
# Training of Trainers (ToT) Workshop on Climate Smart Nutrient and Water Management in Crop Production Course Module

Workshop Report

CGIAR | AICCRA
Accelerating Impacts of CGIAR Climate Research for Africa

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## Acknowledgements

Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture. It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank. The authors would like to thank AICCRA, RUFORUM and University Zambia for the support and facilitation of the training.

## About AICCRA Reports

Titles in this series aim to disseminate interim research on the scaling of climate services and climate-smart agriculture in Africa, in order to stimulate feedback from the scientific community.

## Photos

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## About AICCRA

AICCRA
Accelerating the Impact of CGIAR Climate Research for Africa

Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture. It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank. Explore our work at **aiccra.cgiar.org**

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# CONTENTS

# ABBREVIATIONS

| | |
|---|---|
| AICCRA | Accelerating Impacts of CGIAR Climate Research in Africa |
| CGIAR | Consultative Group of International Agricultural Research Centres |
| CIS | Climate Information Services |
| CSA | Climate-Smart Agriculture |
| IAPRI | Indaba Agriculture Policy and Research Institute |
| KATC | Kasisi Agricultural Training Centre |
| MoA | Ministry of Agriculture |
| NAIS | National Agricultural Information Services |
| NRDC | Natural Resource Development College |
| RUFORUM | Regional Universities Forum for Capacity Building in Agriculture |
| UNZA | University of Zambia |
| ZCA | Zambia College of Agriculture |

# ABSTRACT

As part of the AICCRA, the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) are tasked to develop curricula and training materials to accelerate the mainstreaming of Climate Information Services (CIS) and Climate- Smart Agriculture (CSA) into University's curricula in Africa. This report describes the activities of a training of trainers' (ToT) workshop on Climate Smart Nutrient and Water Management in Crop Production course module . The University of Zambia (UNZA) organised and hosted the Training of Trainers (ToT) workshop from the 29th August - 2nd September, 2023 at Chita Lodge in Kafue District of Zambia with the objective of increasing awareness on climate-smart soil nutrient and water management at university level and with non-academic audiences. The ToT included 28 participants (about 39% women) drawn from various institutions involved in training, dissemination and promotion of CSA and CIS in Zambia. These institutions included the Ministry of Agriculture, Zambia National Information Services (NAIS), Zambia College of Agriculture (ZCA), Natural Resource Development College (NRDC), Kasisi Agriculture Training Centre (KATC), Indaba Agriculture Policy and Research Institute (IAPRI), AfriSeed and relevant Departments at the University of Zambia. The workshop was organised as a three-day Modular Training of Trainers workshop organised in interactive sessions and a field visit. The Sessions included: (i) Official opening and setting of the scene; (ii) Concepts and principles of soil health and nutrient management in crop production; (iii) Soil: plant-water interrelations; (iv) Challenges of climate change to soils and soil fertility management; (v) Water management for crop production; (vi) Climate smart crop production and nutrient management Systems; (vii) Nutrient management for climate change adaptation and crop production; and, a field visit to two Conservation Agriculture (CA) practicing farms. The following issues and recommendations emerged from the ToT: (i) There is need to scale-up the training to cover additional institutions and farmers for enhancement of CSA practices; (ii) There is need to contextualize the module to suit the different stakeholders and environments; (iii) There is need to develop a toolkit translating scientific terms into the major local languages of Zambia; and, (iv) based on the success of the training workshop, the Department of Soil Science has since received requests to organise similar training to targeting seed companies in climate smart agriculture. We therefore recommend that: (i) a scale-up of ToT be implemented; (ii) the next phase of AICCRA includes the development of contextualized materials including booklets, pamphlets, flyers, videos, bulletins and newsletters. Such materials could be developed in partnership with the media houses.

# INTRODUCTION

The University of Zambia (UNZA) was established by an Act of Parliament in 1965 and is the oldest grant-aided public university in the country. It currently has thirteen schools, two (2) institutes, four (4) directorates with two (2) campuses and ten (10) provincial centres for its extension & distance education programmes, and over 17,000 full-time registered students. In its 55 years of existence, the University has produced over 60,000 graduates in different fields of specialization, and graduates over 4500 students annually at both undergraduate and postgraduate levels. Among its notable alumni are the third, fifth & seventh republican Presidents of Zambia, and the current President of Zimbabwe. UNZA has well-stocked libraries with over 1.2 million volumes, 200 databases and e-journals to meet most education and academic requirements for an institution of higher learning. It has strong academic linkages and networks across the globe through existing partnership programmes.

Since 2006, UNZA has been a full & active member of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). As such, UNZA is an implementing partner for the East and Southern Africa (ESA) Component of Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project anchored in the School of Agricultural Sciences. Under this component, the following outputs are envisaged from the AICCRA project in its strategic collaboration with RUFORUM:

1. Awareness creation materials on climate change, climate-related risks for agriculture, and on climate resilience, adaptation and mitigation and CSA approaches developed for university students and extension service providers disseminated in ESA;
2. Teaching materials and curriculums modules for technical and vocational schools for ag-extension agents, ag-graduate and post graduate studies at ESA universities on climate change and climate risks and risk management in agriculture including components of farm-level climate risk assessment, managing climate risks, CIS for risk management, CSA, and for developing institutional DSTs to advance resilience and adaptation with mitigation co-benefits developed, disseminated with national partner universities in ESA through trainings and workshops;
3. Key strategic Eastern and Southern African universities' capacity for teaching and research on climate risks, CIS, CSA to contribute to resilient agriculture with mitigation co-benefits, as well as ability to promote links between climate research, agriculture, food security and climate action policy strengthened;
4. Together with strategic national universities and using the jointly co-developed training modules on climate information for risk management and sustainable production, build extension service providers, students, public institutions, private sector firms, farmers' organizations, and media's capacity through periodic workshops and trainings on context-specific CIS delivery models in multiple value chains using PPPs; and,
5. Jointly envisage, envision, advocate for and work towards institutionalizing climate thinking and climate-informed medium and long-term capacity building roadmap in key strategic ESA universities to lay the foundation for climate informed ag-education and to contribute to resilient agriculture and food systems in ESA.

Under the AICCRA programme ESA component anchored on Outputs No. 2, 3 & 4, RUFORUM has developed curricula for enhancing the use of validated CSA and climate information services (CIS) knowledge products developed by the CGIAR centres and other institutions. The modules developed under the AICCRA programme have formed the basis for training academic staff and students from different disciplines and next users (extension officers, input providers, private sector and media). In this vein, UNZA organised and hosted the training workshop from the 29th August- 2nd September, 2023 at Chita Lodge in Kafue District of Zambia the

objective of increasing awareness on Climate-Smart Soil Nutrient and Water management at university level and with non-academic audiences. The 28 participants were drawn from various institutions involved in training, dissemination and promotion of CSA and CIS in Zambia. These institutions included; the Ministry of Agriculture, Zambia National Information Services (NAIS), Zambia College of Agriculture (ZCA), Natural Resource Development College (NRDC), Kasisi Agriculture Training Centre (KATC), Indaba Agriculture Policy and Research Institute (IAPRI), AfriSeed and relevant Departments at the University of Zambia (Appendix I). Of the 28 participants, 61% were male, while 39% were female.

The expected outcomes of the training workshop were to;

I. Explore the possibility of further development of a curriculum or module in an existing programme to focus on Climate-Smart Soil Nutrient and Water Management;
II. Enriching and enhancing the existing curriculum with case studies and examples of CSA/CIS with specific reference to Climate-Smart Soil Nutrient and Water Management; and
III. Awareness creation for other participants who may not have received exposure to CSA/CIS in the Climate-Smart Soil Nutrient and Water Management context.

# WORKSHOP PROCEEDINGS

The workshop was organised as a three-day Modular Training of Trainers in eight (8) interactive sessions and a field visit (Appendix II). The various sessions were facilitated by experts from the Department of Soil Science within the School of Agricultural Sciences at the University of Zambia.

## *Session I: Official opening and setting of the Scene*

The workshop was graced by the representative of the Vice Chancellor of the University of Zambia. The Vice Chancellor recognized the timeliness of the training in view of the negative effects of climate change on agriculture. The Dean of the School of Agricultural Sciences who was also present at the meeting noted that Zambia as a country has made some significant progress towards breeding drought resistant crop varieties in response to the negative impacts of climate change and variability. He further noted that trainings such as this one in climate smart agriculture would contribute to the enhancement of food production and security as well as the exploitation of regional markets for agricultural produce. The workshop coordinator introduced AICCRA projects, its aims & scope at continental and national levels, and outlined the workshop objectives & expected outcomes. The coordinator recognized and appreciated the financial and technical support towards the hosting of the training from RUFORUM.

## *Session II: Concepts and principles of soil health and Nutrient Management in Crop Production-Dr Hendrix Chalwe*

This session outlined the concepts and principles of soil health and nutrient management in crop production within the local Zambian context. The participants expressed interest in soil health and sort further clarification on whether a health soil still requires external inputs to remain productive.

## *Session III: Soil: plant-water interrelations by Dr Elijah Phiri*

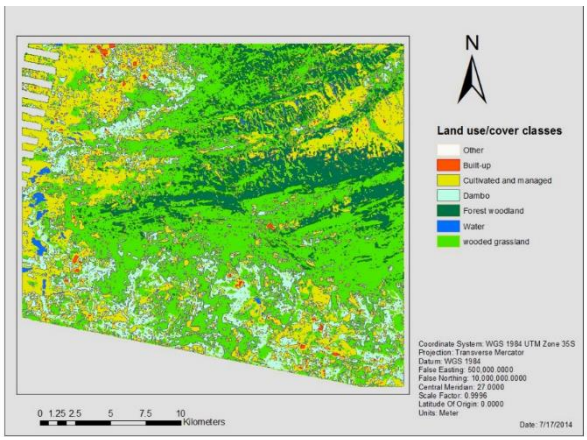
This session introduced plant and water relationships important for guiding irrigation scheduling and water virtual footprints. Insights into the potential use of dry boreholes for recharging acquifers and the importance of vegetation management around ground water recharge areas within farm landscapes were shared with participants. The participants expressed concern on the frequent and recent flooding events within urban areas due to excessive paving of potential water seepage zones.


## *Session IV: Challenges of Climate Change to Soils and Soil Fertility Management by Ms Olipa Lungu*

This session brought out the interrelatedness of the different effects of climate change on the soil physical, biological and chemical attributes for soil fertility. The participants expressed the need to manage the soils in terms of acidity as it is key for nutrient availability for crop production. A need was identified to develop on-site lime application recommendations based on soil pH ranges. Further, the need to maintain residues in fields for erosion prevention and to serve as substrates for soil organisms was recognised.

## *Session V: Landscape Approaches for Achieving Sustainable Crop Production by Dr Lydia M. Chabala*

This session introduced the concept of landscapes based on matrices and patches for achieving sustainable crop production and land use. The session brought out the importance of collaboration and networking among various actors in landscapes for their effective management. The participants observed the frequent occurrence of extreme events such as floods and erratic rainfall warranting the application of landscape based practices in water management.




## *Session VI: Nutrient Management for Climate Change Adaptation and Crop Production by Dr Peter Kaluba*

This session highlighted the need for nutrient management as a measure for climate change adaptation and crop production. The participants appreciated the need to: (i) apply nutrients at the right time and correct place rather than broadcasting which might lead to volatilization and decrease the nutrient use efficiency, (ii) manage of fertilizer application to minimize volatization which might lead to an increase in greenhouse gases emission and further exacerbate negative impact of climate change and (iii) observe the correct storage practices for chicken, pig, goat and cow manure in order to minimize volatization.

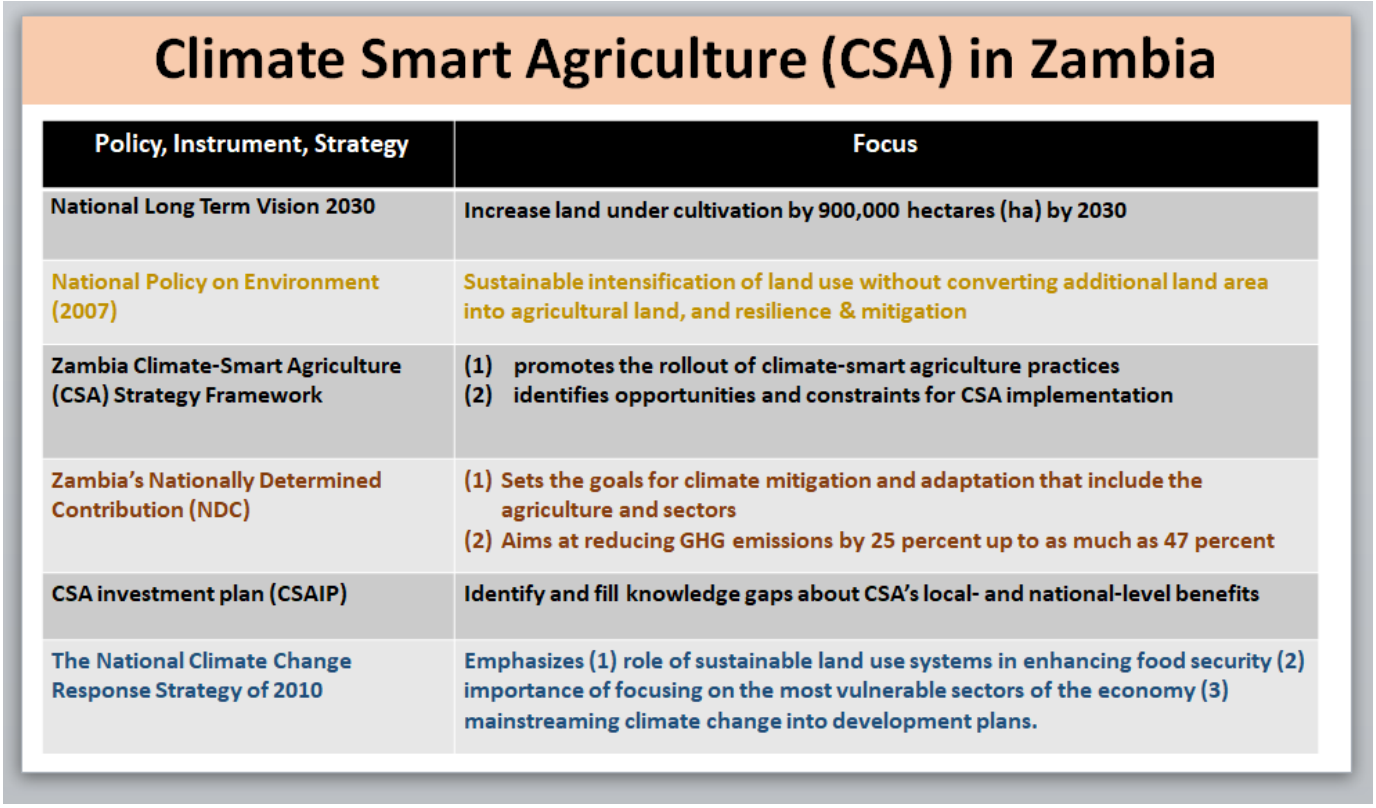
## *Session VII: Water Management for Crop Production by Dr Mabvuso Sinda*

This session focused on the importance of managing water for sustainable crop production in the face of climate change and variability. The participants expressed the need to effectively manage the existing irrigation

schemes and have an extension system around such structures to ensure their longevity. Further, it was observed that there is need to develop monitoring and evaluation measures and strategies around water bodies to enhance quality and quantity of the water.

## *Session VIII: Climate Smart Crop Production and Nutrient Management Systems by Dr Alice M. Mweetwa*

This session highlighted the current policies and strategies in Zambia in relation to climate smart crop production and nutrient management systems. The session further highlighted the functions of various categories of plant nutrients and factors that affect their availability in relation to climate change. The participants expressed concern on how soil analysis could be performed at field level to manage nutrient deficiencies. This information could be used to guide the type of fertilizer required for a particular location in the absence of detailed soil nutrient maps. The participants expressed the need to have local expressions/terminologies of soil parameters such as 'soil acidity' for easy communication and interpretation. The participants appreciated the importance of combining organic and inorganic fertilizers for the optimization of nutrient management in climate smart crop production and the maintenance of healthy soils.



**Climate Smart Agriculture (CSA) in Zambia**

| Policy, Instrument, Strategy | Focus |
|---|---|
| National Long Term Vision 2030 | Increase land under cultivation by 900,000 hectares (ha) by 2030 |
| National Policy on Environment (2007) | Sustainable intensification of land use without converting additional land area into agricultural land, and resilience & mitigation |
| Zambia Climate-Smart Agriculture (CSA) Strategy Framework | (1) promotes the rollout of climate-smart agriculture practices<br>(2) identifies opportunities and constraints for CSA implementation |
| Zambia's Nationally Determined Contribution (NDC) | (1) Sets the goals for climate mitigation and adaptation that include the agriculture and sectors<br>(2) Aims at reducing GHG emissions by 25 percent up to as much as 47 percent |
| CSA investment plan (CSAIP) | Identify and fill knowledge gaps about CSA's local- and national-level benefits |
| The National Climate Change Response Strategy of 2010 | Emphasizes (1) role of sustainable land use systems in enhancing food security (2) importance of focusing on the most vulnerable sectors of the economy (3) mainstreaming climate change into development plans. |

## *Session IX: Field visit by Dr Peter Kaluba*

This activity involved exposing the participants to various CSA practices on farms within the Kafue District of Zambia. Two farms had been practicing CSA for over 15 years. The farms had various enterprises which included: keeping of broilers, pigs, cattle rearing and vegetable production. This mix of enterprises had allowed the farms to build resilience to various climatic, environmental and economic shocks. Both farms utilized their oxen for draught power; this ensured timely land preparation and planting thus crop stable yields. Both farms utilized bio-circular system to minimize external input use and recycled farmwaste from the different enterprises. The farms used Faidherbia albida in their fields as wind breaks and for nitrogen fixation. It was observed that the farms had adopted residue retention, minimum tillage and crop rotation as components of CA. Based on the discussions with the farmers, it was concluded that both farms were performing well economically and were contributing to sound environmental management. The participants appreciated enterprises diversification as a measure against climate change and variability.


Farmer explaining on CSA practices of residue retention, crop rotation and diversification winter maize, tomato and livestock production

# EMERGING ISSUES AND CONCLUSIONS

I. Based on the ToT training, the following issues on CSA/CIS emerged:

II. There is need to scale-up the training to cover additional institutions and farmers for enhancement of CSA practices, we therefore recommend that this is considered for inclusion in the next phase of the AICCRA projects.

III. There is need to contextualize the module to suite the different stakeholders and environments i.e media, students, academicians, policy makers, farmers, among others. We therefore, recommend that the next phase includes the development of contextualized materials including booklets, pamphlets, flyers, videos, bulletins and newsletters. Such materials could be developed in partnership with the media houses.

IV. There is need to develop a toolkit translating scientific terms into the major local languages of Zambia e.g. soil acidity, soil alkalinity, erosion, pollution/ contamination among others.

V. Based on the success of the training workshop, the Department of Soil Science has since received requests to organise similar training to targeting seed companies in climate smart agriculture

# APPENDIX

## APPENDIX I: LIST OF PARTICIPANTS

| No | Name | Organization | Department |
|---|---|---|---|
| 1 | Dr Norman Kamanga (Representative Vice Chancellor) | University of Zambia | Bursar |
| 2 | Prof. Thomson H Kalinda (Dean) | University of Zambia | Deans Office |
| 3 | Mrs M Chanshika | University of Zambia | Registrar |
| 4 | Mrs J Malama | University of Zambia | Soil Science |
| 5 | Mrs M Zulu | University of Zambia | Deans Office |
| 6 | Dr A. Mweetwa | University of Zambia | Soil Science |
| 7 | Dr. Elijah Phiri | University of Zambia | Soil Science |
| 8 | Ms. Olipa Lungu | University of Zambia | Soil Science |
| 9 | Dr. Lydia M. Chabala | University of Zambia | Soil Science |
| 10 | Dr. Peter Kaluba | University of Zambia | Soil Science |
| 11 | Dr. Mabvuso C. Sinda | University of Zambia | Soil Science |
| 12 | Dr. Hendrix Chalwe | University of Zambia | Soil Science |
| 13 | Mr. Victor Njovu | University of Zambia | Bursar |
| 14 | Dr. Langa Tembo | University of Zambia | Plant Science |
| 15 | Ms. Elizabeth Kabelenga | University of Zambia | Registrar |
| 16 | Mr. Cosmas Chola | Ministry of Agriculture | |
| 17 | Mrs. Chilufya Musendeka | National Agriculture Information Services | |
| 18 | Ms. Ireen M. Maimbolwa | Zambia College of Agriculture at Monze | |
| 19 | Mr. Zebron Chirwa | Ministry of Agriculture | Headquarters |
| 20 | Mr. Lackson Munyalu | National Agriculture Information Services | |
| 21 | Ms. Miniver Maleya | Natural Resources Development College | |
| 22 | Mr. Deadricks Hadunka | Kasisi Agricultural Training Centre | |

| | | | |
|---|---|---|---|
| 23 | Mr. Nashon Ngalande | Indaba Agriculture Policy and Research Institute | |
| 24 | Dr. Mabvuso C. Sinda | University of Zambia | |
| 25 | Ms. Swivia Hamabwe | University of Zambia | Plant Science |
| 26 | Prof. Elias Kuntashula | University of Zambia | Agric. Econ & Extension |
| 27 | Mr. Samson Muweme | Steve Globes Limited (AFRISEED) | Productions/ Agronomy |
| 28 | Mr Tranos Makuvara | Indaba Agriculture Policy and Research Institute | |

## APPENDIX II: AGENDA

| Date | Activities | Time | Responsible person(s) |
|---|---|---|---|
| Wednesday Morning 30/08/2023 | Departure from UNZA | 08:30 | Mrs. J. Malama<br>Mrs. M. Chishinka<br>Mrs. M. Zulu |
| | (i) Arrival of participants Chita Lodge, Kafue | 10:00 | |
| | Lunch | 12:00-14:00 | Secretariat |
| | Opening session | 14:00-14:30 | Chairperson |
| | (i) Concepts and principles of soil health and Nutrient Management in Crop Production | 14:30-16:00 | Dr. H. Chalwe |
| | Tea/ Coffee break | | Secretariat |
| | (i)Soil: plant-water interrelations | 16:00-17:00 | Dr. E. Phiri |
| Thursday 31/08/2023 | Lessons learnt (Yesterday) | 08:00-08:30 | Dr. P. Kaluba |
| | (ii) Challenges of Climate Change to Soils and Soil Fertility Management | 08:30-10:30 | Ms. O. Lungu |
| | (i) Landscape Approaches for Achieving Sustainable Crop Production | 10:30-12:30 | Dr. L. M. Chabala |
| | LUNCH | 12:30-14:00 | Secretariat |
| | (ii) Nutrient Management for Climate Change Adaptation and Crop Production | 14:00-15:30 | Dr. P. Kaluba |
| | Tea/ Coffee break | 15:30-15:40 | Secretariat |
| | Summary for the Day | 16:00-17:00 | Dr. A. Mweetwa |
| Friday 01/09/2023 | (i) Water Management for Crop Production | 08:00-09:00 | Dr. M.C. Sinda |
| | (ii) Climate Smart Crop Production and Nutrient Management Systems | 09:00-10:30 | Dr. A. Mweetwa |
| | Field visit | 10:30-13:00 | Dr. P. Kaluba |
| | LUNCH | 13:00-14:00 | Secretariat |
| | Lessons learnt (Field visit) | 14:00-15:00 | Dr. P. Kaluba |
| | Teak Break | 15:00-15:20 | Secretariat |
| | Closing session | 15:30-16:00 | Chairperson |
| Saturday 02/09/2023 | | 10:00 | Departure |

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