficient because they engage the largest proportion of the continent's land and labour to produce very little marketable surplus which is needed for growth. In other words, by engaging 60% of her labour in unproductive agricultural activities, Africa is holding back her own economic growth. This makes existing agricultural production systems the target for Africa's economic solutions.

My concern, which was supported by the study, is linked to the established view that majority of those engaged in agriculture in Africa are poor, illiterate and live in rural areas deprived of amenities like electricity, water, transportation and communication infrastructure, allegedly important for modernization. This view has therefore constructed a **'victim of unfair development'** whose interpretations evoke sympathy and empathy from the developed world, where countries are perceived to have been favoured by the development discourse. Therefore, by looking through the eyes of 'victimhood', development policy and practice see rural producers as victims of marginalization, resource deprivation, bad policies (governance), and bad development interventions, etc. While I may not have problems with the observation that rural producers are marginalised, my problem is how the observation is then used to define development policies and programmes. Often, this leads to using identities like 'the *vulnerable*', the '*marginalised*', 'the *resource poor*', 'the *poorest of the poor*', '*traditional producers',* etc. which tend to justify and determine the type of interventions thought to be particularly appropriate.

Within the 'victim' perspective, agricultural interventions often protect and even patronise the small producer. As a result, only what is perceived to be within the victim's means is allowed. Any effort to expose him or her to higher levels of resource use, (or risks), is deemed 'unsustainable', 'exploiting' or increasing vulnerability. Unfortunately, for the past 50 years this kind of gatekeeping has been the norm, and the vulnerable are still vulnerable, and so are the marginalised– even where projects worth millions of dollars were implemented to help them. The fact is, this kind of gatekeeping starts and ends with a victim, because what justified the victim tends to persist throughout the project. It is not eliminated in the course of implementation. The questions are therefore, from whose eyes does the victim emerge? And from whose choice of a path is the victimhood expected to end? My argument here is that, and learning from the analysis of RIU interventions, there are no victims in agricultural development. Rather we have different people developing from different contexts and following different paths. Thus what matters is the presence of unbounded exposure to choices (of both opportunities and solutions-technological or not) and the capacity to pursue expectations embedded in those choices (i.e. capacity to identify needs, to seek and utilize solutions). Furthermore, the role of the poor to interact and negotiate in development should not be ignored. The poor too have the right to negotiate and compromise as necessary.

Meeting the social cost of building rural innovation networks

After producers accepted to change their routines and commercialise, they went through a process of internalising the idea. This involved engaging themselves in series of discussions and mental evaluation both at individual and society level. Afterwards, they negotiated with other actors to know exactly what would change and what they were supposed to do. These processes were facilitated by RIU and had a 'social cost' which was paid for by RIU. These negotiations built the initial trust among actors as well as established a mental picture of how interactions would look like. It is during these negotiations when roles and responsibilities of each actor were laid down. RIU played a very important role in filling capacity gaps during the negotiations. This implies that if negotiations had taken place without RIU, the intended partnerships wouldn't have been realised. In essence, it was these prior

discussions that made all partnerships possible, and which happened to change the role of RIU beyond bringing actors together into *'cushioning risks'* and therefore *'levelling negotiating grounds'*. As a matter of fact, none of these two roles were envisaged initially by the programme management.

Therefore, the thesis introduces the concepts of *'sketching envisaged networks'* and that of *'meeting the social cost of building networks'* as important steps and roles of an innovation facilitator (or broker) towards promoting innovation in an industry dominated by subsistence producers living in rural areas. The former role involves building trust among actors before they re-organise their routines to accommodate expected changes, while the later ensures all actors have the capacity to engage with subsistence producers and do business with them, otherwise nothing would change because existing support services such as from financial institutions are not designed to work with such industries. Apparently, the thesis makes it clear that playing these roles requires significant flexibility within the programme plans and finances.

10.3 Conclusions

10.3.1 Contribution to knowledge

The theory of path dependency and specifically the concepts of lock-in, organisational thinness and fragmentation can explain why innovation is prevalently low in rural poultry. Combined with the use of innovation context analysis using the Agricultural Innovation System (AIS) framework, the theory can establish the extent of interactions and organisational mix in a particular industry, and what hinders or blocks interactions or emergency of actors to promote innovation. In this study it is evident that, knowledge generators and intermediary actors can actually promote low interactions among actors as well as lock an industry into an inferior technology or innovation. The theory also helps to unveil policy factors that create a lock-in. This is a new finding since most 'lock-ins' tends to be associated with the market and users' behaviour.

In the light of the path dependency theory and findings in the chapter, policy makers may gain new insights on how their decision to aggressively promote inferior technologies or production systems in poor economies may actually lower innovation, or lock-in a certain industry to an inferior path. It also highlights how

promoting certain ideas like self-sufficiency and diversification can hinder innovation and therefore counteract good intentions. This challenges policy makers to consider the long-term consequences of protectionist ideas often imposed on poor producers in developing countries. It also opens up new thinking on how and where to intervene to create new development paths by presenting more choices to small producers.

10.3.2 Reflections and future research

Data used in this research is limited to what RIU did, what happened, and how actors and the industry responded. It does not capture the dynamics within RIU management to correspond to what gave the programme the ability to do what it did. For example, it would have been interesting to show how planning, reporting, staffing and budgeting were done while taking such a flexible approach and still be able to satisfy the donor. However, given the scope and time of this PhD research, it was not possible to conduct an in-depth analysis of RIU as the broker and reveal the internal dynamics of being indeterminate and still be a successful donor programme.

The study did not capture information on potential risks associated with commercialisations and the RIU interventions in general. RIU reports explain that commercialising rural poultry enterprises causes some unintended shifts which may not be desirable depending on how the society is organised around poultry business. Mechanisms to manage such shifts are important. Such problems only emerge and can therefore not be predetermined (RIU, 2011a).

Examples of such risks include a shift in gender roles which could cause problems to women and girls as discussed above. Another risk is movement of nutritious foods from rural to urban markets for economic gain, while depleting resources in rural areas. High demands for quality agricultural products in urban areas may persuade farmers to sell all their produce to these markets leaving none for consumption in rural areas. Therefore, a deeper analysis to understand such dynamics, and to understand the mechanism used by RIU to buy only 75% and leave behind 25% of the poultry produce to encourage local consumption and selling might reveal useful information on how to reduce negative impacts on rural nutrition.

The study also did not capture the effects of the changes in poultry production system on crop farming. Poultry keeping provides farmers with easy access to money in a short amount of time, and although this is a positive gain it may reduce farmers' efforts in crop farming and cause imbalances in food production. For example, an old lady mentions during interviews that she stopped farming because keeping chickens was easier and more profitable to her. However, other interviewees made it clear that the income from poultry had improved crop production because the extra income is used to hire extra labour and buy inputs. While RIU promoted poultry keeping as a supplementary activity it is worth analysing the trade-offs, and the dynamics of situating the commercial poultry enterprise in the rural farming and livelihood systems.

The study did not analyse the effects of establishing direct links between rural producers and input suppliers, and with markets. Chances are, such links could have negative implications be it social, economic or environmental. For example, there could be loss of jobs for some stakeholders in the value chains e.g. middlemen, traders; increase in grain prices as more producers use them to feed chicken, less social exchanges of chicken as gifts, etc. RIU addressed the first issue by integrating some of the 'losers' into other activities along the value chain such as in production, transportation or marketing. However, the chances are that more jobs were created in the urban than in the rural areas where they were lost. Therefore understanding such dynamics and how to address them is useful for future learning

10.3.3 Implications for policy

The study makes it clear that transforming an industry dominated by subsistence producers is beyond transforming an individual farm, firm or actor. It is about creating new expectations, new relationships, new vision, new routines and new institutions, rather than supplying knowledge, promoting technologies, addressing a few selected institutional problems, or simply linking actors. It also means avoiding sticking to predetermined notions of how the poor should be developed (i.e. seeking to deliberately avoid using certain technologies in the spirit of appropriateness, etc.) which may tend to limit how the industry would restructure. The process involves redefinition and reconfiguration of perceptions, rules, roles, relationships and

institutions to create new paths without pre-conceived ideas of what is relevant and what is not. This means, setting the system free from pre-established narratives regarding subsistence and allow it the opportunity to redefine itself. For example, from the start RIU did not make pre-assumptions of the kind of technologies to be promoted, but allowed actors and situations to determine the most suitable solutions, by looking at what was needed, then combine what respective actors could do with RIU's support to fill in gaps.

Setting the system free from subsistence narratives means letting go scientific fears, prejudices and conclusions regarding what 'the poor can or cannot', or what is appropriate and what is not, and give them the 'benefit of the doubt' in relation to what it takes to afford a new trajectory. This is important because, unless it is believed (no matter how temporary) that poor producers can afford a new production paradigm if they want to, and giving them the freedom and support to experiment, then it is very unlikely that they will innovate as a group. As the study explains in Chapter seven, there is a lacuna to be crossed by subsistence producers before they could commercialize. And bridging that lacuna was among the most important roles that RIU played. In fact, that *'bridge'* entails the 'social cost' of experimentation needed to change behaviours of a significant number of producers who are needed to transform the industry. And meeting the cost of this bridge is probably what is currently missing, and therefore forms the important role needed to be played by the public sector.

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Appendices

List of interviews

II. Individual Interviews			
	INTERVIEWEE	**WARD/POSITION**	**DATE**
Ex-RIU Staff			
1.	Robert Levi Mgeni	Monitoring Officer (left in 2010)	4/5/2013
2.	Pamela Lwakabare (F)	Innovation Officer (left in 2010)	7/5/2013
3	Dennis M. Mbangulla	Innovation Officer (after Pamela)	12/5/2013
4	Matilda S. Mndeme (F)	Field Coordinator	13/5/2013
5	Jwani Tranquilino Jube (F)	Communications Officer	20/5/2013
6	Eliasa Saidi	Entrepreneurship/Business Trainer	-"-
7.	Sella Gavile	Driver	21/5/2013
RUVUMA and NJOMBE REGIONS *(Control)*			
Songea Rural District			
1.	Rehema Mapunda (F)	Mtyangimbole Ward	6/6/2013
2.	John Maseko (F)	-"-	-"-
3.	Oliver Nyoni	-"-	7/6/2013
4.	Ahmad Komba	-"-	-"-
5.	Juliana Kyula (F)	-"-	8/6/2013
6.	Hassan Lahi	-"-	-"-
7.	Joseph Menace Banda	-"-	9/6/2013
8.	Hilda Shupa (F)	-"-	-"-
9.	Hamdan A Hamdan	Peramiho Ward	12/6/2013
10.	Emerenciana Komba (F)	-"-	-"-
11.	Peter Ngonyani	-"-	13/6/2013
12.	Bernada Kawonga (F)	-"-	-"-
13.	Grace Lima (F)	-"-	14/6/2013
14.	Albanus Nyoni	-"-	-"-
15.	Moses J. Ndonde	-"-	15/6/2013
16.	Pili Cletus (F)	Mahanje Ward	-"-
17.	Eleutherius Mvulla	-"-	19/6/2013
18.	Agenta Kilewa (F)	-"-	-"-
19.	Christian Ngonyani	-"-	20/6/2013
20.	Krista Kristom Mlowe (F)	-"-	-"-
NJOMBE REGION *(Control)*			
Njombe Rural District			
1.	Godlove Kiukila	Ikuna Ward	25/7/2013
2	Grace Nyagawa (F)	-"-	-"-
3	Jairos Mhoka	-"-	-"-
4	Jofrey Mhoka	-"-	26/7/2013
5	Joyce Nyagawa (F)	-"-	-"-
6.	Lucy Mtagawa (F)	-"-	28/7/2013
7.	Sarah Kihindo (F)	-"-	-"-
8.	Rahel Mwinami (F)	-"-	29/7/2013
9.	Petro Kiwale	-"-	-"-
10.	Jackson Andrea Mwanza	Igima Ward	02/08/2013
11.	Job Lumuliko Mwanza	-"-	-"-
12.	Joyce Nathan Simkoko (F)	-"-	-"-

13.	Matrida Mwepelwa (F)	-“-	03/08/2013
14.	Milka Msemwa (F)	-“-	-“-
15.	Ndonina Kitalula (F)	-“-	-“-
16.	Ngati Tewele	-“-	06/08/2013
17.	Norice Mng'ong'o	-“-	-“-
18.	Suzana Simon Mpolya (F)	-“-	07/08/2013
19.	Veronica Nyamle (F)	-“-	-“-
20.	Yalileni Mwanzanila	-“-	-“-
	PWANI (COAST) REGION *(RIU beneficiaries)*		
Bagamoyo District			
1.	Juto Abdallah	Fukayosi	03/9/2013
2.	Mwakombo Mtoro (F)	-“-	-“-
3.	Muharami Mtoro (F)	-“-	04/09/2013
4.	Ramadhani Saidi Mtawa	-“-	-“-
5.	Nuru Mshamu Saidi (F)	-“-	05/09/2013
6.	Mwishamba Rajabu (F)	-“-	-“-
7.	Godfrida P. Sungura (F)	-“-	-“-
8.	Elizabeth Mathias (F)	Kiwangwa	08/09/2013
9.	Hilda Chilongola (F)	-“-	-“-
10.	Lameck Malau Mbalani	-“-	-“-
11.	Muharam Kimela	-“-	09/09/2013
12.	Saidi R. Chambela	-“-	-“-
13.	Siwema S. Tanganyika (F)	-“-	-“-
14.	Innocent L. Lyimo	Bong’wa Magomeni	13/09/2013
15.	Joshua N. Msechu	-“-	-“-
16.	Esther N. Msechu (F)	-“-	14/09/2013
17.	Triphona A. Temba (F)	-“-	-“-
18.	Winifrida A. Gumbo (F)	-“-	16/09/2013
19.	Mwansiha Hussein (F)	-“-	-“-
20.	Mary A. Kisima (F)	(Champion)	17/09/2013
21.	Anna Komba (F)	-“-	-“-
22.	Leticia Baisi (F)	-“-	-“-
23.	Dickson Chahe (VALEO)	Chalinze (Extension staff)	20/09/2013
24.	Herman Mahuwi	-“-	-“-
25.	Maria Godwin Kimaro	-“-	21/09/2013
26.	Esther Matingisa (F)	-“-	-“-
27.	Sipora Salali (F)	-“-	22/09/2013
28.	Tumaini Mbise	-“-	-“-
29.	Ezra Ngulwa	-“-	23/09/2013
30.	Willima Jeuri	-“-	-“-
31.	Domina Kimaryo (F)	-“-	24/09/2013
32.	Latiel Mbise	-“-	-“-
Kibaha District			
33.	Mary Wanna (F)	Galagaza	26/09/2013
34.	Siwangu Nchimbi (F)	-“-	-“-
35.	Paulo Lalusa	-“-	27/09/2013
36.	Issa Athumani	-“-	-“-
37.	Christina David (F)	(Champion)	28/09/2013
38.	Mabua Mtumbati Mussa	-“-	-“-
39.	Julieth Paulo (F)	-“-	29/09/2013
40.	Bora Saburi (F)	-“-	-“-

41.	Maulid Ngenje	-“-	-“-
42.	Shwabe Shomari	-“-	30/09/2013
43.	Bwana Kimbwapule	-“-	-“-
44.	Chacha Makuru	-“-	-“-
Rifiji District			
45.	Sauda S. Mkumbaru (F)	Kibiti Ward	01/10/2013
46.	Salma A. Mlawa (F)	-“-	-“-
47.	Rehema M. Mtulia (F)	-“-	02/10/2013
48.	Salumu M. Mkendo (F)	-“-	-“-
49.	Jumanne Mkumba	-“-	03/10/2013
50.	Rajabu M. Munilwa	-“-	-“-
51.	Ayubu A. Simba	-“-	04/10/2013
52.	Abdara S. Mkumbo	-“-	-“-
53.	Mwanaisha S. Lipunda (F)	-“-	05/10/2013
54.	Hamis s. Nyuambara	-“-	-“-
55.	Maimuma S. Mkongea	Bungu Ward (Champion)	06/10/2013
56.	Omari J. Mkosa	-“-	-“-
57.	Zuhura O. Kanyampa (F)	-“-	07/10/2013
58.	Juma E. Alberto	-“-	-“-
59.	Maua M. Mtandika (F)	-“-	08/10/2013
60.	Saidi a. Ndaro	-“-	-“-
61.	Zena K. Roya (F)	-“-	09/10/2013
62.	Shani K. Mtyangu (F)	-“-	-“-
63.	Mohamedi H. Mpayuka	-“-	10/10/2013
64.	Yasini a. Joli	-“-	-“-
Mkuranga District			
65.	Shabani A. Kindamba	Magoza	12/10/2013
66.	Hasani M. Maranga	-“-	-“-
67.	Selemani S. Mahinde	-“-	13/10/2013
68.	Amina M. Mpate (F)	-“-	-“-
69.	Hadija M. Mbopotile (F)	-“-	14/10/2013
70.	Halissa J. Heri (F)	-“-	-“-
71.	Hamis K. Manzi	-“-	15/10/2013
72.	Zuhura H. Almasi (F)	-“-	-“-
73.	Sadi A. Kindamba (F)	-“-	16/10/2013
74.	Ally Kindamba	-“-	-“-
75.	Asia M. Maluku (F)	Kimanzichana	17/10/2013
76.	Salima Milanzi (F)	-“-	-“-
77.	Hadija Malekela (F)	-“-	18/10/2013
78.	Zubeda Lema (F)	-“-	-“-
79.	Omari Masisi	-“-	19/10/2013
80.	Yahaya Kamkosa	-“-	-“-
81.	Habibu Mbepo	-“-	20/10/2013
82.	Eugenia Njau (F)	-“-	-“-
83.	Hasani Kimbendengu	-“-	21/10/2013
84.	Hadija Ukata (F)	-“-	-“-
85.	Kamkosa Siraji	-“-	-“-
	OTHER ACTORS *(Inputs suppliers, service providers, Government)*		
1.	Dr. Samora Mshanga	District Livestock Officer -Songea	05/06/2013
2.	Fr.	Feed producer - Peramiho Catholic church	11/06/2013
3.	Dr. Ngwale	District Livestock Officer -Njombe	04/08/2013

4.	Mr. Mpete	Feed Producer (Mpete feeds Njombe)	05/08/2013
5.	Prof. Lekule	Feed producers - Tanfeeds	09/08/2013
6.	Dr. Mgaya	Veterinary Drug Supplier -	20/08/2013
7.	Dr. Msami	Vaccine supplier (importer)	22/08/2013
8.	Mr. Mrindwa	Chick Producer – Msigani Hatchery	25/09/2013
9.	Dr. Mlinga	Chik Producer	25/09/2013
10.	Dr. Mang'ana	Veterinary shop owner, Kibaha	01/10/2013
11.	Dr. Kaijage	Ministry of Livestock Development and Fisheries	03/11/2013
II. Group Interviews			
GROUP			**DATE**
1. FGD with Ex-RIU staff			25/5/2013
FGDs in Songea and Njombe (non-RIU target areas)			
1. Mtyangimbole		Songea District	22/6/2013
2. Peramiho		-"-	23/6/2013
3. Mahanje		-"-	24/6/2013
4. Ikuna		Njombe District	13/8/2013
5. Mtwango		-"-	14/8/2013
FGDs in Coast Region (RIU target areas)			
1. Fukayosi and Kiwangwa		Bagamoyo District	10/09/2013
2. Bagamoyo		-"-	18/09/2013
3. Chalinze		-"-	25/09/2013
4. Galagaza		Kibaha District	01/10/2013
5. Bungu		Rufiji District	11/10/2013
6. Kibiti		-"-	11/10/2013
7. Magoza		Mkuranga District	22/10/2013