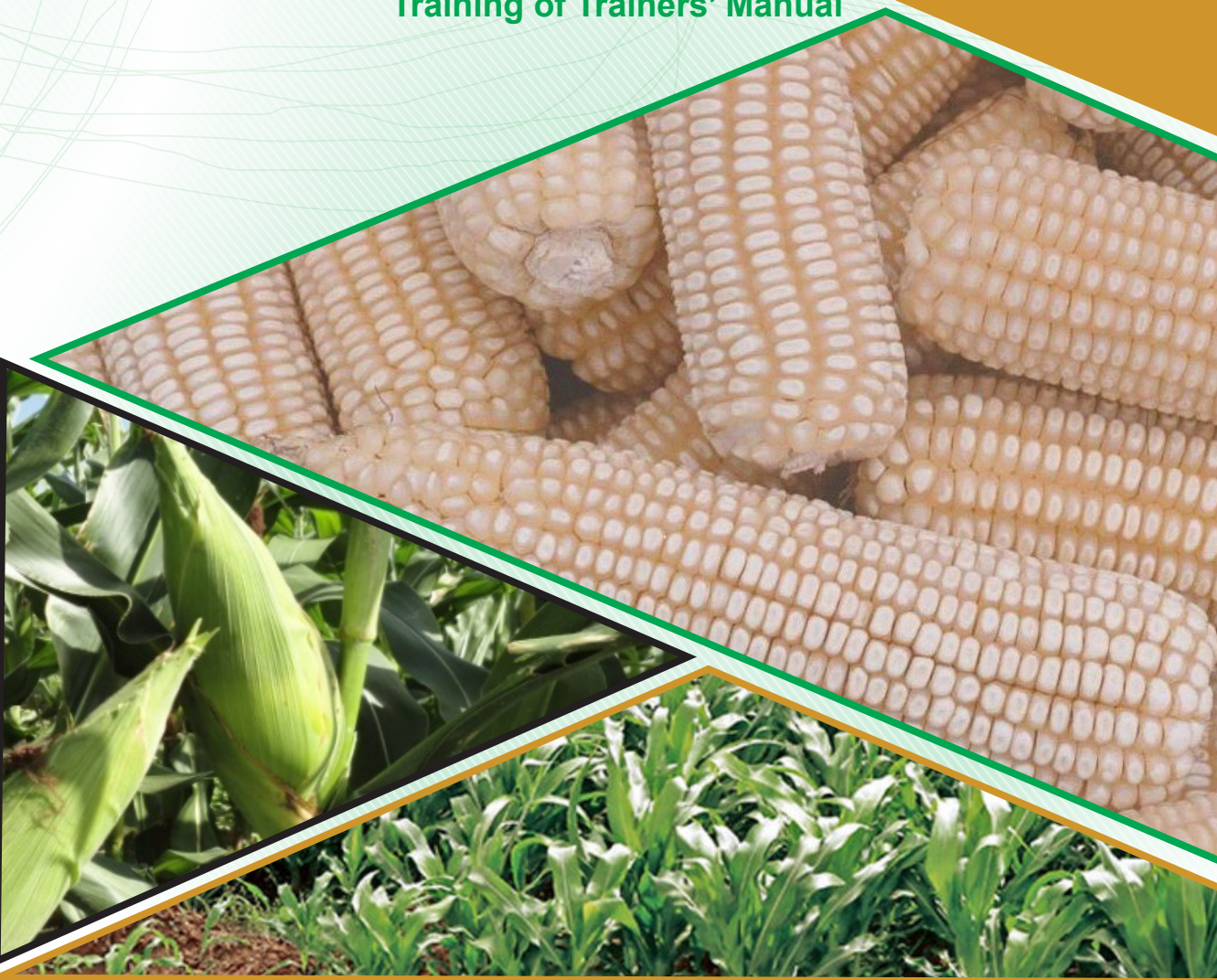




Kenya Climate Smart
Agriculture Project

CLIMATE SMART AGRICULTURE TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES FOR MAIZE VALUE CHAIN

Training of Trainers' Manual



Musila R.N., Ligeyo D., Bett C., Nekesa C., Esilaba A. O., Muli B., Murenga M., Wayua F., Otipa M., Nasirembe W., Odhiambo H.O, Otieno M., Wambua J., Ndubi J., Ndambuki J., Mwangi H.W., Kamau G.M., Momanyi V., Ndungu J., Nyaga A., Kirigua V. O. and Wasilwa L. A.

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Published by

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Editing and Publication coordination: Kirigua V.O. and Lung'aho C.

Design and layout: Nyaola E. and Mnene N.

Typesetting: Kibwage P.N.

ISBN

FOREWORD

Kenya Climate-Smart Agriculture Project (KCSAP) tasked the Kenya Agricultural and Livestock Research Organization (KALRO) with the implementation of the project's Component 2, which is 'Strengthening Climate-Smart Agricultural Research and Seed Systems'. The component activities are geared towards the development, validation, adoption and delivery of context specific climate smart agriculture (CSA) technologies, innovation and management practices (TIMPs). It is also responsible for development of sustainable seed production and distribution systems of priority agricultural value chains to enhance availability and access to improved seeds, animal breeds and fingerlings by target beneficiaries. Against this background, KALRO and her National Agricultural Research System (NARS) partners have developed, validated and availed CSA TIMPs for dissemination and adoption. This Training of trainers' (ToT) Manual is instructional guides to be used for teaching and learning step-by-step procedures of implementing CSA innovations for the Maize value chain. The training content is drawn from the inventory of TIMPs that has been documented.

The contents of training is arranged in progressive modules supported by extensive information from research and background data drawn from the TIMPs. Their relevance is based on the needs teased out of the value chain and the project objectives. The training design takes into consideration the delivery system, the partners and their roles, the duration of training and logical flow of the sessions. Similar content requiring similar delivery systems are grouped together while the roles of the partners are tapped in the training and planning of the training sessions. The Manual is divided into modules, which have a uniform outline that ensures every aspect of the TIMPs are fully covered in way that the trainees can absorb and relate to. Various delivery methods are deployed and where possible demonstrations and practical work are incorporated to enable the trainees learn by participating in the actual field activities. Furthermore, to ensure that the training across various groups is standardized, trainers' guidelines, program, training methods and training evaluation have been provided in the manual. Adhering to these lines, therefore, enables replicating the training in several locations without loss of details regardless of whether conducted by different trainers.

It is highly advised that the ToT Manuals should be used in conjunction with the respective value chain' TIMPs inventory document and facts sheets in order to provide valuable resource for both public and private extension service providers. The use of this Manual is therefore expected to enable achievement of the envisaged 'Triple Wins' of increased productivity, enhanced resilience and reduction of greenhouse gases emissions.

I am greatly indebted to the value chain leaders and all those who participated in the preparation of the Manual, which is expected to herald a new way of delivering training content in a changing agricultural environment.

Eliud K Kireger, PhD, OGW
Director General, KALRO



PREFACE

The Kenya Climate-Smart Agriculture Project (KCSAP) is a Government of Kenya project with support from both the World Bank and the government. The project runs for five years and implemented in 24 counties, mainly in the arid and semi-arid lands (ASALs), at an approximate cost of KES 25 billion. The project development objectives is “to increase agricultural productivity and build resilience to climate change risks in the targeted smallholder farming and pastoral communities, and in the event of an Eligible Crisis or Emergency, to provide immediate and effective response.” This objective is to be achieved through the implementation of five key components, which are 1) Upscaling Climate-Smart Agricultural Practices, 2) Strengthening Climate-Smart Agricultural Research and Seed Systems, 3) Supporting Agro-weather, Market, Climate, and Advisory Services, 4) Project Coordination and Management and 5) Contingency Emergency Response.

Component 1 involves facilitating the empowering of farmers and communities to adopt technologies, innovations and management practices (TIMPs) to achieve the Climate Smart Agriculture (CSA) triple-wins of; increased productivity, enhanced resilience (adaptation), and reduced Greenhouse gas (GHG) emissions (mitigation). Component 2 is tasked with the responsibility of providing the TIMPs. Therefore, it supports the development, validation, and adoption of context specific CSA TIMPS to target beneficiaries under Components 1 and 3.

To catalyze uptake of TIMPs, Kenya Agricultural & Livestock Research Organization (KALRO) in conjunction with partners in the National Agricultural Research Systems (NARS) and Consultative Group for International Agricultural Research (CGIAR) compiled inventories of TIMPs for the prioritized value chains. The crop-based value chains are 19 and include roots and tubers (cassava, potato), pulses (dry beans, green gram and pigeon peas), vegetables (tomato, onion, indigenous vegetables, kale and cabbage), cereals (sorghum, millet, teff and maize) nuts (cashew nut), fruits (banana, mango and watermelon) and fibre (cotton). Those that are animal production based are five (5) and include apiculture, indigenous chicken (meat and eggs), dairy (cattle and camel), red meat (cattle, sheep and goats) and aquaculture. Also, there are three (3) cross cutting themes on pastures and fodder, natural resource management, and animal health. The TIMPs were categorized into those ready for up scaling and those requiring validation. Furthermore, gaps that required further research and development of TIMPS were identified. Training of Trainers’ (ToT) manuals focusing on TIMPs that are ready for up scaling for each of the value chains were subsequently developed to form the basis of training county extension staff, service providers and lead farmers. Those trained are in turn expected to cascade the training to beneficiaries in the targeted smallholder farming, agro-pastoral and pastoral communities in the 24 project counties of Marsabit, Isiolo, Tana River, Garissa, Wajir, Mandera, West Pokot, Baringo, Laikipia, Machakos, Nyeri, Tharaka Nithi, Lamu, Taita Taveta, Kajiado, Busia, Siaya, Nyandarua, Bomet, Kericho, Kakamega, Uasin Gishu, Elgeyo Marakwet and Kisumu.

KALRO having the mandate of implementing the activities under Component 2 has been instrumental in using its information resources and those of partners and collaborators to come up with

the inventories of TIMPs and corresponding ToT Manuals. The use of these information resources coupled with the accompanying training and the contribution of the other project components, will go a long way in enabling the KCSAP to meet its development objective.

The National Project Coordination Unit is grateful to all who participated in the development and production of this Climate Smart Training of Trainers Manual for Maize value chain. It is my hope that Counties and other users will put this resource to good use as they transform and reorient their agricultural systems to make them more productive and resilient while minimizing GHG emissions under the new realities of a changing climate.

Francis Muthami

National Project Coordinator

Kenya Climate-Smart Agriculture Project



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LIST OF ABBREVIATIONS AND ACRONYMS

AEZs	Agro-ecological zones
AIP	Agricultural Innovation Platform
APVC	Agriculture Product Value Chain
ASALs	Arid and Semi-Arid Lands
B	Boron
CA	Conservation Agriculture
CCP	Critical control points
CIG	Common Interest Group
CL	Critical limits
CTT	Core Team of Trainers
ESMF	Environmental and Social Management Framework
ESMF	Knowledge on environmental and social management framework
FFBS	Farmer Field Business School
FSMS	Food Safety Management System
GAPs	Good Agricultural Practices
Ha	Hectare
HACCP	Hazard Analysis Critical Control Points
IDM	Integrated Disease Management
INRM	Integrated Natural Resource Management
IPM	Integrated Pest Management
ISFM	Integrated Soil Fertility management
IWM	Integrated Weed Management
K	Potassium
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	Kenya Climate Smart Agriculture Project
kg	Kilogram
LF	Lead Farmer
Mo	Molybdenum
N	Nitrogen
P	Phosphorus
S	Sulphur
TIMPs	Technologies, Innovations and Management Practices
ToT	Training of Trainers
VMG	Vulnerable and Marginalized Group
Zn	Zinc





ABOUT THIS MANUAL

This training of trainers' manual consist of two parts; namely part 1 and part II. Part I comprises notes for the facilitators while part II is made up of training module in the value chain.

PART I

This part consists of four sections including the Background of the Maize value chain, Content of the Training, Training Design and Facilitator's Guidelines.

SECTION 1: BACKGROUND

1.1 The Role of Maize in the Kenyan Economy

Maize (*Zea mays* L.) is a major staple food in Kenya, with high per capita consumption (103 kg/year). It was introduced in Kenya in the 16th century from Mexico. Due to its wide adaptation in diverse environments, low rate of damage by birds unlike sorghum and millets, and its relative ease of growing, storing and processing, white kernel maize rapidly replaced African cereals in the fields and in diets.

Maize can be used as food, feed for animals and as a source of industrial raw material. It contributes to about 65% of daily per capita cereal consumption and maize accounts for over 20% of the total agricultural production and 25% of agricultural employment in the country (Government of Kenya, 2020; FAOSTAT, 2020). It comprises about 3% of Kenya's gross domestic product (GDP), 12% of the agricultural GDP and 21% of the total value of primary agricultural commodities. It is grown both for subsistence and as a commercial crop by large-scale farmers (25%) and smallholders (75%) and total annual production estimated at about 4.0 metric tons against a consumption of about 4.5 million metric tons. It is grown in almost all agro-ecological zones Kenya that include the coastal lowlands (CL), Mid medium altitude (MM), moist transitional (MT) Central and parts of Eastern, MT Western Kenya and the highlands, ranging from an altitude of zero metres above sea level (Masl) at coast to more than 2000 Masl at the highlands.

Despite the importance of maize in Kenya, it still bedeviled by several biotic, abiotic and socio-economic constraints. Specifically the constraints include, low use of improved varieties, use of inappropriate varieties, pests and diseases, drought, use of poor agronomic practices, low soil fertility, low prices, unstructured markets and low diversification.

1.2 Role of Maize in Food and Nutrition Security

Maize is an important food and nutrition crop contributing to 31% of calories and 28% of protein of the dietary requirements. It is an important source of carbohydrate, protein, iron and vitamin B. Its products include baked, roasted and boiled fresh maize on the cob, porridge, pastes, beer, starch, oil and livestock feed from by-products of fresh and dry maize grain.

1.3 Maize value chain as climate innovation

Maize does well various environments in Kenya ranging from the lowlands to the highlands and there exist specific varieties for all these zones. There are drought tolerant and early maturing varieties suited for the coastal lowlands, medium altitude and dry transitional while late maturing varieties are suited for the highlands.

Maize does well under various climate smart soil and water management technologies such as conservation agriculture (mulching, minimum tillage, zero tillage, intercropping) and integrated soil fertility management (ISFM).

1.4 Objectives of the Training

This training aims at providing farmer trainers with knowledge and skills on facilitating and supporting farmers, for increased productivity through adoption of GAPs. Specifically, the objectives of this training are to provide farmer trainers with:

- a) Relevant attitude, knowledge and skill in farming as a business and market assessment techniques for market-led production including establishment and management of maize fields.
- b) Providing new information to farmers on maize post-harvest management and value addition.
- c) Knowledge and skills in participatory techniques for effective facilitation of adult learning processes through FFBS and developing inclusive stakeholder partnership development for sustainable up scaling of maize.
- d) Knowledge on improved maize varieties and GAP.

After the training, the Trainer of Trainers as facilitators will train lead farmers (LF) in various aspects of Maize value chain. The training will involve providing the LF with techniques in participatory preparation, mobilization, planning, implementation, monitoring and evaluation of training sessions. The lead farmers and county extension personnel will thereafter upscale the adoption of GAPs through farmer groups in their villages and those in the neighborhoods.

SECTION 2: TRAINING CONTENT

2.1 Orientation of the Module

This section of the training manual deals with the training content. It outlines the orientation and outline of the 14 modules, which are orientated to ensure adoption and up scaling of Maize TIMPs, to improve productivity, resilience and mitigation of harmful greenhouse gases. The purpose of these modules is to enhance the knowledge and capacities of trainers in understanding and disseminating the climate-smart Maize practices to the intended beneficiaries, who are primarily farmers.

2.2 Module Outline

Each of the 14 modules consisting of 8 parts. These parts are:

- a) **Introduction** – context and background to training needs, knowledge and skills gaps being addressed
- b) **Module learning outcomes** – what trainees are expected to learn
- c) **Module target group**-trainee categories
- d) **Module users** –facilitators

- e) **Module duration** –number of hours of exposure to materials
- f) **Module summary** –sequence of sessions, training methods, materials and duration
- g) **Facilitators guideline** –detailed sessions, training methods, materials and session guides
- h) **Participant’s handouts** – detailed notes and reference materials for trainees

The outline of the 14 modules is presented in **Table 1**.

Table 1: Summary of 14 module outlines for the Maize value chain

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
1	Climate change and climate smart agriculture	<ul style="list-style-type: none"> • The impact of climate crisis to Maize production • The climate smart technologies for Maize value chain 	<ul style="list-style-type: none"> • Master trainers made aware of the potential impact of climate change on Maize production • Master trainers updated on climate smart techniques for Maize 	3 hours
2	Farmer Field Business School (FFBS) approach	<ul style="list-style-type: none"> • Skills/technologies for production, processing and marketing 	<ul style="list-style-type: none"> • Improved technologies/ innovations and agronomic practices for Maize availed 	6 hours
3	Good Agricultural Practices (GAP) and Food Safety Management System (FSMS)	<ul style="list-style-type: none"> • Enhance food safety through lowering presence of hazardous solids/ organisms/ and pollutants pathogens 	<ul style="list-style-type: none"> • Techniques for determining pollutants in food material explored for adoption in Maize value chain 	6 hours 30 minutes
4	Maize production niche and climate requirements	<ul style="list-style-type: none"> • Identify areas suitable for Maize production 	<ul style="list-style-type: none"> • Master trainers learn of Maize niche in the respective counties 	4 hours
5	Maize variety selection	<ul style="list-style-type: none"> • Awareness on improved Maize varieties 	<ul style="list-style-type: none"> • Master trainers made aware of the new improved varieties 	3 hours 30 minutes

6	Maize seed systems	<ul style="list-style-type: none"> • Both formal and informal seed systems operations. 	<ul style="list-style-type: none"> • The formal and informal seed supply systems analyzed. 	4 hours
7	Maize climate smart agronomics practices	<ul style="list-style-type: none"> • Agronomic options for increased Maize production 	<ul style="list-style-type: none"> • Agronomic practices for maize production validated and upscaled 	3 hours 30 minutes
8	Integrated soil and water management practices for Maize production	<ul style="list-style-type: none"> • Soil water and fertility enhancing techniques availed. 	<ul style="list-style-type: none"> • All techniques validated and upscaled for increased production 	5 hours
9	Maize Crop Health	<ul style="list-style-type: none"> • All major pests (invertebrate and vertebrate) and diseases organisms control mechanisms availed to the master trainers. 	<ul style="list-style-type: none"> • Reduction of yield loss of Maize by the major pests and diseases 	6 hours
10	Maize harvesting and Post- harvest management	<ul style="list-style-type: none"> • Storage technologies to reduce losses in quantity and quality 	<ul style="list-style-type: none"> • Trainees sensitized on proper harvesting techniques and storage facilities, hygiene and monitoring 	4 hours
11	Maize value addition	<ul style="list-style-type: none"> • Various maize products, for human and animal feeds 	<ul style="list-style-type: none"> • Maize products identified and prioritized for the farming communities and business entities 	4 hours 30 minutes
12	Mechanization of maize production activities	<ul style="list-style-type: none"> • Adaptation of mechanized operations of maize from crop establishment, crop management to post-harvest 	<ul style="list-style-type: none"> • Options of mechanization for increased yield availed to farmers. 	3 hours 30 minutes

13	Maize Business and Marketing	<ul style="list-style-type: none"> Review what business and marketing options are available in Maize 	<ul style="list-style-type: none"> Different business and marketing options analyzed and proposed for use by farmers e.g. Contract farming 	4 hours
14	Maize Cross cutting issues (i) Innovation Platforms (ii) Gender mainstreaming and social inclusion (iii) Policy	<ul style="list-style-type: none"> Articulate how Voluntary Marketing Groups can draw benefits from Maize value chain Options of employment opportunities in Maize production Sites for information profiled at the county levels 	<ul style="list-style-type: none"> Opportunities for marginalized groups identified and gains made Farmers get access to more information on Maize production 	8 hours 30 minutes
Total Duration				66 hours

SECTION 3: TRAINING DESIGN

3.1 Delivery System

The delivery system designed for this training consists of two stages:

a) Establishment of a team of facilitators

- A Core Team of Trainers (CTT) to train farmer trainers (service providers) as facilitators of a ToT course will be established. This is done using this manual and modules contained therein.
- Each of the Master trainers will facilitate trainers of farmers and other stakeholders to acquire knowledge and skills for facilitating Farmer-led Field and Business Schools through practical demonstrations.

b) Upscaling –This will be done by selecting lead farmers (LF) to be trained in facilitation skills.

3.2 Partners and their Roles

The partners envisioned in this training plan are:

- a) **Core Team of Trainers** – Master trainers drawn from KALRO, Universities, and Tertiary Institutions offering crop sciences and State Department of Agriculture, MoALF&C will facilitate initial training of trainers of farmers and other stakeholders. They will also provide mentorship to farmers’ trainers during the first year of LF trainings. They should also be available in the evaluation of the first round of LF trainings.
- b) **County Government Department for Crops and Livestock**
County Coordination Teams (CCT) including technical departments and service providers will play specific roles of LF trainers, mentors and coordinators at sub-county level. They will assist FFBS to form partnership with stakeholders for sustainability. They will also support LF to establish their upscaling networks.
- c) **Lead Farmer Networks**-association of LFs in the counties to take up farmer trainings and upscaling in the future. Lead farmer networks and groups will conduct exchange visits to learn best practices in other project implementing counties.
- d) **Private Sector Service Providers** – Inputs suppliers, financial and business development service providers, market players and processors will partner and support growth of individual or mMaize farmer groups.

3.3 Training Duration

The proposed ToT course for Master trainers for 14 modules in the Maize value chain shall take a total of 66 hours of training period. This does not include break hours of mid-morning, afternoon and lunch breaks

3.4 Logic of Design and Flow of Session

The logic of design and flow of each module is that the facilitator, paying attention to the proposed methods and sessions guidelines shall: (i) Introduce the module; (ii) Draw out the participant’s expectations; (iii) Relate participants’ expectations with module objectives or learning outcomes; (iv) Explore the concept and content, switching to different methods of delivery of the content (group exercise, brainstorming, excursions, plenary discussions, role plays) as the session progresses; (v) Review the module at the end using participatory approaches like one participant reads one summary message and its application; and, (vi) Distribute the participants’ handouts.

SECTION 4: FACILITATOR'S GUIDELINES

4.1 Preparation of Training Materials

The training materials suggested require adequate preparations and should be available before the actual training dates. Further:

1. The facilitators should familiarize themselves and internalize the guidelines provided by this manual prior to the training.
2. The stationery required should be available within the training institution 3 days before the training. These include name tags, writing materials, paper punch and medium size box files for participants' handouts filing.
3. Flip charts and good quality felt pens could be used interchangeably with projections. Each participant will require one felt pen while the trainers will require two sets of felt pens.
4. Visual aids such as field equipment and tools should also be arranged in time before the sessions start.
5. There should be adequate copies of participants' handouts (one per participant) to be distributed at the end of each session or as may be suitable.
6. Copies of the modules are distributed at the end of each module.

4.2 Preparation of Training Venue and Sites

The training venue will include the training room, field demonstration and market sites.

- a) Training Room** – Should have adequate space for 25 participants seated in a semi-circle or U shape arrangement ensuring access and unobstructed view of the front. There should be adequate space for a desk and seats for 3 trainers preferably at the sides or at the back of the training room. There should also be a desk for the trainer, their training materials and projector, a flip charts holder and white wall to act as a projector screen.
- b) Demonstration Site** – Should be within a walking distance with at least five distinct plots for demonstrations.
- c) Market Sites** – these include cereal retail outlets (kiosks, stalls, shops and supermarkets), whole sale and aggregation points and processing sites if any. The operators should be informed in advance about the visits. These should not be very far away preferably less than 10 minutes' drive distance.

4.3 The Trainees

The trainees who will participate are extension officers, lead farmers, educators, service providers and researchers with elaborate training back ground in extension and advisory services. They will be drawn from public and private sector based on considerable experience in training farmers

but with minimal facilitative advisory or technology transfer approaches. The facilitator should therefore act more of a facilitator than a lecturer and draw out and build on their knowledge, skills and experience that they shall bring. As a golden rule, do not lecture trainees but facilitate, listen and let them feel like equals to each other and the CTT team members.

4.4 Training Program

The training program proposed consists of the actual training modules and the corresponding days and time allocation (**Annex 1**).

4.5 Training Methods

The training methods proposed for each session are suitable for adult learners and appropriate for addressing knowledge, skills and attitudes of the participants. The choice of the methods has been informed by the competency issues being addressed, time available and experiences of the author of this manual. Depending on time available, the facilitator may modify these training methods but as a golden rule no presentation by the facilitator should take more than 30 minutes continuously; but should be separated by the other participatory training methods. Table 2 presents a list of available training methods.

Table 2: Description of Training methods

Training Method	Description of Method
Plenary presentations	Use of PowerPoint or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Group exercises, visits and brainstorming sessions	To be considered where skills are an issue requiring sharing and trying
Role plays and problem-solving exercises	Plenary discussions have been considered as training methods where attitude is an issue
On-farm practical demonstration and exchange visits	To be considered where hands-on practical skills are acquired through sharing and demonstration

4.6 Planning Schedule and Guideline for ToT Preparation

While planning for this training, the CTT leader should ensure the following before the training:

- 1. Six weeks** – recruit master trainers, compose CTT, have at least 5 Maize demonstration plots near training venue where possible
- 2. Four weeks** – send out invitation letters to participants and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members
- 3. Two weeks** – confirm names of participants; reproduce training materials for facilitators and package, confirm preparedness of the field sites to be visited. Hold

briefing of CTT members to finalize training plan. Confirm special guests if any

4. **Four days** –Confirm training sites preparedness, prepare sitting arrangements, and brief assistants
5. **One day** - arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at residence proposed
6. **On first day** – arrange for reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes:
 - Registration
 - Welcoming to venue by host
 - Elaborate introduction of CTT and participants
 - Introduction to the project and training course
 - Ground rules
 - Groups formation

4.7 Evaluation of the Training

Half day has been allocated for planning for way forward and evaluation of the TOT on the last day of the training. This is as presented in the program in section 4.4. The evaluation strategy should take two directions the first being the individual trainees evaluate through evaluation forms without conferring or refereeing to each other. The evaluation forms are then collected and analyzed by the CTT members.

The second evaluation approach is trainees’ group evaluation. They retreat to one room and elect a chair and a secretary. Ask them to objectively and constructively evaluate the training in about 45 minutes in the absence of the CTT members. They then present their evaluation to the CTT members and as they do so, the CTT members should only give points of clarifications if any misunderstanding occurred but should not try to be defensive. The CTT members then use the two evaluation results to write a report highlighting aspects that went on well and can be replicated, challenges that were encountered, and opportunities for future ToT’s improvement.

Table 3: Sample Evaluation Form

Aspect / Module	Rating		
	Very Useful (3 marks)	Useful (2 marks)	Of Limited Use (1 marks)
1. Climate change and Climate smart Agriculture			
2. Farmer Field and Business School Approach in Maize Production			

3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			
4. Maize production Niches and Climatic Requirements			
5. Maize variety selection and access to quality seeds.			
6. Maize Seed Systems			
7. Climate Smart Agronomic Practices			
8. Integrated Soil and Water Management Practices for Maize			
9. Maize Crop Health			
10. Maize Harvesting and Post-harvest Management			
11. Maize Value Addition			
12. Mechanization of Maize production Activities			
13. Maize Business and Marketing			
14. Cross-Cutting Issues (Agricultural Innovation Platforms, Policy, Gender Mainstreaming and Social Inclusion)			

4.8 Facilitator’s Training Notes and Reference Materials

4.8.1 Key references

Two key references should be provided for each module plus a list of other relevant publications for reference.

4.8.2 Guide on the use of the information

The trainers will be advised to issue farmers with utmost two publications for each of the training sessions. This is because if they go away with 10 publications in one visit, they may be overwhelmed with the material load and thus limit knowledge uptake. Also, some will just take away

as many as they can if allowed.

The list of all individual publications will be stored and available as electronic copies – mainly PDFs. The service providers are strongly advised to keep these electronic copies on a memory stick, CD or portable hard drive to enable farmers easily access and if necessary, print any of them out at a local internet café.

Trainers will be advised to issue one General Maize farming manual to be accompanied by two other publications e.g. information sheets, brochures, factsheets and poster. With subsequent training modules, they can develop their collection of publications.



PART II: TRAINING MODULES

This part presents the content of 14 modules for training namely: Climate change and climate smart agriculture, Farmer Field Business school (FFBS) approach, Maize production niche and climate requirements, Good Agricultural Practices (GAP) and Food Safety Management System (FSMS), Maize variety selection, Maize seed systems, Maize climate smart agronomics practices, Integrated soil and water management practices for Maize, maize Crop Health, Maize harvesting and Post-harvest management, maize value addition, Mechanization of Maize production activities, Maize business and Marketing, and Maize Cross cutting issues (Innovation Platforms, Policy, gender mainstreaming and social inclusion).

All the modules will be divided into the following:

1. Introduction
2. Module learning outcomes
3. Module target group
4. Module users
5. Module duration
6. Module summary
7. Facilitator's guidelines
8. Reference Materials

MODULE 1

CLIMATE CHANGE AND CLIMATE SMART AGRICULTURE

1.1 Introduction

The impacts of climate change (CC) and variability in agriculture, food systems and food security is a serious concern. Kenya's agricultural production systems is highly impacted upon, due to the low adaptive capacity and the high exposure to climate related risks. The major agricultural activities are prone to risks and uncertainties of nature, which is affected by climate change, either in intensity, scope or frequency. Climate change is expected to modify risks, vulnerabilities and the conditions that shape the resilience of agriculture systems as well as introducing new uncertainties. Adoption of climate smart agriculture (CSA) through application of tools and technologies and effective communications of weather information, reduces the negative impacts of climate change and enhances access to food security in a changing environment. Thus, there is need to mainstream suitable climate resilient technologies, innovations and management practices (TIMPs) to increase productivity, resilience to climatic shocks and mitigate the causes of climate change.

1.2. Module Learning Outcomes

By the end of the module, the following outcomes should be achieved:

1. Concept of the climatic change and availability discussed and explained.
2. Impacts of the climate change and variability on agricultural and food security shared.
3. Concept of climate smart agriculture (CSA) shared and explained.
4. Future climate scenarios and how to manage projected and appreciated.

1.3 Module Target Group

This module targets public agricultural extension agents, service providers and lead farmers based at sub-county and ward level.

1.4 Module Users

This module is intended for use by Master trainers who are members of the core team of trainers (CTT) and lead Farmers in the target counties. The trainers using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

1.5 Module Duration

The module is estimated to take **3 hours**

1.6. Module Summary

Module 1: Climate Change and Climate Smart Agriculture in Maize Value Chain			
Sessions	Training Methods	Training Materials	Duration
1.6.1 Introduction and Levelling Expectations	<ul style="list-style-type: none"> • Personal • Introduction • PowerPoint Presentation • Plenary discussion 	<ul style="list-style-type: none"> • Projector • Laptop • Flip charts 	30 minutes
1.6.2 Introduction to climate change and variability	<ul style="list-style-type: none"> • PowerPoint Presentation • Case study videos • Plenary discussion 	<ul style="list-style-type: none"> • Projector • Laptop • Videos • Flip charts • Participants' handouts 	45 minutes
1.6.3. Concept of Climate smart agriculture (CSA) in Maize	<ul style="list-style-type: none"> • PowerPoint Presentation • Plenary discussion 	<ul style="list-style-type: none"> • Projector • Laptop • Videos • Flip charts • Participants' handouts 	45 minutes
1.6.4 Projected future climate scenarios affecting Maize and how to manage	<ul style="list-style-type: none"> • PowerPoint Presentation • Case study videos • Plenary discussion 	<ul style="list-style-type: none"> • Projector • Laptop • Flip charts • Participants handouts 	40 minutes
1.6.5. Module review	<ul style="list-style-type: none"> • Participants' questions and comments • Facilitator's summary 	<ul style="list-style-type: none"> • Module review 	20 minutes
TOTAL			3 hours

1.7 Facilitator's Guidelines

1.7.1 Introduction and Levelling Expectations (30 minutes)	Session Guide
<p><i>(The facilitator introduces the trainees to this module on climate change and climate smart agriculture).</i></p> <p>Trainees' expectation (20 minutes)</p> <p><i>The facilitator organizes the trainees into groups to state and list their expectations.</i></p> <p>Module Objectives (10 minutes)</p> <p><i>(The facilitator presents module's objectives on power point).</i></p> <p>By the end of the module training, the trainee should be able to:</p> <ul style="list-style-type: none"> • Explain climate change and adaptations. • Describe Climate Smart Agriculture (CSA). • Describe and explain available climate smart crop management practices in maize production. • Explain the benefits of selected climate smart crop management practices in maize production. 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute Participants' handouts

1.7.2 Introduction to Climate Change and Climate Variability (1 hour)	Session guide
<p><i>(The facilitator introduces the module basics).</i></p> <p>Plenary presentation (40 minutes)</p> <ul style="list-style-type: none"> • Basic terminologies used in the module (weather, climate, variability, adaptation, coping). • Explain climate change and climate variability. • The causes of climate change. • Climate risks impacting agriculture. • Proposed adaptation and mitigation measures <p>Case study videos and discussion (20 minutes)</p> <ul style="list-style-type: none"> • The impact of climate change 	<ul style="list-style-type: none"> • PowerPoint presentation • Plenary Discussion • Video Presentation

1.7.3 Concept of Climate Smart Agriculture (CSA) (1 hour)	Session Guide
<p><i>(The facilitator presents to the trainees the principles underpinning CSA and the link to deliverable of project objectives).</i></p> <p>Plenary Presentation (45 minutes)</p> <ul style="list-style-type: none"> • Definition of the CSA approach and their characteristics • The three pillars of CSA (productivity, Adaptation and Mitigation) • Why CSA is needed <p>Plenary discussion (15 minutes)</p> <p>Discussions on the CSA concept</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Participants' handouts • Plenary discussion.
1.7.4 Projected Future Scenarios that will Impact Productivity (40 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in discussing future climatic projections focusing on rainfall and temperature, which directly impacts on crop yields).</i></p> <p>PowerPoint presentation (20 minutes)</p> <ul style="list-style-type: none"> • Projected impacts on food production and needed adaptation measures especially for maize. <p>Video presentation and discussion (20 minutes)</p> <ul style="list-style-type: none"> • Short Video on showing projections of rainfall and temperature. 	<ul style="list-style-type: none"> • PowerPoint presentation • Video presentation • Plenary discussion
1.7.5 Module Review (20 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in summarizing the key points discussed in the module).</i></p>	<ul style="list-style-type: none"> • Plenary discussion

1.8 Reference Materials

1.8.1 Participants hand-outs

- Climate Change and CSA Factsheets
- Climate Change and CSA Leaf-lets

Reference

1. Esilaba, A.O. *et al.* (2019). KCEP-CRAL Climate Smart Agriculture Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya

MODULE 2

FARMER FIELD AND BUSINESS SCHOOL (FFBS) APPROACH IN MAIZE PRODUCTION

2.1. Introduction to the module

This module is designed for training and exposing trainees to the Farmer Field and Business Schools (FFBS) approach and concepts. In addition, practitioners of FFBS need to have knowledge of this methodology in order to transfer various Technologies, Innovations and Management Practices (TIMPs) in the Maize value chain to farmers. The trainees will thereafter facilitate farmers in the Common Interest Groups (CIGs) to learn by doing the available Technologies, Innovations and Management Practices (TIMPs) from a common plot of FFBS and then implement what they have learnt into their individual farms in order to meet the KCSAP project objectives of sustainable increased productivity, building resilience to climate change risks and reduction of greenhouse gases. FFBS also empowers the learners with various skills in facilitation, communication and agri-business. Since the methodology is participatory, it improves the learners' observation skills and creates linkages with other value-chain players, thereby making maize production profitable and sustainable.

2.2. Module Learning Outcomes

By the end of the module the following outcomes should be achieved:

1. Concept of Farmer Field and Business School approach in Maize value chain, teaching and facilitating described and explained.
2. Be equipped with practical skills that help them feel informed and confident about their roles and ability Approaches to facilitate FFBS participatory learning process demonstrated and explained.
3. Knowledge and analytical skills to design simple experiments to test and select options identified and demonstrated.
4. Shift from the domestic focus on maize production to improving productivity to farming business proposition explained.

2.3. Module Target Group

This module targets agricultural extension service providers based at sub-county and ward level. It will also be useful for private extension service providers dealing directly with farmer groups at community level and lead farmers.

2.4. Module Users

This module is intended for use by Master Trainers who are members of the Core Team of

Trainers (CTT) and Lead Farmers in the Maize value chain target Counties. The Facilitators using this module should thoroughly familiarize themselves with the participants’ Handouts (training materials).

2.5. Module Duration

The module is estimated to take **7 hours 30 minutes**.

2.6 Module Summary

Module 2 Farmer Field and Business School Approach			
Sessions	Training Methods	Training Materials	Time
2.6.1 Introduction, Climate setting, leveling of expectations and objectives.	<ul style="list-style-type: none"> • Participatory introduction • Plenary Presentation • Host team and functions of host team • Group discussion on expectations 	<ul style="list-style-type: none"> • Laptop • Projector • Flip charts Mark pens	30 minutes
2.6.2 Overview of FFBS key activities	<ul style="list-style-type: none"> • Presentations and plenary discussions 	<ul style="list-style-type: none"> • Projector • Pictorials • Lap top 	1 hour
2.6.3 Introduction to Communication and communication skills	<ul style="list-style-type: none"> • Presentation • Group exercise 	<ul style="list-style-type: none"> • Projector • Flip charts • Felt pens • Lap top 	1 hour
2.6.4 Facilitation and leadership skills	<ul style="list-style-type: none"> • Plenary Presentation • Group discussion 	<ul style="list-style-type: none"> • Lap top • Projector. 	1 hour
2.6.5 Organization and management in FFBS	<ul style="list-style-type: none"> • Plenary Presentation • Group discussion 	<ul style="list-style-type: none"> • Lap top • Projector. 	1 hour 30 minutes
2.6.6 Developing FFBS Curriculum for the Maize value chain	<ul style="list-style-type: none"> • Group discussion • Plenary presentation 	<ul style="list-style-type: none"> • Lap top • Projector • Flip charts • Felt pens 	1 hour 30 minutes
2.6.7 SMART County action plan development of Maize value chain on the transfer of TIMPs	<ul style="list-style-type: none"> • Group discussions • Plenary presentations 	<ul style="list-style-type: none"> • Lap top • Projector • Felt pens • Flip chart Felt pens 	30 minutes
2.6.8 Module review	<ul style="list-style-type: none"> • Group Discussions • Conclusions and way forward 	<ul style="list-style-type: none"> • Lap top • Flip charts • Power point • Projectors 	30 minutes
TOTAL			7 hour 30 minutes

2.7 Facilitator’s Guidelines to FFBS establishment and operations

2.7.1 Introduction, climate setting Leveling Expectations and Objectives (1 hour)	Session Guide
<p><i>(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations).</i></p> <p>Trainee introduction and climate setting</p> <p>Introduction of participants, setting training norms, formation of FFBS sub groups (Working groups) and trainees to share their expectations</p> <p>Plenary presentation on module Objectives</p> <p>The facilitator presents modules objective in power point</p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Describe and explain the concepts, characteristics, principles and plans of Farmer Field and Business School (FFBS) as a ‘learning by doing approach as it applies in Maize • Demonstrate and explain approaches to effective facilitation and participatory learning for FFBS. • Identify and demonstrate knowledge and analytical skills to design simple experiments for testing options. • Explain and facilitate shift from the traditional focus to improving productivity to farming business proposition. 	<ul style="list-style-type: none"> • Provide checklist for introduction of trainees to help them build confidence in participation • Summarize and display trainees expectations • Assign roles to the Sub groups • Set Norms and nominate leaders • Power point presentation on the Objectives of the FFBS training module
2.7.2 Overview of FFBS key activities (1 hour)	Session guide
<p>Plenary presentation</p> <p>The facilitator takes the trainees through the main concepts and pillars of FFBS which includes:</p> <ul style="list-style-type: none"> • The definition of FFBS • Participatory technology development (PTD) for the maize value chain TIMPs • Agro ecosystems Analysis (AESAs) of the Maize value chain • Concept of what is this what is that • FFBS principle of Integrated production and pest management (IPPM) • FFBS Business concept and opportunities in the maize value chain stages. 	<ul style="list-style-type: none"> • Power point presentation on the overview of Key activities in FFBS

2.7.3 Introduction to Communication and Communication skills (1 hour)	Session guide
<p>Group exercise to gauge the understanding of trainees on:</p> <ul style="list-style-type: none"> • What communication is, • Communication channels, • Barriers to effective communication and • How to effectively communicate <p>Plenary presentation</p> <p>Communication and communication skills</p>	<p>Group exercise and presentations on flip charts and power point presentation</p> <p>Handouts</p>
2.7.4 Facilitation and leadership skills (1 hour)	Session guide
<p>Plenary presentation</p> <ul style="list-style-type: none"> • Definition of Facilitation, facilitator and effective facilitation. • Qualities of a good facilitator. • Golden rules of facilitation. • Roles and responsibilities of FFBS Facilitators. • Difference between facilitation and teaching • Definition of leadership • Elements of leadership • Types of leadership • Characteristics of a good leader 	<p>Power point presentation on Facilitation and leadership skills</p> <p>Handouts</p>
2.7.5 Organization and management in FFBS 1 hour	Session guide
<p>Plenary presentation</p> <p>Steps of FFBS implementation framework</p> <ul style="list-style-type: none"> • Ground working. • Training of Facilitators. • Establishing PTDs at the FFBS. • Season long FFBS sessions. • Evaluation of PTDs. • Field days. • Graduation. • Establishment of Lead FFBS. • Follow up. 	<p>Power point presentation</p> <p>Handouts</p>
2.7.6 Developing FFBS Curriculum for the Maize value chain (1 hour 30minutes)	Session guide

<p>Plenary presentation</p> <p>Steps of Participatory technology development on the Maize value chain production</p> <ul style="list-style-type: none"> • Identify the major constraints to increased yields of Maize value chain production • Ranking of constraints in order from highest. • Identify list of TIMPs to address the constraints • Rank the TIMPs in order from the most preferred • Develop PTD on the most preferred TIMP objective • Decide on the parameters for AESA • Develop FFBS curriculum using crop growth stage calendar for the maize value chain <p>Group exercises</p> <ul style="list-style-type: none"> • Constraint identification and ranking • TIMPs options identification and ranking • Identification of the growth stages of the value chain crop and development of FFBS training curriculum 	<p>Group exercises on</p> <ul style="list-style-type: none"> • pair wise matrix ranking of constraints and TIMPs in Maize value chain • curriculum development based on the value chain growth stages • Presentations of the group exercises on flip charts • power point presentations on PTD and curriculum development
2.7.7 SMART County action plan development on Maize value chain of transfer of TIMPs (30 Minutes)	
<p>Plenary presentation</p> <p>Action plan of maize county value chain that has:</p> <ul style="list-style-type: none"> • Activities to be undertaken in the regular FFBS meetings • Time frame of the activities • Who is responsible for each of the activities • Required resources for the specific activity • Means of verification for the activity. • Group exercise • The trainees conduct a group exercise of the action plan based on sub counties and wards represented 	<p>Power point presentation on the template of County Maize value chain TIMPs transfer action plan</p> <p>Group exercise on development of County Maize action plan for the respective wards and sub Counties represented in the training</p>
2.7.8 Module review (30 minutes)	
<ul style="list-style-type: none"> • Participants Questions and answers • Facilitator’s Summary 	<p>Power point presentation, projector, flip charts, felt pens</p>

2.8 Participants’ Handouts

References

1. FAO (2006) Farmer Field School FFS Manual
2. Khisa Godrick:(2004) Farmer Field School Methodology: Training of Trainers Manual.
3. Sustainet East Africa; (2010) Farmer Field School: A Technical Manual
4. FAO (2010) Food safety manual for Farmer field Schools: A training reference guide for food safety in global FFS programs.

MODULE 3

GOOD AGRICULTURAL PRACTICES (GAPs) AND FOOD SAFETY MANAGEMENT SYSTEMS (FSMS)

3.1 Introduction

This module is designed for training and exposing trainees to good agricultural practices and food safety management system along the Maize value chain.

Good Agricultural Practices (GAPs) manage risks through risk prevention, risk analysis and sustainable agriculture by means of Integrated Pest and Disease Management (IPDM) and Integrated Crop Management (ICM). Declining food safety, reduced food quality, unsustainable farming practices and negative environmental impact from agricultural activities plague the food sector. Worker safety and health along with traceability requirements are major concerns to modern consumers. Good Agricultural Practices protect consumer health by ensuring safety within the food chain. It is imperative to operate from the table upstream to include suppliers of agricultural inputs, providers of logistics and farm equipment. Good Agricultural Practices therefore constitute a certification system for agriculture, specifying procedures that must be implemented to produce and supply food that is safe for consumers and wholesome, using sustainable methods.

Food safety assures food quality with respect to the absence or occurrence of hazards that are risky to human and animal health, within acceptable limits. Hazards are common along food value chains that lack effective control measures and may be due to 'bad' agronomic practices or are introduced along the supply chain. Currently, there is increased public concern on the negative environmental and health impacts of agro-chemicals, microbial pathogens and their toxins. Control of these hazards occurrence is done through the implementation of an effective Food Safety Management Systems (FSMS) through Hazard Analysis Critical Control Points (HACCP) management system. It involves a seven-step management system that provides the framework for monitoring the entire food chain making it more preventive, rather than reactive and control potential problems before they occur. Aflasafe KE01 is a pre-harvest biocontrol agent which reduces aflatoxin contamination in maize by 80-99% at harvest and post-harvest.

3.2 Module Learning Outcomes

By the end of the module, the following outcomes will be achieved:

1. Good Agricultural Practices on food safety and enhanced quality along the Maize value chains discussed and appreciated.
2. Knowledge on optimization and utilization of resources (water, soil, manure, fertilizers and other inputs), environmental protection and conservation acquired and described.
3. Use of aflasafe as pre-harvest bio- control agent to control aflatoxin in maize at harvest explained and demonstrated.
4. Worker safety and health within the maize production system explained.
5. Traceability in food safety and quality along the Maize value chain mapped and

implemented.

3.3. Module Target Group

This module targets public and public agricultural extension agents, service providers and lead farmers based at sub-county and ward level.

3.4. Module Users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT) and Lead Farmers in the maize value chain target counties. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

3.5. Module Duration

The module is estimated to take **6 hours 30 minutes**.

3.6 Module Summary

Module 3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			
Sessions	Training Methods	Training Materials	Time
3.6.1 Introduction, objectives and levelling of expectations	<ul style="list-style-type: none"> • Groups to bring out expectations • Plenary presentation 	<ul style="list-style-type: none"> • Module objectives • Marker pens • Flip charts • Projector • Laptop 	30 minutes
3.6.2 Understanding what is GAP and its application in the Maize value chain	<ul style="list-style-type: none"> • Plenary presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Marker pens • Projector • Laptop • Pictorials/video clips 	30 minutes
3.6.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk Assessment	<ul style="list-style-type: none"> • Plenary presentation • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Marker pens • Projector • Laptop • Pictorials/video clips • Data sheets 	30 minutes
3.6.4 Review of GAP requirements for audit and types of protocols possible	<ul style="list-style-type: none"> • Plenary presentations • Plenary discussion 	<ul style="list-style-type: none"> • Data forms • Flip charts • Marker pens • Projector • Laptop • Pictorials/video clips • Data sheets 	30 minutes

3.6.5 Introduction to Site Selection	<ul style="list-style-type: none"> • Plenary Presentation • Plenary discussion 	<ul style="list-style-type: none"> • Projector • Laptop 	30 minutes
3.6.6 GAP checklists and Audit	<ul style="list-style-type: none"> • Plenary Presentation • Group exercise 	<ul style="list-style-type: none"> • Flip charts • Marker pens • Projector • Laptop 	30 minutes
3.6.7 Safe use of Pesticides and calibration of sprayers and nozzles	<ul style="list-style-type: none"> • Group work on nozzles • Rate of discharge • Safety guidelines 	<ul style="list-style-type: none"> • Pictorials/video clips • Knapsacks • Measuring cylinders • Tape measure • Nozzles • Empty clean pesticide containers 	1 hour
3.6.8 Understanding of food safety management system in Maize value chains	<ul style="list-style-type: none"> • Plenary presentation • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Marker pens • Projector • Laptop • Pictorials/video clips 	30 minutes
3.6.9 Determination of food safety risk/ hazards in Maize value chains (hazard analysis)	<ul style="list-style-type: none"> • Plenary presentation • Group exercise 	<ul style="list-style-type: none"> • Projector • Laptop • Flip charts • Marker pens • Participants' hand outs 	30 minutes
3.6.10 Determination of critical control points (CCPs) and Critical limits (CLs) in Maize value chain	<ul style="list-style-type: none"> • Plenary Presentation • Group Exercise 	<ul style="list-style-type: none"> • Projector • Laptop • Flip charts • Marker pens 	30 minutes
3.6.11 Prevention and corrective measures for CCPs in Maize value chain	<ul style="list-style-type: none"> • Plenary Presentation • Group exercise 	<ul style="list-style-type: none"> • Flip charts • Marker pens • Power point projector • Laptop • Pictorials/video clips 	30 minutes
3.6.12 Module review	<ul style="list-style-type: none"> • Participants' questions and comments • Facilitator's summary 	<ul style="list-style-type: none"> • Participants' hand outs • Module review 	30 minutes
TOTAL			6 hours 30 minutes

3.7 Facilitator's Guidelines

3.7.1 Introduction and Levelling Expectations (30 Minutes)	Session Guide
<p><i>(The facilitator welcomes trainees to the module and invites them to introduce themselves).</i></p> <p>Trainees' introductions and expectations (20 minutes)</p> <p>The facilitator invites the trainees to state their expectations after brain storming in their respective county groups</p> <p>Module Objectives (10 minutes)</p> <p><i>(The facilitator presents module's objectives in power point).</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate GAP's on matters of food safety and quality along the Maize value chain. • Describe optimization and utilization of resources (water, soil, manure, fertilizers, and other inputs), environmental protection and conservation. • Explain worker safety and health within the Maize production system. • Explain and demonstrate use of aflasafe as pre-harvest bio control agent to control aflatoxin in maize at harvest. • Map and implement traceability in food safety and quality along the Maize value chain. 	<ul style="list-style-type: none"> • Summarize trainees' Expectations on a flipchart • PowerPoint presentation
3.7.2 Understanding what GAP is and its application in the Maize value chain (30 minutes)	Session Guide
<p><i>(Facilitator leads discussions on understanding of GAPs and its relevance to actors in the Maize value chain).</i></p> <p>Plenary Presentation (10 minutes)</p> <ul style="list-style-type: none"> • Understanding GAP in the context of Maize production • Explain the role of GAPs in safe and sustainable food production system for growers and consumers. • Understanding aflasafe pre-harvest bio control to control aflatoxin in maize. • Understanding GAPs as the key to high commodity market destinations <p>Plenary discussion</p> <p>Application of GAP in the maize value chain</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Participants handouts • Plenary discussion

3.7.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk Assessment (30 minutes)

Session Guide

(Facilitator guides discussions on the key determinants of site suitability for agricultural activities).

Plenary presentation and discussion (30 minutes)

- Factors to be considered in an agricultural site selection
- (Site history, slope of land, type of soil versus maize, water sources and physical quality, soil and water analysis)
- The need for documentation in a farm assurance system
- Types of mandatory farm records
- General guidelines to conservation agriculture (CA).

- PowerPoint presentation
- Participants' handouts
- Plenary discussion

3.7.4 Review of GAP requirements for audit and types of protocols possible (30 minutes)

Session Guide

(The facilitator leads the trainees in summarizing the key points discussed in the module).

Plenary presentation and discussion (30 minutes)

- Methods and procedures required at on-farm level to obtain GAP certification in maize production.
- Good soil management practices (appropriate maize rotations, manure application).
- Careful management of water resources and efficient use of water for rain-fed maize production via irrigation.
- Selection of maize types and varieties to meet local consumer needs.
- Adoption of IPM practices to minimize the potential impact of pest control actions on workers, food, and environmental and health safety.
- Minimizing contamination at harvest, on-farm processing and storage.

- Power point presentation
- Participants' handouts
- Plenary session

3.7.5 Introduction to Site Selection (30 minutes)

Session Guide

3.7.8 Understanding Food Safety (30 minutes)

(The facilitator should be able to introduce food safety system by defining it and sharing its benefits with the trainees).

Plenary presentation and discussion

- Overview of Food Safety Management Systems (FSMS).
- Why food safety is important in maize production systems.
- Risks to human/animal health due to chemical, biological and physical hazards exposure.
- Legal and market requirements for food safety practice.
- Food safety practices that reduce risks/hazards.
- Use of HACCP tool/system for monitoring maize production

- PowerPoint presentation
- Participants' handouts
- Plenary discussion

3.7.9 Determination of food safety risks/hazards (30 minutes)

(Facilitator should guide discussions on the steps of identification of food safety hazards FSMS).

Plenary Presentation (15 minutes)

- Explain the concept of risk identification (Hazard analysis) in maize production chain.
- Listing the types of hazards that cause illness or death.
- Determine and identify factors influencing likely occurrence/severity of hazards.
- List hazards alongside the possible control measures
- Explain the concept in a flow diagram

Group Exercise (15 minutes)

- Groups to identify major risk/hazards at points of maize production
- Produce flow diagrams for the maize

- Power point presentation
- Participants hand outs
- Group exercise

3.7.10 Determination of critical control points (CCP) in Maize value chains (30 minutes)

<p><i>(The facilitator introduces the topic on determination of critical control points (CCP)).</i></p> <p>Plenary presentation (15 minutes)</p> <ul style="list-style-type: none"> • Why it is important to determine CCP in production chain (preventing, eliminating or reducing risks). • How to monitor and measure the CCP (point, step or procedure). • How to document the CCP • How to establish critical limits (From standards or guidelines) for each CCP. <p>Group Exercise (15 minutes)</p> <ul style="list-style-type: none"> • Groups to identify and establish critical control points and critical limits. 	<ul style="list-style-type: none"> • Power point presentation • Participants hand outs • Group exercise
3.7.11 Prevention and corrective measures for CCP in Maize value chains (30 minutes) Session Guide	
<p><i>(The facilitator introduces the topic on prevention and control of possible hazards).</i></p> <p>Plenary presentation (15 minutes)</p> <ul style="list-style-type: none"> • Establishment of corrective actions against CCP • Establish verification procedures for CCP • Establish record-keeping and documentation procedures • How to develop HACCP plan and Food safety tool kit for the Maize value chain <p>Group exercise (15 minutes)</p> <p>Groups to identify and establish corrective actions and verification procedures for Maize value chain.</p>	<ul style="list-style-type: none"> • Power point presentation • Participants hand outs • Group exercises
3.7.12 Module Review (30 minutes) Session Guide	
<p><i>(The facilitator leads the trainees in summarizing the key points discussed in the module).</i></p>	<p>Plenary discussion</p>

3.8. Reference Materials

3.8.1 Participants' Handouts

- Good Agricultural Practices (GAP) hand book
- HACCP hand book for crop production
- Farm management and production hand book

References

- Hazard Analysis Critical Control Point Principles and Application Guidelines (2018). National Advisory Committee on Hazards Criteria for Foods.
- Food Safety Manual for Farmer Field Schools (2010). A training reference guide on food safety in global FFS Programs, FAO.
- Global GAP Version V

MODULE 4

MAIZE PRODUCTION NICHEs AND CLIMATIC REQUIREMENTS

4.1 Introduction

This module exposes farmer trainers' to the different types of ecological conditions comprising of altitudes, soils, climate and agro-ecological zones (AEZs) for maize production. These abiotic factors greatly influence the yields of maize due to their relationship with biotic factors (pests, diseases, weeds, beneficial soil-borne microbial activities). It is therefore important to understand the agro-ecological zones suitable for maize so as to ensure high productivity.

Maize is mainly grown by smallholder farmers under rain-fed conditions. The crop is mostly grown as a monoculture but a significant proportion of farmers intercrop with legumes. The production systems are guided by the size of the farm, demand or purpose (e.g., for subsistence or commercialization where farmers strictly produce for markets). It is necessary for the extension agents to be able to guide farmers on the suitable areas within the counties where maize can do well.

4.2 Module Learning outcomes

By the end of the module, the trainees should be able to:

1. The importance of Maize in Kenya's economy defined.
2. Altitudes and soil types/characteristics for maize production Identified and described.
3. Climatic conditions (temperatures, rainfall and humidity) required for maize production described.
4. Specific county agro-ecological zones for maize production explained.

4.3 Module Target Group

This module is intended for public agricultural extension providers in the Maize value chain target counties and service providers.

4.4 Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT) and Lead Farmers in the Maize value chain target Counties. The facilitator using this module should familiarize themselves with the participants' handouts (training materials).

4.5 Module Duration

The module session is expected to last for a time duration of **4 hours**

4.6 Module Summary

Module 4: Maize production niches and climatic requirements			
Sessions	Training methods	Training materials	Time
4.6.1 Introduction and climate setting	<ul style="list-style-type: none"> • Self-introduction • Plenary discussion • Group exercise 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop for power point Presentation • Projector 	30 minutes
4.6.2 Importance of maize in Kenya's economy	<ul style="list-style-type: none"> • Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop for power point presentation • Projector • Participants' handouts 	1 hour
4.6.3 Maize production ecological/climatic requirements for optimal yields	<ul style="list-style-type: none"> • Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop for power point presentations • Participants' handouts • Projector 	1 hour
4.6.4 Maize production Agro-ecological zones (AEZs)- average yields, and constraints in the target Counties	<ul style="list-style-type: none"> • Group exercise • Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop for power point presentations • Projector 	1 hour
4.6.5 Module review	<ul style="list-style-type: none"> • Discussions/conclusion and way forward 	<ul style="list-style-type: none"> • Flip charts • Felt pens • Laptop for power point presentations 	30 minutes
Total			4 hours

4.7 Facilitator's Guidelines

4.7.1. Introductions and climate setting (30 minutes)	Session Guide
<p><i>(The facilitator welcomes trainees to the module on and then invites them to introduce themselves and state their expectations).</i></p> <p>Expectations (15 minutes) The trainees to form groups (e.g. county based) and list their expectations. <i>The facilitator presents module objectives</i></p> <p>Objectives (15 minutes) By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> • Define the importance of maize in Kenya's economy. • Identify and describe altitudes and soil types/ characteristics for maize production. • Describe climatic conditions (temperatures, rainfall and humidity) required for maize production. • Explain specific county agro-ecological zones for maize production. 	<ul style="list-style-type: none"> • Summarize the facilitator/trainees involvement in Maize value chains
4.7.2 Importance of Maize in Kenya's economy (1 hour)	
<p>Plenary Presentation (45 minutes)</p> <ul style="list-style-type: none"> • Origin of maize • Maize in Kenyan households • Key counties producing maize in Kenya • General maize production in Kenya <p>Facilitator's guided discussions (15 minutes) Questions/answers/comments</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Participants' handouts
4.7.3 Maize production ecological/climatic requirements (1 hour)	
<p>Plenary Presentation (45 minutes)</p> <ul style="list-style-type: none"> • Altitude and Agro-ecological zones for maize production • Climatic conditions (Rainfall, Temperatures and humidity) • Soils (soil types, pH, general fertility for maize) <p>Facilitator's guided discussion (15 minutes) Questions/answers/comments</p>	<ul style="list-style-type: none"> • Power point presentation • Participants' handouts • Plenary discussion

4.7.4. Maize production AEZs (villages), average yields, and constraints in the target Counties (1 hour)	Session Guide
<p>Plenary Presentation (30 Minutes)</p> <p>Facilitator guides in reviewing and discussing suitability map (County by County)</p> <p>Group exercise (15 minutes)</p> <p>Trainees to bring out specific county or sub-county AEZs, land size, yields and constraints to Maize production and present in the plenary:</p> <ul style="list-style-type: none"> • Agro-ecological zones (AEZs) and % area suitable for Maize • Average land/farm size under Maize production in Kenya • Average yield of Maize per farm • Constraints to Maize production <p>Discussions/presentations from the groups (15 minutes)</p> <p>Let the trainees/groups share the group exercise outcomes</p>	<ul style="list-style-type: none"> • Power point presentations • Group work • Open discussions with the guidance of the facilitator • Plenary discussion
4.7.5. Module review (30 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summary of the main points from the training (20 minutes)</p> <ul style="list-style-type: none"> • Objectives and expectations (review done on basis of the expectations listed earlier) • Trainees to recall the Maize production ecological/ climatic requirements, maize production AEZs (villages) average yields, and constraints in the target Counties • Trainees to indicate new sets of skills and knowledge acquired from the module. The results are recorded per county presented • Trainees to randomly pin-point the way forward issues. <p>Facilitator’s guided discussion (10 minutes)</p>	<ul style="list-style-type: none"> • The last participants’ Handouts/training materials • Summarize the main points of the module on a flip chart and display • Plenary discussion

4.8 Reference Materials

4.8.1 Participants’ Handouts

- Maize production Guides
- Maize leaflets
- Maize factsheets

MODULE 5

MAIZE VARIETY SELECTION

5.1. Introduction

This module exposes service providers, lead farmers and public extension facilitators to the improved maize varieties, their uses and target area of production. It is necessary that the Master trainers have knowledge on the recommended and improved maize varieties for maize production in all maize growing regions in Kenya. As a result of this, they will help smallholder farmers to improve maize production and productivity in the country. Low adoption rates of improved maize technologies is one of the key constraints to maize production. Smallholder farmers mainly source maize seed from neighbours, local markets, agrovet shops or recycle their own. Moreover, the seed is produced in traditional farming practices leading to below average yields. It is therefore necessary to provide knowledge on recommended improved maize varieties to improve maize productivity.

The choice of appropriate maize varieties for a given location is very important because every variety has extensively been tested and recommended based on climatic conditions, soil type, yield potential, resistance to pest and diseases or maturity period among others. These varieties are also grouped into categories such as grain production varieties for human consumption, livestock fodder varieties and dual purpose varieties. However, farmers are not able to identify the varieties suited to their regions and their needs. There is therefore need to introduce farmer trainers in the target counties to the different maize varieties available in Kenya, their suitable areas of production and their end uses.

5.2 Learning Outcomes

By the end of the module, the following outcomes should be achieved:

1. The maize crop and its climatic and ecological requirements described.
2. The various improved maize varieties and their ecological areas of cultivation and their uses identified.
3. The varieties suited to the counties of interest identified.

5.3 Module Target Group

This module targets agricultural extension, service providers and lead farmers based at maize target counties.

5.4. Module users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT) and Lead Farmers in the maize value chain target Counties. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

5.5 Module Duration

The module is estimated to take **3 hours 30 minutes**

5.6 Module Summary

Module 5: Maize Variety Selection			
Sessions	Training Methods	Training Materials	Time
5.6.1 Introduction and Objectives Expectations	<ul style="list-style-type: none"> • Plenary presentation • Group discussion and presentation of expectations 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop for power point presentations • Projector 	30 minutes
5.6.2 Introduction to various improved maize varieties, their ecological areas of cultivation and their attributes and uses.	<ul style="list-style-type: none"> • Group Exercises to identify maize land races and improved varieties • Plenary Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop for power point presentations • Projector • Manila papers 	1 hour 30 minutes
5.6.3 Recommended varieties for specific regions	<ul style="list-style-type: none"> • Plenary Presentation • Group exercise • Field demonstration 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop for power point presentations • Projector • Manila papers 	1 hour
5.6.4 Module review	<ul style="list-style-type: none"> • Group Exercise • Facilitator's summary 	<ul style="list-style-type: none"> • Participants' handouts • Module review • maize manual 	30 minutes
TOTAL			3 hours 30 minutes

5.7. Facilitator's Guidelines

Module 5: Maize Variety Selection	
<p>5.7.1 Introduction and levelling of expectations and objectives (30 minutes)</p> <p>Introduction (15 minutes) <i>(The facilitator welcomes trainees to the module on maize varieties and invites the trainees to introduce themselves and state their expectations.)</i></p> <p>Module Objectives (15 minutes) (The facilitator presents modules objectives)</p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Describe the maize crop and its climatic and ecological requirements. • Identify the various improved maize varieties and their ecological areas of cultivation and their uses. • Identify the varieties suited to the counties of interest. 	<p>Session Guide</p> <ul style="list-style-type: none"> • Summarize trainees' "expectations" and display. • Distribute participants' handouts • Module Objectives,
<p>5.7.2 Introduction of Maize and the various improved Maize varieties and their uses (30 minutes)</p> <p><i>(The facilitator describes the maize crop and guides the trainees in identifying the various maize improved varieties and their uses).</i></p> <p>Group exercise and discussion (10 minutes) Ask trainees highlight and describe some of the maize varieties they know.</p> <p>Plenary Presentation (20 minutes)</p> <ul style="list-style-type: none"> • What is maize? • Improved maize varieties. • Categories of maize varieties for grain or dual purpose <p><i>Show trainees the photographs of each variety and the full description and its uses.</i></p>	<p>Session Guide</p> <ul style="list-style-type: none"> • Distribute Participants' handouts • Group exercise • Plenary discussion

5.7.3 Recommended Maize varieties for the target counties (2 hours)	Session Guide
<p>Plenary Presentation</p> <p>Varieties for the target counties (30 minutes)</p> <ul style="list-style-type: none"> • Maize growing regions and the new regions which are being targeted for Maize cultivation in Kenya. • Maize varieties suited for each county • County climate conditions for target county (semi-arid, hot dry low land, cold dry highlands and high potential) <p>Group exercises (30 minutes)</p> <p>Trainees discuss and come up with maize varieties in their county</p> <p>Field demonstration (1 hour)</p> <p><i>(Ensure there is an established plot of all the varieties or maize plant samples).</i></p> <ul style="list-style-type: none"> • Visit the maize plots with the trainees and assist them identify and study the various varieties. • After the field visit facilitate them to recall what they learned and discuss on any issue that may arise. (You could also use maize plant samples for the various varieties). 	<ul style="list-style-type: none"> • Distribute participants' handouts. • Group exercise • Field demonstration
5.7.4 .Module review (30 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module).</i></p> <p>Group Exercise</p> <p>Summarize the main points of the training</p> <p>Together with the trainees review the main points about improved maize varieties</p> <ul style="list-style-type: none"> • What new things did you learn from this module? • What are some of the problems and issues that you have become more aware of in improved maize varieties? • What questions do you still have about identification of maize varieties? 	<ul style="list-style-type: none"> • The last Participants' Handouts • Summary of the main points from the module.

5.8 Reference Materials

5.8.1 Participants' Handouts

- Maize leaflets
- Factsheets

MODULE 6

MAIZE SEED SYSTEMS

6.1 Introduction

Maize farmers source seeds from their neighbours, local markets, agrovet shops or recycle their own. Persistent use of farmer-saved seeds significantly reduces yields and undermines the potential of private sector investment in commercial production and marketing of improved certified seeds be they open pollinated varieties or hybrids. This has negatively impacted on the dissemination of improved high-quality maize seed especially in the drylands where open pollinated varieties are prevalent. Partly this may be blamed on the inability of the farmers to select good seed due to lack of the necessary information on seed selection and regulation.

As agricultural production increasingly becomes commercialized and global food markets become more competitive, farmers need to invest in improved high yielding maize seed varieties for sustainability and profitability. This module exposes county extension officers, private service providers, lead farmers and facilitators to the various seed systems and the importance of quality seed in maize production. It also covers community seed production and advises how to interface formal and informal seed production to enable farmers with adequate land to venture into commercial production of maize.

6.2 Module learning outcomes

By the end of the module, the following should be achieved:

1. The main maize seed systems in Kenya explained and appreciated.
2. Seed production in formal and informal seed system described.
3. The importance of informal seed system, community seed bulking and its interface with formal seed production for enhanced production of quality grain explained.

6.3 Module Target Group and Categories

This module is intended for public and private extension agents, service providers and lead farmers

6.4 Module Users

This module is intended for use by Master trainers who are members of the Core Team of Trainers (CTT). The facilitator using this module should be well conversant with the participants' handouts.

6.5 Module Duration

The module is estimated to take a minimum of **6 hours**.

6.6 Module Summary

Module 6: Maize Seed System			
Sessions	Training methods	Training materials	Time
6.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> • Self-introduction • Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Marker pens • PowerPoint presentation • Laptop • Projector 	30 minutes
6.6.2 Definition of seed and seed system in Kenya; difference between hybrids and open pollinated varieties	<ul style="list-style-type: none"> • Group exercise • Plenary presentations 	<ul style="list-style-type: none"> • Flips charts • Marker pens • PowerPoint Presentation • Laptop • Projector 	1 hour
6.6.3 Formal seed system in Kenya	<ul style="list-style-type: none"> • Plenary Presentation • Plenary discussion 	<ul style="list-style-type: none"> • PowerPoint Presentation • Flips charts • Marker pens • Laptop • Projector 	1 hour 30 minutes
6.6.4 Informal seed system in Kenya	<ul style="list-style-type: none"> • Plenary Presentation • Plenary discussion • Group exercise 	<ul style="list-style-type: none"> • PowerPoint Presentation • Flips charts • Marker pens • Laptop • Projector 	1 hour 30 minutes
6.6.5 Module review and discussions	<ul style="list-style-type: none"> • Group exercise • Plenary discussion • presentation 	<ul style="list-style-type: none"> • Flips charts 	30 minutes
Total			5 hours

6.7 Facilitator’s Guidelines

Module 6: Maize Seed System	
6.7.1. Introduction and levelling of expectations and objectives (30 minutes)	Session Guide
<p>Introduction (10 minutes) <i>(The facilitator welcomes trainees to the module on the maize seed systems and thereafter invites trainees to introduce themselves and state their expectations.</i></p> <p>6.7.1. Module Objectives (20 minutes) <i>(The facilitator presents modules objectives)</i> By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate maize seed systems and its importance in production. • Describe seed production in formal and informal seed system. • Explain informal seed system, community seed bulking and its interface with formal seed production for enhanced production of quality grain. 	<ul style="list-style-type: none"> • Summarize Trainees’ “Expectations” and display. • PowerPoint Presentation • Plenary discussion • Distribute participants’ handouts
6.7.2. Definition of seed and seed system in Kenya (1 hour)	Session Guide
<p>Group exercise and presentations: (30 Minutes)</p> <ul style="list-style-type: none"> • What is quality seed? <p>Plenary Presentation (60 Minutes)</p> <ul style="list-style-type: none"> • Definition of a seed system and characteristics of main seed systems (formal and informal seed system) • Commodity corridors 	<ul style="list-style-type: none"> • Group exercise • PowerPoint presentation • Distribute participants’ handouts
6.7.3 Formal seed systems in Kenya (1 hour 30 minutes)	Session Guide
<p>Plenary presentation and discussion (60 Minutes)</p> <ul style="list-style-type: none"> • Legal requirements for seed certification • Seed certification process • Post certification activities for enforcing the seed act cap 326 • Post certification activities for seed quality assurance • Seed importation and exportation requirements <p>Plenary Discussion (30 minutes)</p> <ul style="list-style-type: none"> • Formal seed systems 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants’ handouts

6.7.4 Informal seed system in Kenya (1 hour 30 minutes)	Session Guide
<p>Plenary presentations: (1 hour)</p> <ul style="list-style-type: none"> • Seed multiplication • Maize seed standards and commercial production • Informal seed system • Community seed bulking and how it is implemented • Synergies for formal and informal seed systems <p>Group exercise and discussion (30 Minutes) Calculate seed requirements for the county/ward/farmer group and present</p>	<ul style="list-style-type: none"> • PowerPoint Presentation • Distribute participants' handouts • Group exercise • Plenary discussion
6.7.5 Module review (30 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summarize the module together with the trainees and have a recap of the main components in:</p> <ul style="list-style-type: none"> • Maize seed systems and their characteristics • Importance of using certified seed • Informal seed <p><i>(Discuss the knowledge acquired and skills learnt from this module with the trainees. What are the observations made by trainees from this module?)</i></p>	<ul style="list-style-type: none"> • Participants' handouts • Summarize the main points from the module on a flip chart and display

6.8 Reference Materials

6.8.1 Participants' Handouts

- Maize leaflets
- Maize fact sheets

MODULE 7

CLIMATE SMART AGRONOMIC PRACTICES FOR MAIZE

7.1 Introduction

In order to optimize maize productivity, farmers need to adopt specific agronomic packages without which the yield potential of improved varieties cannot be achieved. In addition, the weather vagaries occasioned by climate change effects make it necessary to incorporate adaptation or mitigation measures which enable maize farmers to increase productivity.

Adoption of climate smart agronomic practices enable maize farmers to adapt and mitigate effects of climate variability thereby attaining sustainable yields and returns despite the climate changes. In doing this, maize farmers must be trained on applicable climate smart agronomic practices that hold promise. There is therefore need for extension service agents from the maize target counties to be equipped with skills and knowledge that enable them to guide farmers on the climate smart maize agronomic practices, seed selection techniques, and disease and pest management strategies.

7.2 Module Learning outcomes

By the end of this module training, the following outcomes should be achieved:

1. Agronomic practices for maize production described and explained.
2. Region specific agronomic practices for maize production optimization outlined.
3. Appropriate inputs and their correct application rates for maize production described.
4. Timing for operations or inputs application in maize production described and explained.

7.3 Module Target Group and Categories

This module targets service providers, public extension agents and lead farmers from maize value chain target counties.

7.4 Module users

This module is intended for use by Master trainers who are members of the Core Team of Trainers (CTT). The facilitator using this module should familiarize themselves with the participants' handouts or training materials.

7.5. Module Duration

The module is estimated to take a duration of **3 hours 30 minutes**

7.6 Module Summary

Module 7: Maize climate smart agronomic practices			
Sessions	Training methods	Training materials	Time
7.6.1 Introduction and climate setting, objectives and expectations	<ul style="list-style-type: none"> • Self-introduction • Plenary discussion • Presentations • Group exercise 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop • Projector 	30 minutes
7.6.2 Agronomic practices for maize production	<ul style="list-style-type: none"> • Plenary presentation • Practical exercise (groups tour nearby farm for layout demonstration) • Plenary discussion resulting from the farm visit 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop • Projector 	1 hour 30 minutes
7.6.3 Appropriate inputs and their recommended application rates for optimum production of Maize	<ul style="list-style-type: none"> • Presentations • Group exercise (trainees enlist inputs and dosage in different counties) • Plenary discussion to share group work results 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Laptop • Projector • Participants' handouts 	1 hour
7.6.4 Module review and discussion	<ul style="list-style-type: none"> • Discussion/conclusion and way forward 	<ul style="list-style-type: none"> • Flip charts • Felt pens • Laptop • Projector 	30 minutes
Total			3 hours 30 minutes

7.7 Facilitator's Guidelines

Module 7: Climate Smart Agronomic Practices for Maize	
7.7.1. Introduction and climate setting (30 minutes)	Session Guide
<p><i>(The facilitator welcomes trainees to the module. The trainees are then invited to introduce themselves and state their expectations).</i></p> <p>Expectations (15 minutes)</p> <p>The trainees form groups (e.g., county based) and list expectations from the module</p> <p><i>The facilitator presents the module objectives.</i></p> <p>Objectives (15 minutes)</p> <p>By the end of the training module, the trainee should be able to:</p> <ul style="list-style-type: none"> • Explain and describe agronomic practices for maize production. • Outline region specific maize production agronomic practices. • Describe appropriate inputs and their correct rates of application for maize production. • Explain the right timing for operations or inputs application in maize production. 	<ul style="list-style-type: none"> • Summarize the trainees expectations • PowerPoint presentations • Group exercise (listing and presenting expectations). • Expectations lists kept for later reviewing compliancy
7.7.2. Agronomic practices for Maize production (1 hour 30 minutes)	
<p>Plenary Presentation (40 minutes)</p> <p>The facilitator presents critical factors on:</p> <ul style="list-style-type: none"> • Factors for selecting maize production as an enterprise • Climate smart land preparation • Climate smart planting (seed rates, plant density) • Thinning • Weed control • Pests and disease control • Cropping systems • Spacing (inter-and intra-row spacing) • Conservation agriculture principles/benefits <p>Practical exercise (30 minutes)</p> <p>Groups tour nearby for farm layout demonstration</p> <p>Plenary discussion (20 minutes)</p> <p>Questions/answers and comments</p>	<ul style="list-style-type: none"> • PowerPoint Presentation • Plenary discussion • Distribute participants' handouts/training materials • Practical exercise

7.7.3. Appropriate inputs for the optimal production of Maize and their correct/recommended application rates (1 hour)

Session Guide

Group exercise (30 minutes)

- The facilitator guides trainees to list or/and present the required inputs for use in maize production
- The trainees get into county groups to provide lists of maize inputs and their application rates as practiced by farmers.
- The groups present their results in the plenary - opening up for questions, answers and discussion.

- PowerPoint Presentation
- Distribute participants' handouts
- Groups exercise
- Plenary discussion

Plenary presentation and plenary discussion (30minutes)

- The recommended maize inputs (seeds, fertilizers, manures, among others), their rates and their time of application for optimal yields

7.7.4. Module review (30 minutes)

Session Guide

(The facilitator leads the trainees in reviewing the module).

Summary of the main points from the training

- Objectives and expectations (review done on basis of the objectives and expectations listed earlier)
- Trainees to randomly indicate new sets of skills and knowledge learnt from the module. The results are recorded per county presented
- Randomly (average of 10 cases) trainees pin-point the way forward issues.

- Participants' handouts
- Summarize the main points of the module on a flip chart and display

7.8 Reference Materials

7.8.1 Participants' Handouts

1. Maize production Guides.
2. Maize leaflets
3. Maize Factsheets
4. Brochures

MODULE 8

INTEGRATED SOIL AND WATER MANAGEMENT PRACTICES FOR MAIZE PRODUCTION

8.1 Introduction

Poor soil conditions and unreliable availability of moisture in most smallholder farming systems have been the main causes of low yields. Generally, crop yields have continued to decline over the years due to increased soil acidity, mining of nutrients not supplied in the applied fertilizers and poor soil structure caused by failure to use the available sources of organic matter. Macronutrients [nitrogen (N), phosphorus (P), potassium (K) and Sulphur (S)] and micronutrients [zinc (Zn), Molybdenum (Mo) and Boron (B)] have been identified as deficient in Kenyan soils. Additionally, climate change has accelerated the decline of the agricultural sector performance through limited and unpredictable water availability for the Maize production systems.

Maize is grown on a wide range of soils but performs best on well-drained, well-aerated and deep soils containing adequate organic matter content and well supplied with available nutrients. Maize crop grows well in soils with a pH range of 5.0 to 8.0 with an optimum pH range for growth at 5.5 to 7.0. For optimum production, factors such as soil moisture, temperature, pests and diseases, weed control, and soil chemical and physical conditions are taken into consideration. Various climate smart soil and water management technologies such as conservation agriculture (mulching, minimum tillage, zero tillage, intercropping) and integrated soil fertility management (ISFM) offers the best options for improving soil fertility in the advent of climate change adaptation.

8.2 Module learning outcomes

By the end of the module, the following training outcomes should be achieved:

1. Soil composition, the various physical, chemical and biological properties and what constitutes a healthy soil, including soil classification explained and appreciated.
2. Soil and plant tissue sampling for laboratory analysis, interpretation and utilization of results from accredited laboratories in Kenya discussed and described.
3. Soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping explained.
4. Water harvesting technologies, soil and water management discussed and explained
5. Temporary or permanent decline of land productive capacity and various solutions to soil degradation identified.
6. Problematic soils and their management identified and described.

8.3 Module Target Group and Categories

This module is intended for public extension agents, lead farmers and service providers in the maize producing regions.

8.4 Module Users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT). The facilitators using this module should be well conversant with the participants' handouts.

8.5 Module Duration

The module is estimated to last for a duration of **5 hours**.

8.6 Module Summary

Module 8: Integrated soil and water management practices for Maize production			
Sessions	Training methods	Training materials	Duration
8.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none">• Self-introduction• Plenary Presentation• Plenary discussion	<ul style="list-style-type: none">• Flip charts• Marker pens• Projector for PowerPoint presentation• Laptop	30 minutes
8.6.2 Soil composition, properties and health,	<ul style="list-style-type: none">• Plenary Presentations• Plenary discussion	<ul style="list-style-type: none">• Flip charts• Marker pens• Projector for PowerPoint presentation• Laptop• Participants' handouts	30 minutes
8.6.3 Soil and plant tissue sampling and analysis	<ul style="list-style-type: none">• Plenary Presentations• Field demonstrations (Conduct soil and plant tissue sampling and analysis)	<ul style="list-style-type: none">• Projector for PowerPoint presentation• Participants' handouts• Soil and plant tissue sampling tools	1 hour
8.6.4. Soil fertility and plant nutrition	<ul style="list-style-type: none">• Plenary Presentation• Plenary discussion	<ul style="list-style-type: none">• Flip charts• Marker pens• Projector for PowerPoint presentation• Laptop• Participants' handouts	30 minutes

8.6.5 Soil health and (ISFM) for climate resilient cropping systems	<ul style="list-style-type: none"> • Plenary Presentation • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Marker pens • PowerPoint presentation • Participants' handouts 	30 minutes
8.6.6 Soil and water management and water harvesting technologies	<ul style="list-style-type: none"> • Plenary Presentation • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Marker pens • PowerPoint presentation • Participants' handouts 	30 minutes
8.6.7 Soil degradation and reclamation	<ul style="list-style-type: none"> • Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Marker pens • PowerPoint presentation • Participants' handouts 	30 minutes
8.6.8 Problematic soils and their management	<ul style="list-style-type: none"> • Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Marker pens • PowerPoint presentation • Participants' handouts 	30 minutes
8.6.9 Module review and discussion	<ul style="list-style-type: none"> • Discussion 	<ul style="list-style-type: none"> • Flip charts 	30 minutes
Total			5 hours

8.7 Facilitator’s Guidelines

Module 8: Integrated soil and water management practices for Maize production	
8.7.1. Introduction, Objectives and Expectations (30 minutes)	Session Guide
<p><i>(The facilitator welcomes trainees to the module and are then invites them to introduce themselves and state their expectations).</i></p> <p>Module Objectives (30 minutes)</p> <p><i>(The facilitator presents the modules objectives)</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate soil composition and what constitutes a healthy soil, including soil classification. • Describe soil and plant tissue sampling for laboratory analysis, interpretation and utilization of results from accredited laboratories in Kenya. • Explain soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping systems. • Explain water harvesting technologies, soil and water management. • Identify temporary or permanent decline of land productive capacity and provide various solutions to soil degradation. • Identify and describe problematic soils and their management. 	<ul style="list-style-type: none"> • Summarize trainees’ “Expectations” and display. • PowerPoint presentation • Distribute participants’ handouts on Module • Objectives and Training Program
8.7.2. Soil composition, properties and health (30 minutes)	Session Guide
<p><i>(The facilitator presents on soil composition, properties and health)</i></p> <p>Plenary presentation (20 minutes)</p> <p>Soil composition, properties and health</p> <ul style="list-style-type: none"> • Description of soil composition • Description of soil properties • Describe what soil health is all about <p>Plenary discussion (10Minutes)</p> <p>Let the trainees recall what they learnt and discuss any issues that may arise</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Participants’ handouts • Plenary discussion

8.7.3. Soil and plant tissue sampling and analysis (1 hour)	Session Guide
<p>Plenary Presentation (30 minutes)</p> <ul style="list-style-type: none"> • Overview of the soil sampling methods • Soil analysis results and interpretation • Overview of soil analysis results using available examples • Soil sampling guidelines <p>Practical exercise and demonstration on soil sampling (30 minutes)</p> <ul style="list-style-type: none"> • soil sampling methods 	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Practical exercise and demonstration
8.7.4. Soil fertility and plant nutrition (30 minutes)	Session Guide
<p>Plenary Presentation (20 minutes)</p> <ul style="list-style-type: none"> • Potential role of different soil management techniques in addressing soil fertility challenges in Maize smallholder farming systems • Integrated Soil Fertility Management techniques • Soil management guidelines <p>Plenary discussion (10 Minutes) Let the trainees recall what they learnt and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Plenary discussion • Distribute participants' handouts
8.7.5 Soil health and (ISFM) for climate resilient cropping systems (30 minutes)	Session Guide
<p>Plenary Presentation (20 Minutes)</p> <ul style="list-style-type: none"> • Soil health • Introduce integrated soil fertility management (ISFM) • Soil health and ISFM for a climate resilient cropping system • Manure management, mulching, organic amendments and composting for increased use of organic manure for improving agricultural production • Conservation agriculture as a climate smart agriculture practice • Maize intercrops and crop rotation as climate resilient cropping systems <p>Plenary discussion (10 Minutes) Let the trainees recall what they learnt and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual

8.7.6 Soil and water management and water harvesting technologies (30 minutes)

Session Guide

Plenary Presentation (20 Minutes)

- Principles of soil management for increased Maize productivity
- Methods of tillage systems that conserve water for Maize use.
- Principles of soil fertility management for increased Maize productivity
- Methods of soil fertility management for increased Maize productivity

Plenary discussion (10 Minutes)

Let the trainees recall what they learnt and discuss any issues that may arise.

- PowerPoint presentation
- Distribute participants' Handouts
- Plenary discussion

8.7.7 Soil degradation and reclamation (30 minutes)

Session Guide

Plenary Presentation (20 minutes)

- Overview of soil degradation and reclamation.
- Reclamation measures of degraded soil
- Identification of the causes of soil degradation
- Identification of reclamation measures of degraded soil

Plenary discussion (10 Minutes)

Let the trainees recall what they learnt and discuss any issues that may arise.

- PowerPoint presentation
- Distribute participants' handouts
- Plenary discussion

8.7.8 Problematic soils and their management (30 minutes)

Session Guide

Plenary presentation (20 minutes)

- Problematic soils and their management
- Soils with unsuitable biological properties
- Soils with unsuitable chemical properties
- Soils with unsuitable physical properties

Plenary discussion (10 Minutes)

Let the trainees recall what they learnt and discuss any issues that may arise.

- PowerPoint presentation
- Distribute participants' Handouts
- Brochures, leaflets and manual

8.7.9. Module review (30 minutes)	Session Guide
<p><i>The facilitator leads the trainees in reviewing the module)</i></p> <p>Summarize the main points of the training review the main points together with the trainees.</p> <p>Discuss with trainees about skills learnt from this Module. Let them identify some of the problems and any other issues arising from the module.</p>	<ul style="list-style-type: none"> • The last participants' handouts • Summary of the main points from the module on a flip chart and display

8.8 Reference Materials

8.8. Participants' Handouts

- Soil Management Extension Manual [KCEP-CRAL Manual 2021]
- Soil Management Leaflets [KCEP-CRAL PAMHPLETS 2019}
- OFRA Technical Training Manual

MODULE 9

MAIZE CROP HEALTH

9.1 Introduction

Maize pests and diseases are important biotic constraints which cause significant yield losses in production leading to losses of 10-100%. Most maize farmers depend heavily on use of pesticides for the management of these constraints and at time leading to cases of overuse of pesticides. Occasionally farmers using pesticides do not apply the recommended dose of pesticides leading to resistance or high minimum residual levels on crops. Farmers are encouraged to use integrated Pest management (IPM), an ecologically friendly approach that relies use of combined practices such as tolerant varieties, biological control agents and selected environmentally safe synthetic for disease and pest management. This approach is guided by continuous monitoring of pests and diseases for timely decision making in their management.

This module exposes service providers, lead farmers and facilitators to the importance of maintaining crop health as well as human and environmental safety when producing maize. The module introduces the major maize pests and diseases, their distribution and management. It also unveils the economic losses caused by the mentioned pests and diseases. A sustainable pest, disease and weed management program is essential in minimizing losses and in enhancing environmental and food safety concerns adequately. Available options for the control of these biotic impediments to high yields of maize can greatly prevent losses experienced by farmers. There is need to employ human and environmentally safe approaches to pest, disease and weed management so as to increase productivity and enhance food safety and security. Finally, the module details the recommended sustainable integrated pests, disease and weed management practices, which if applied, can help reduce the yield losses and improve the quality of produce for the market.

9.2 Module Learning Outcomes

By the end of the module, the following outcomes should be achieved:

1. Major pests, diseases and weeds identified.
2. Integrated pest, disease and weed management in maize described and explained.
3. Knowledge on sustainable Integrated Pest Management (IPM) practices and scouting for threshold determination explained and understood.
4. Knowledge on safe use of agro-chemicals (pesticides, fungicides and herbicides) and sources of information on registered pesticides enhanced and applied.

9.3 Module Target Group

This module targets public and private extension agents, service providers and lead farmers

9.4 Module Users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT). The facilitators using this module should be well conversant with the participants' handouts.

9.5 Module Duration

The facilitation of this module is estimated to last for a period of **6 hours 30 minutes**.

9.6 Module Summary

Module 8: Crop Health			
Sessions	Training methods	Training materials	Time
9.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none">• Self-introduction• Group exercise• Plenary presentation• Plenary discussion	<ul style="list-style-type: none">• Flips charts• Marker pens• PowerPoint presentation	30 minutes
9.6.2 Major maize pests that cause economic losses and their control methods	<ul style="list-style-type: none">• Group work• Plenary presentation• Plenary discussion• Practical exercise	<ul style="list-style-type: none">• Flips charts• Marker pens• Projector• Laptop• Participants' handouts	1 hour
9.6.3 Sustainable Integrated Pests Management practices and scouting for threshold determination in maize	<ul style="list-style-type: none">• Plenary presentations• Plenary discussion	<ul style="list-style-type: none">• Flip charts• Marker pens• Projector• Laptop• Participants/ handouts	1 hour
9.6.4 Major maize diseases that cause economic losses and conditions that favour their development including their control methods	<ul style="list-style-type: none">• Group work• Plenary Presentation• Plenary discussion• Practical exercise	<ul style="list-style-type: none">• Flip charts• Marker pens• Projector• Laptop• Participants' handouts	1 hour
9.6.5 Sustainable Integrated Management of maize diseases and scouting for threshold determination	<ul style="list-style-type: none">• Presentations• Plenary discussion• Field demonstration	<ul style="list-style-type: none">• Flip charts• Marker pens• Projector• Laptop• Participants' handouts	1 hour
9.6.6 Integrated weed management (Major weeds of maize)	<ul style="list-style-type: none">• Plenary Presentation• Plenary discussion• Field demonstration	<ul style="list-style-type: none">• Flip charts• Marker pens• Projector• Laptop• Participants' handouts	1 hour

9.6.7 Safe use of agro-chemicals and update source for registered agro-chemicals (PCPB registered products)	<ul style="list-style-type: none"> • Presentations • Practical • Plenary discussion 	<ul style="list-style-type: none"> • Projector • Laptop • Flip charts • Marker pens • Participants' handouts 	30 minutes
9.6.8 Module Review	<ul style="list-style-type: none"> • Discussion/ Recap of the module • Take away messages 	<ul style="list-style-type: none"> • Flip charts • Marker pens • Participants' handouts 	30 minutes
Total			6 hours 30 minutes

9.7 Facilitator's Guidelines

Module 9: Maize Crop Health

9.7.1. Introduction and leveling of expectations and objectives (30 minutes)

Session Guide

Introduction (15 minutes)

(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations).

Module Objectives (15 minutes)

(The facilitator presents modules objectives)

By the end of the module, the trainee should be able to:

- Identify major pests, diseases and weeds.
- Describe and explain integrated pest, disease and weed management in maize.
- Explain and appreciate the sustainable use of Integrated Pest Management (IPM) practices and scouting for threshold determination.
- Explain safe use of agro-chemicals (pesticides, fungicides and herbicides).

- Summarize trainees' "Expectations"
- PowerPoint presentation
- Participants' handouts

9.7.2. Major Maize pests that cause economic losses and their control methods; emerging/migratory pests (1 hour)

Session Guide

(The facilitator presents on the common maize pests that are of economic importance)

Group work (15 minutes)

- Trainees to share maize pest information from their respective counties

Plenary Presentation (20 minutes)

- Names of pests and their descriptions
- Symptoms of their infestation/type of damage
- Data on economic significance of the common maize pests

Practical exercise (15 minutes)

- Identification of maize pests from provided specimens

Discussion (10 minutes)

- Let the trainees recall what they learned and discuss any issues that may arise.

- PowerPoint presentation
- Group exercise
- Practical exercise
- Participants' handouts

9.7.3. Sustainable Integrated Pest Management (IPM) practices in Maize; scouting and threshold determination (30 minutes)

Session Guide

Plenary Presentation (20 minutes)

- IPM principles; how to implement them with a focus on cultural, physical, biological and chemical pest management options.
- Critical considerations for proper scouting
- Threshold determination and when to implement control measures
- An overview on the safe use of agro-chemicals (demonstration on how to select most suitable pesticides, for the management of pests in maize).

Discussion (10 minutes)

Let the trainees recall what they learned and seek clarification on the principles of sustainable IPM options.

- PowerPoint presentation on scouting for pests
- Participants' handouts (brochures,
- Leaflets and manuals on pest specimens on maize

9.7.4. Major Maize diseases that cause economic losses, conditions that favour their development and their control methods (1 hour) Session Guide

<p>Group work (15 minutes)</p> <ul style="list-style-type: none"> • Determination of maize diseases in specific Counties <p>Plenary Presentation (15 minutes)</p> <ul style="list-style-type: none"> • Presentations on maize diseases and conditions that favor their development <p>Practical Exercise (30 minutes)</p> <ul style="list-style-type: none"> • Identification of major disease species causing economic • Damage based on samples presented 	<ul style="list-style-type: none"> • PowerPoint presentation • Participants' handouts • Disease identification guidelines • Practical Exercise
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9.7.5. Sustainable Integrated Diseases Management (IDM); scouting and threshold determination (1 hour) Session Guide

<p>Plenary presentation (30 minutes)</p> <ul style="list-style-type: none"> • Critical considerations for scouting and when to implement maize disease control measures • Presentation on Integrated Disease Management (IDM) in maize • An overview on the safe use of recommended agro-chemicals (demonstration on how to select most suitable fungicides for the management of major maize diseases). <p>Field visit (30 minutes)</p> <ul style="list-style-type: none"> - Visit to a nearby maize field for collection and identification of diseased maize samples 	<ul style="list-style-type: none"> • PowerPoint presentation • Participants' handouts • Disease management guidelines • Field demonstration
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9.7.6 Integrated weed management (Major weeds of Maize) (1 hour) Session Guide

<p>Plenary presentation (45 minutes)</p> <ul style="list-style-type: none"> • Identification of weeds • Major types of weed in the maize field • Integrated Weed control measured <p>Plenary discussion (15 minutes) Integrated weed management</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Participants' Handouts • Plenary discussion
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9.6.7 Safe use of agro-chemicals and update source for registered agro-chemicals (PCPB registered products) (30minutes) **Session Guide**

- Effects of pesticides on maize production
- WHO classification
- The Red List -List of banned agro-chemicals
- Safe use of agro-chemicals (pesticides, fungicides and herbicides).

- PowerPoint presentation
- Participants' Handouts
- Plenary discussion

9.7.8. Module review (30 minutes)

Session Guide

(The facilitator leads the trainees in reviewing the module)

Summarize the main points of the training: The facilitator should review the following main points about climatic conditions suitable for maize production:

- Major pests of maize and their economic impacts on maize production.
- Integrated Pest Management (IPM) options for maize
- Major diseases of maize and their economic impact on maize production.
- Integrated Disease Management (IDM) options for maize
- Major weeds of maize and their economic impacts on maize production.
- Integrated Weed Management (IWM) options for maize

(Discuss with trainees about new skills and ideas learnt from this module. What are some of the issues that need clarification)?

- The last participants' handouts
- Summarize the main points from the module on a flip chart and display

9.8 Reference Materials

9.8.1 Participants' handouts

1. Fact sheets on Maize pest identification and control
2. Factsheets on Maize disease identification and their control
3. Factsheets on Maize weeds identification and their management
4. Weed Management manual. Mwangi, H.W. KALRO-Kabete

MODULE 10

MAIZE HARVESTING AND POSTHARVEST MANAGEMENT

10.1. Introduction

Smallholder maize farmers in Kenya face two key interrelated challenges after harvesting their crop. The first relates to poor handling and management practices (including drying and storage challenges), which contribute to significant deterioration of the quality of the grain and subsequent losses currently estimated to be upwards of 30%. This translates to more than US\$ 4 billion losses annually. Postharvest losses are one of the major reasons why Kenya continues to be insufficient in food supply even when crop yields and land under cultivation have been increasing. The second challenge relates to market access. Most smallholder farmers sell their grain individually to traders in their villages shortly after harvesting a result, they get low prices compared to what they would have earned if they had stored their grain and sold it 3 – 6 months after the harvest period. This is particularly a serious challenge given that many smallholder farmers will usually need to buy again grains for household consumption when prices have significantly shot up. Others process their maize to meet national standards and sell it to the Millers for processing and National Cereals and Produce Board for the strategic grain reserves.

The main purpose of this module is, therefore, to safeguard the gains farmers are expected to make from productivity enhancement, by addressing the twin problems of high postharvest losses and access to profitable markets through adoption of the postharvest TIMPs. Large scale dissemination of the available climate smart TIMPs through farmer awareness, training and demonstrations can reduce these losses from the current estimated levels of 30% to the industry acceptable levels of below 5%. This module introduces service providers and lead farmer trainers to maize postharvest value chain, constraints and opportunities in maize postharvest value chain and climate smart and gender friendly postharvest TIMPs for minimizing the losses and enhancing quality of the grain.

10.2 Module Learning Outcomes

By the end of the module the participants should be able to:

1. Whole range of postharvest practices for maize explained.
2. Constraints and opportunities in maize postharvest value chain explained.
3. Climate smart and gender friendly postharvest TIMPs for minimizing the losses and enhancing quality of the grain explain.

10.3 Module Target Group

This module targets agricultural extension service providers based at sub county and ward level. It can also be useful for private extension service providers.

10.4 Module Users

This module is intended for use by master trainers who are members of the CTT and Lead Farmers in the maize value chain target Counties. The trainers using this module should thoroughly

familiarize themselves with the participant’s handouts (training materials).

10.5 Module Duration

The module is estimated to take **3 hours 25 minutes**.

10.6 Module Summary

Module 10: Maize Harvesting and Postharvest management			
Sessions	Training Methods	Training Materials	Time
10.6. 1 Introduction, Expectations Objectives	<ul style="list-style-type: none"> • Personal introduction • Group work • Plenary presentation 	<ul style="list-style-type: none"> • Flip charts • Felt pens • PowerPoint / projector 	30 minutes
10.6.2 Constraints and opportunities in postharvest handling of maize	<ul style="list-style-type: none"> • Group Exercise • Plenary presentations 	<ul style="list-style-type: none"> • Flip charts • Participants’ hand-outs • Maize TIMPs manual • Videos 	45 minutes
10.6.3 Maize postharvest chain TIMPs <ul style="list-style-type: none"> • Maturity indices and harvesting of maize • Field drying of maize before threshing • Threshing of maize (manual threshing, mechanised threshing) • Winnowing • De-stoning • Metal silos • Maize stores – design and location, protection from rodents 	Group work <ul style="list-style-type: none"> • Brainstorming sessions • Plenary presentation • Practical demonstration 	<ul style="list-style-type: none"> • PowerPoint • Participants’ hand-outs • Maize TIMPs manual • Materials for demos (tarpaulins, metal silos, threshers, grain moisture meters, among others) • Video 	1 hours 30 minutes
10.6.4 Module review	<ul style="list-style-type: none"> • Facilitator’s summary • Group Exercise 	<ul style="list-style-type: none"> • Flip charts • Projector • Module evaluation forms 	30 minutes
TOTAL			3 hours 15 minutes

10.7 Facilitator's guidelines

Module 9. Maize Harvesting and Postharvest management	
<p>10.7.1 Introduction and levelling of expectations and objectives (30 minutes)</p> <p><i>(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations).</i></p> <p>Introduction and Module Objectives (15 minutes) <i>(The facilitator presents module's objectives)</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Explain the whole range of postharvest practices for maize. • Explain the constraints and opportunities in maize postharvest value chain. • Explain climate smart and gender-friendly postharvest TIMPs for minimizing the losses and enhancing quality of the grain. <p>Expectations (15 minutes) Guide the trainees to state their expectations based on the objectives</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • Hand-outs • Training program • Note books • Pens • PowerPoint presentation <p>Summarize trainees' expectations and display on flip chart/board.</p>
<p>10.7.2 Constraints and opportunities in postharvest handling of maize (45 minutes)</p> <p><i>(Facilitator highlights the maize postharvest value chain-harvesting, drying, threshing, storage, among others)</i></p> <p>Group work (30 minutes)</p> <ul style="list-style-type: none"> • Trainees discuss constraints in the postharvest handling of maize, and suggest solutions <p>Group presentation (15 minutes) Trainees present results of group work in plenary</p>	<p>Session Guide</p> <p>Use PowerPoint Hand-outs</p> <ul style="list-style-type: none"> • Maize manual • Brochures • Leaflets • Factsheets

10.7.3 Maize postharvest value chain TIMPs (1 hour 30 minutes)

Session Guide

(Facilitator uses slides to train)

PowerPoint Presentation (50 minutes)

PowerPoint presentation on the operations in the maize postharvest chain highlighting:

- Maturity indices and harvesting of maize (importance of harvesting at the right maturity index, advantages and disadvantages of harvesting too early or too late)
- Preparations farmers need to make prior to harvesting
- Maize harvesting methods
- Field drying of maize before threshing
- Threshing (manual vs. mechanized threshing)
- Winnowing
- Sorting and grading
- De-stoning
- Maize quality standards
- Metal silos
- Maize stores – design and location, protection from rodents, e.g. rat-proof cages / cribs, among others.
- The correct moisture content for storage
- Precautions during storage

Video presentation (10 minutes)

Trainees watch a video on threshing of maize, metal silo and grain storage

Practical demonstrations (30 minutes)

- Threshing of maize
- Sorting and grading (a sample of maize purchased from the market and grading into various grades with reference to existing standards)

- Power point

- Handouts
- maize manual
- Brochures
- Leaflets

Materials for demos (maize, hermetic bags, metal silos, threshers, grain moisture meters, among others);
Video

10.7.4 Training review (30 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Plenary presentation (10 min) Summarize the main points of the training.</p> <p>Group Exercise (10 min) Together with the trainees review the main points about maize post-harvest handling.</p> <ul style="list-style-type: none"> • What skills did you learn from this module? • What are some of the problems and issues that you have become more aware of in harvesting and post harvesting? • What questions do you still have about post-harvest handling? 	<p>Summary of the main points from the module</p>

10.8 Reference Materials

10.8.1 Participant's Handouts

1. Factsheets
2. Maize TIMPs manual
3. Maize production guides
4. Maize leaflets

MODULE 11

MAIZE VALUE ADDITION

11.1 Introduction

Maize is a major food crop in Kenya. Maize value addition (production, processing and distribution) in Kenya does not only provide food security to the population, but is also a source of livelihood in form of employment generation. Maize displays a rather impressive nutrition profile, encompassing all the essential macronutrients and micronutrients. This include carbohydrates, fibres, fats, and proteins, along with key micronutrient-vitamins and minerals. It has low negligible of cholesterol and sodium, to promote heart wellness. It's also rich in vitamin C and E which boost immunity. This module introduces farmer trainers to the importance of maize in addressing food and nutrition security at the household level, community level and industrial level. The module also covers constraints in value addition and consumption of maize and their suggested solutions, and various maize value added products. It is anticipated that developments in processing and value addition will enhance production and consumption of maize, and hence enhance food and nutrition security.

11.2 Module Learning Outcomes

By the end of the module, the following outcomes should be achieved:

1. The role of maize as a food and nutrition security crop explained and appreciated.
2. Nutritional composition of maize, health benefits, food security and income described.
3. Constraints in value addition and consumption of maize and suggested solutions identified.
4. Maize-based value added products identified and explained.

11.3 Module Target Group

This module targets public and private extension agents, service providers and lead farmers.

11.4 Module Users

This module is intended for use by Master trainers who are members of the Core Team of Trainers (CTT) and Lead Farmers in the maize value chain target Counties. The trainers using this module should thoroughly familiarize themselves with the participant's handouts (training materials).

11.5 Module Duration

The Module is estimated to take **6 hours**.

11.6 Module Summary

Module 11 Maize value addition			
Sessions	Training Methods	Training Materials	Time
11.6.1. Introduction, Objectives Expectations	<ul style="list-style-type: none"> • Personal introduction • Group work • Plenary Presentation 	<ul style="list-style-type: none"> • Flip charts • Projector • Laptop 	30 minutes
11.6.2 Role of Maize as a food and nutrition security crop	<ul style="list-style-type: none"> • PowerPoint Presentation • Group exercise • Plenary Presentation 	<ul style="list-style-type: none"> • Flip charts • Felt pens • Projector • laptop • Participants' handouts 	30 minutes
11.6.3. Nutritional composition of Maize and its role in human health	<ul style="list-style-type: none"> • PowerPoint • Plenary presentation • Group exercise 	<ul style="list-style-type: none"> • PowerPoint presentation • Flip charts • Felt pens • Participant handouts 	1 hour
11.6.4. Constraints in value addition and consumption of Maize	<ul style="list-style-type: none"> • Group exercise • Plenary Presentation 	<ul style="list-style-type: none"> • List of value added products • Checklist for prioritization • Pair wise ranking tool • Flip charts • Felt pens • Participants' handouts • Projector • Laptop 	1 hour
11.6.5 Maize based value added products:	<ul style="list-style-type: none"> • Plenary Presentations • Plenary discussion • Practical demonstration • Sensory evaluation of value added Maize products • Field visit to processing firms / groups 	<ul style="list-style-type: none"> • Projector • Laptop • Participant handouts • Assorted value addition equipment and ingredients (Maize, corn starch, among others.) • Sensory evaluation forms 	2 hours 30 minutes
11.6.6. Module review	<ul style="list-style-type: none"> • Plenary discussion • Presentations 	<ul style="list-style-type: none"> • Flip charts • PowerPoint presentations • Module evaluation forms 	30 minutes
TOTAL			6 hours

11.7 Facilitator's Guidelines

Module 11. Maize value addition	
11.7.1 Introduction, expectations and objectives (30 minutes)	
<p>Introduction and expectations (15 minutes) <i>(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations),</i></p> <p>Module Objectives (15 minutes) <i>(The facilitator presents modules objectives).</i> By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate the role of maize as a food and nutrition security crop. • Describe nutritional composition of maize, health benefits, food security and income. • Identify constraints in value addition and consumption of maize, and suggest solutions. • Explain how to make maize-based value added products. 	<p>Session Guide</p> <ul style="list-style-type: none"> • Participants' hand-outs • PowerPoint Presentation • Summarize trainees' expectations and display on flip chart/board.
11.7.2 Role of maize as a food and nutrition security crop (30 minutes)	
<p><i>(The facilitator presents on malnutrition cases in Kenya and the importance of maize in addressing food security and malnutrition challenges)</i></p> <p>Plenary Presentation (15 minutes) PowerPoint presentation highlighting the critical elements:</p> <ul style="list-style-type: none"> • Micronutrient malnutrition cases in Kenya • Dietary nutrient requirements (focusing on VMGs) <p>Group Exercises (15 minutes) Trainees discuss in groups, the main malnutrition challenges in their respective counties / regions</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint presentation • Participants' hand-outs • Recipe books • Sample Maize and other processing ingredients • Group exercise
11.7.3 Maize nutritional composition and impact of consumption on human health (1 hour)	
<p>Plenary presentation (1 hour)</p> <ul style="list-style-type: none"> • Overview of the documented Maize nutritional composition and their role in human health and nutrition 	<ul style="list-style-type: none"> • PowerPoint • Participant hand-outs • Brochures, leaflets, manual, factsheets, posters

11.7.4. Constraints in value addition and consumption of Maize, and suggested solutions (1 hour)	Session Guide
<p>Group exercise (45 min) Groups discuss the constraints in Maize value addition and consumption</p> <p>Plenary presentation (15 min) Overview of constraints in value addition and consumption of Maize</p>	<ul style="list-style-type: none"> • PowerPoint presentation • Group Exercise
11.7.5 Maize based value added products (2 hours 30 minutes)	Session Guide
<p>Plenary presentation (30 min)</p> <ul style="list-style-type: none"> • Overview of maize based value added products • Meaning of value addition • Requirements for value addition of maize • Maize based value added products; sensory evaluation of the products <p>Practical exercise (2 hours)</p> <ul style="list-style-type: none"> • Demonstration on formulation of maize based products • Practical on sensory evaluation of value added maize products 	<ul style="list-style-type: none"> • Hand-outs • Maize manual • Brochures • Leaflets • Recipes • Sensory evaluation forms • Assorted value addition equipment and ingredients
11.7.6 Training review (30 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i> Review the main points about maize value addition together with the trainees.</p> <ul style="list-style-type: none"> • What new things did you learn from this module? • What are some of the problems and issues that you have become more aware of in maize value addition? • What questions do you still have about maize value addition? 	<p>Summary of the main points from the Module.</p>

11.8 Reference Materials

11.8.1 Participants' Handouts

- Maize Manual
- Pamphlets, leaflets.
- Recipe books

MODULE 12

MECHANIZATION OF MAIZE PRODUCTION ACTIVITIES

12.1 Introduction to the module

Modern agricultural mechanization supports production and profitability in agriculture by achieving timeliness, quality, quantity, entrepreneurship and reduced drudgery in farm operations. It brings along precision in metering and appropriate placement of inputs therefore reducing available input losses and increases utilization efficiency of costly inputs (seed, chemical, fertilizer, irrigation among others.). Overall, mechanization reduce unit cost of production, enhancing profitability and competitiveness in the Maize value chain.

Mechanization when applied in processing, helps in the conservation of agricultural produce and by-products from qualitative and quantitative damages; enables value addition and establishment of agro processing enterprises for additional income and employment generation from farm produce. It is one of the important inputs that has potential to revolutionize maize farming in Kenya especially when applied to seedbed preparation, planting, weeding, pest control, harvesting and post-harvest activities.

12.2 Module Learning outcomes

By the end of the module, the following should be achieved:

1. Climate smart tillage operations explained and appreciated.
2. Knowledge of calibration of fertilizer and seed rates for planters enhanced and applied.
3. Use of pest control implements and tools explained and demonstrated.
4. Harvesting explained and demonstrated.
5. Machine and procedure for shelling explained and demonstrated.

12.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents.

12.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The facilitator using this module should thoroughly familiarize themselves with the participant's handouts/factsheets.

12.5 Module Duration

The module is estimated to take a minimum of **4 hours**.

12.6 Module Summary

Module 11: Mechanization of Maize production activities			
Sessions	Training methods	Training materials	Duration
12.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> • Personal introductions/ know your audience • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flips charts • Power Point Presentations • Laptop • Projector 	30 minutes
12.6.2 Climate smart tillage options	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • Power Point presentation • Participants Handouts • Laptop • Projector 	30 minutes
12.6.3 Calibration of fertilizer and seed rates for planters	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • Laptop • Projector • PowerPoint presentation • Participants Handouts • Practical 	45 minutes
12.6.4 Weed control equipment and tools, usage	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • Laptop • Projector • PowerPoint presentation • Participants Handouts • Practical 	45 minutes
12.6.5 Harvesting	<ul style="list-style-type: none"> • Presentations • Plenary discussions 	<ul style="list-style-type: none"> • Flip chart • PowerPoint presentation • Participants Handouts • Practical • Laptop • Projector 	30 minutes
12.6.6 Shelling	<ul style="list-style-type: none"> • Presentations • Plenary discussions • Demonstrations 	<ul style="list-style-type: none"> • Flip chart • PowerPoint presentation • Participants Handouts • Practical • Laptop • Projector 	30 minutes

12.6.7 Model review	<ul style="list-style-type: none"> • Presentations • Plenary Discussions 	<ul style="list-style-type: none"> • Flip Charts • Hand outs • Laptop • Projector 	30 minutes
Total			4 hours

12.7 Facilitator’s Guidelines

Module 12: Mechanization of maize production activities	
<p>1.1.1 Introduction (30 minutes)</p> <p><i>(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations).</i></p> <p>Module Objectives (30 minutes) <i>(The facilitator presents modules objectives)</i></p> <p>By the end of the module the trainee should be able to:</p> <ul style="list-style-type: none"> • Appreciate and explain various climate smart tillage operations. • Calibrate fertilizer and seed rates for planter • Demonstrate usage of pest control equipment and tools • Demonstrate mechanized harvesting options • Demonstrate machine and procedure for maize grading 	<p>Session Guide</p> <ul style="list-style-type: none"> • Summarize Trainees’ “Expectations” and display. • PowerPoint Presentation • Distribute Participants Handouts on Module Objectives and Training Program
<p>12.7.2. Maize climate smart tillage options (45 hours)</p> <p><i>(The facilitator presents on climate smart land preparation tools)</i></p> <p>Plenary Presentation (30 minutes)</p> <ul style="list-style-type: none"> • Overview of the maize mechanization activities • Climate smart tillage options <p>Discussion (15 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint Presentation • Distribute Participants Handouts • Brochures, leaflets and manual • All trainees

12.7.3. Maize calibration of fertilizer and seed rate for planters (30 hour)	Session Guide
<p>Plenary Presentation (20 minutes)</p> <p><i>PowerPoint Presentation Highlighting on:</i></p> <ul style="list-style-type: none"> Techniques and methods of planter seed and fertilizer rate determination <p>Discussion (10 Minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> PowerPoint Presentation Distribute Participants Handouts Brochures, leaflets and manual
12.7.4 Machine pest control operations (30 hour)	Session Guide
<p>Plenary Presentation (20 minutes)</p> <p><i>PowerPoint Presentation Highlighting on:</i></p> <ul style="list-style-type: none"> Techniques and methods of using maize pest control tools and equipment <p>Discussion (10 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> PowerPoint Presentation Distribute Participants Handouts Brochures, leaflets and manual
12.7.6. Maize harvesting machine operating principles (15 minutes)	Session Guide
<p>Plenary Presentation (10 minutes)</p> <p><i>PowerPoint Presentation Highlighting on:</i></p> <ul style="list-style-type: none"> Harvesting <p>Discussion (5 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> PowerPoint Presentation Distribute Participants Handouts Brochures, leaflets and manual
12.7.7. Maize harvesting machine operating principles and grading (15 minutes)	Session Guide
<p>Plenary Presentation (10 minutes)</p> <p><i>PowerPoint Presentation Highlighting on:</i></p> <ul style="list-style-type: none"> Shelling Grading <p>Discussion (5 Minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> PowerPoint Presentation Distribute Participants Handouts Brochures, leaflets and manual

12.7. 8 Module review (30 hour)	Session Guide
<p><i>The facilitator leads trainees in reviewing the module)</i></p> <p>Summarize the main points of the training and together with the trainees review the main points:</p> <ul style="list-style-type: none"> • Various climate smart tillage operations • Calibration of fertilizer and seed rate for planters • Pest control implements and tools operation • Harvesting machine operating principles • Procedures for shelling and grading <p><i>(Discuss with trainees about new skills and ideas learnt from this Module. What are some of the problems and issues that they have become more aware of in the module?)</i></p>	<ul style="list-style-type: none"> · The last Participants' Handouts · Summary of the main points on from the module on a flip chart and display

12.8 Reference Materials

12.8.1 Participants' Handouts

- Mechanization fact sheets
- Maize production manual

MODULE 13

MAIZE BUSINESS AND MARKETING

13.1 Introduction

Maize is an important food and income generation crop in Kenya. It can be used as food, feed for animals and as a source of industrial raw material. It contributes to about 65% of daily per capita cereal consumption and maize accounts for over 20% of the total agricultural production and 25% of agricultural employment in the country (Government of Kenya, 2020; FAOSTAT, 2020). This module is designed to train Trainer of Trainers (ToTs) in skills that are useful in Maize farming business and marketing in Kenya.

Maize is produced in more than 90% of the households in Kenya. The main maize growing regions are subdivided into six agro-ecological zones, namely, coastal lowlands (CL), Mid medium altitude (MM), Dry Transitional (DT), Moist transitional (MT), Central and parts of Eastern, MT western Kenya, and the Highlands. Maize is an important food crop in Kenya and provides diet to the majority population. Total area under maize is estimated at about 1.5million hectares with an annual production of about 4 million metric tons against a consumption of 4.6million metric tons with deficit bridged by imports. The leading region in terms of production are the highlands, traditionally referred to as the bread basket of the country. The growth of maize production in Kenya has not matched the population increase and as a result the country faces periodic maize shortages. The irony is that when there is maize glut in the highlands, some areas of the country have shortages, a dilemma that has occurred over the years. While the National Cereals and Produce Board (NCPB) was supposed to address this producers' dilemma, it has not been successful in distributing maize to deficit areas hence, resulting in losses to farmers due to low pricing. There is therefore need to upgrade the maize value chain through business and marketing transformation.

13.2 Module Learning Outcomes

By the end of this module training, the following training outcomes must be achieved:

1. Business concept emerging farming business models for organizing farmer groups described and appreciated.
2. Skills for building a business plan acquired.
3. Facilitating marketing as a group - collective marketing described and explained
4. Profitability analysis - Reviewing maize agro-enterprise performance explained.
5. How to facilitate a viable scaling up plan described and explained.

13.3 Module Target Group

This module targets agricultural extension, service providers and lead farmers.

13.4 Module Users

This module is intended to be used by a Master Trainer who is among the members of the core team trainers. The facilitator using this module should thoroughly familiarize and avail the participants' hand-outs.

13.5 Module Duration

The module is estimated to take **3 hours 25 minutes**

13.6. Module Summary

Module 13. Maize Business and Marketing			
Sessions	Training Methods	Training Materials	Time
13.6.1 Introduction to the module and trainees expectations	<ul style="list-style-type: none"> • Personal introduction • Discussion 	<ul style="list-style-type: none"> • PowerPoint • Flip charts • Laptop • Projector 	15 minutes
13.6.2 Module introduction and objectives	<ul style="list-style-type: none"> • Personal introduction • Plenary presentations 	<ul style="list-style-type: none"> • Flip charts • PowerPoint presentations • Projector • Laptop 	15 minutes
13.6.3 Business concept and emerging farming business models	<ul style="list-style-type: none"> • Plenary presentations • Plenary Discussion 	<ul style="list-style-type: none"> • Power point presentation • Flip charts, pelt pens • Laptop • Projector 	30 minutes
13.6.4. Building a business plan	<ul style="list-style-type: none"> • Plenary presentations 	<ul style="list-style-type: none"> • PowerPoint presentations • Laptop • Projector 	30 minutes
13.6.5 Marketing as a group - collective marketing	<ul style="list-style-type: none"> • Plenary presentations • Plenary Discussion 	<ul style="list-style-type: none"> • PowerPoint presentations • Laptop • Projector 	15 minutes
13.6.6 Profitability analysis – Evaluating maize agro-enterprise performance	Plenary presentations	<ul style="list-style-type: none"> • PowerPoint presentations • Laptop • Projector 	15 minutes
13.6.7 Scaling up plan	Plenary presentations	<ul style="list-style-type: none"> • PowerPoint presentations 	15 minutes
13.6.8 Contracted production model	Plenary presentations	<ul style="list-style-type: none"> • PowerPoint presentations • Laptop • Projector 	15 minutes
13.6.9 Maize marketing entrepreneurship model	<ul style="list-style-type: none"> • Plenary presentations 	<ul style="list-style-type: none"> • PowerPoint presentations • Laptop • Projector 	15 minutes

13.6.10 Internet/mobile marketing	<ul style="list-style-type: none"> • Plenary presentations 	<ul style="list-style-type: none"> • PowerPoint presentations • Laptop • Projector 	15 minutes
13.6.11. Training review	<ul style="list-style-type: none"> • Facilitator’s summary: Takeaways 	<ul style="list-style-type: none"> • Module review • Participants • Hand-outs 	15 minutes
TOTAL			3 hours 25 minutes

13.7 Facilitator’s Guidelines

Module 13. Maize Business and Marketing	
13.7.1 Introduction to the module and trainees expectation (15 minutes)	Session Guide
<p><i>(The facilitator welcomes trainees to the module and them to introduce themselves and state their expectations.)</i></p> <p>Plenary discussion</p> <p>Listed trainees expectations</p>	<ul style="list-style-type: none"> • Summarize trainees’ “expectations” and display on flip chart/board. • Handouts • Program • Note books • pens • PowerPoint slides
13.7.2 Module objectives (15 minutes)	
<p><i>(The facilitator introduces the module and states the objectives and expectations)</i></p> <p>By the end of this module, trainee should be able to:</p> <ul style="list-style-type: none"> • Describe and appreciate business concept emerging farming business models for organizing farmer groups • Acquire skills for building a business plan • Describe and explain how to facilitate marketing as a group - collective marketing • Explain profitability analysis - Reviewing maize agroenterprise performance • Describe and explain how to facilitate a viable scaling up plan. 	<ul style="list-style-type: none"> • PowerPoint slides • Factsheets

13.7.3 Business concept and emerging farming business models (10 minutes)		Session Guide
<p><i>(The facilitator to highlight elements of business concept and emerging farming business models)</i></p> <p>Plenary Presentation (5 minutes)</p> <p>Make presentation on the business concept and emerging farming business models</p> <p>Group Exercise (5 minutes)</p> <p>Discuss areas of improvement in the models</p>		<ul style="list-style-type: none"> • PowerPoint slides • Handouts • Flipcharts
13.7.4 building a business plan (20 minutes)		Session Guide
<p><i>(The facilitator highlights the components of a business plan and how to build it)</i></p> <p>Plenary Presentation (15 minutes)</p> <p>Plenary Discussion (5 minutes)</p>		<ul style="list-style-type: none"> • Handouts • Flip charts, • Manila papers, • Pelt pens
13.7.5 Marketing as a group - collective marketing (10 minutes)		Session Guide
<p>Plenary Presentation (5 minutes)</p> <p><i>(The facilitator describes how the farmers should organize themselves to market maize)</i></p> <ul style="list-style-type: none"> • Advantages of collective marketing • Problems with collective marketing • Organizing collective marketing <p>Plenary Discussion (5 minutes)</p>		<ul style="list-style-type: none"> • Use power point • Handouts
13.7.6 Profitability analysis – Evaluating Maize agro-enterprise performance (10 minutes)		Session Guide
<p>Plenary Presentation (5 minutes)</p> <p><i>(The facilitator highlights the usefulness of the profitability analysis)</i></p> <ul style="list-style-type: none"> • Reworking the profitability analysis using actual amounts of produce that were sold, actual material and labour costs and actual sales prices • Reworking sales amounts with the farmers in the group to determine their levels of profit • Calculating costs, income and profits <p>Plenary Discussion (5 minutes)</p>		<ul style="list-style-type: none"> • Use power point • Handouts

13.7.7 Scaling up plan (10 minutes)	Session Guide
<p>Plenary Presentation (10 minutes)</p> <p><i>(The facilitator highlights how farmers begin to organize a new plan with higher targets, or more lucrative markets and more farmers involved in production and sales, to target buyers)</i></p> <ul style="list-style-type: none"> • Reviewing market strategy • Fixing the new target • Identifying the appropriate scaling method 	<ul style="list-style-type: none"> • Use power point • Handouts
13.7.7 Contracted production model (10 minutes)	Session Guide
<p>Plenary Presentation (5 minutes)</p> <p><i>(The facilitator highlights the details of contracted maize production)</i></p> <ul style="list-style-type: none"> • Essence and objectives of contract farming • Key components of a contract • Benefits and challenges in implementation of contracts • Critical issues to look at before signing a contract • The role of government and its arms in contract management <p>Plenary Discussion (5 minutes)</p>	<ul style="list-style-type: none"> • Use power point • Handouts
13.7.8 Maize marketing entrepreneurship model (10 minutes)	Session Guide
<p>Plenary Presentation (5 minutes)</p> <p><i>(The facilitator highlights the characteristics of farmers as entrepreneurs).</i></p> <ul style="list-style-type: none"> • The role of entrepreneurship in Maize marketing • The characteristics of farmers as entrepreneurs <p>Plenary Discussion (5 minutes)</p>	<ul style="list-style-type: none"> • Use power point • Handouts

13.7.9 Internet/mobile marketing (10 minutes)	Session Guide
<p>Plenary Presentation (5 minutes)</p> <p><i>(The facilitator highlights the usefulness of Internet/mobile marketing)</i></p> <ul style="list-style-type: none"> • Advantages of internet/mobile marketing • How to interact with buyers through the use of internet <p>Plenary Discussion (5 minutes)</p>	<ul style="list-style-type: none"> • Use power point • Handouts
13.7.10 Training review (5 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module. Conclude by thanking the trainees)</i></p> <p>Plenary Discussion (5 minutes)</p> <p>Summarize the main points of the training.</p>	<p>Summary of the main points from the Module.</p>

13.8 Reference Materials

References

1. FAOSTAT. 2020. FAOSTAT Statistics Division: Agricultural data, Food and Agriculture Organization of the United Nations, Rome, Italy, 2020.
2. Government of Kenya. 2020. Central Bureau of Statistics for 2020, Nairobi, Kenya.
3. Agricultural Marketing Manual

MODULE 14

MAIZE CROSS-CUTTING ISSUES (AGRICULTURAL INNOVATION PLATFORMS, POLICY, GENDER MAINSTREAMING AND SOCIAL INCLUSION)

14.1 Introduction

The module on cross-cutting issues comprises issues that influence the uptake and up-scaling of TIMPs within the Maize value chain. The issues are namely Agricultural Innovation Platforms, Gender and social-environmental concerns and Climate smart agricultural policy.

Agricultural Innovation Platforms provide a forum for stakeholders to interact and develop technical, institutional and organizational innovations to solve value chain challenges. Additionally, Gender and social-environmental concerns are considerations aimed at providing appropriate solutions to value chain challenges with due regard to graduated gender considerations. Finally, Climate smart agricultural policy creates awareness on policy formulation and the various regulations that are put in place to facilitate the development of value chains. The methodology of delivery for each of these sub modules are presented here.

SUB-MODULE 14.1: AGRICULTURAL INNOVATION PLATFORMS

14.1.1 Introduction

This module exposes the extension staff, service providers, lead farmers and facilitators to an innovation systems based configuration of stakeholders called the Agricultural Innovation Platform (AIP). It is an organizational model for stimulating innovation and development and brings actors together in a way that pools together skills and knowledge to address challenges and utilize opportunities. The AIP configuration emanated from the realization that innovations arise from multiple sources and have to be adapted to specific contexts. The adaptation process requires systems that foster partnerships and reflexive institutions which allow for learning and innovation. The actors or partners within innovation platforms include individuals, private and public sector organizations, policy makers and other value chain stakeholders. These actors are brought together to seek technical, institutional or organizational solutions to a critical challenge hindering agricultural productivity within a value chain. The Agricultural Innovation Platform facilitates actors to interact, innovate, learn and change with time as they seek a solution to the common challenge. In an innovation platform every actor's contribution is valued and benefits accrue to all in a win-win situation. The AIP is a useful methodology for developing, testing and scaling of innovations in the Maize value chain.

14.1.2 Sub-Module learning Outcomes

By the end of the module, the following outcomes must be achieved:

1. The definition of agricultural innovation systems and innovations clearly described and appreciated.

2. The characteristics of an innovation platform described.
3. Mobilization of stakeholders for initiation, establishment, management and sustainability of an Agricultural Innovation Platform explained and demonstrated.
4. The benefits and challenges of Innovation Platforms explained and appreciated.

14.1.3 Sub-Module Target Group and Categories

The target users are public county extension officers, private agricultural service providers, and lead farmers

14.1.4 Sub-Module Users

This sub-module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). The facilitator using this module should thoroughly familiarize themselves with the participants' handouts.

14.1.5 Sub-Module Duration

The sub-module is estimated to take a duration of **3 hours**

14.1.6 Sub-Module Summary

Sub-Module 14.1: Agricultural Innovation Platforms (AIP)			
Sessions	Training methods	Training materials	Time
14.1.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> • Personal introduction • Plenary Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Projector • Laptop • PPT presentation 	20 minutes
14.1.6.2 Definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational)	<ul style="list-style-type: none"> • PowerPoint Presentations • Plenary discussion • Group exercise 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Projector • Laptop • PPT presentation 	30 minutes
14.1.6.3 Characteristics of an Agricultural Innovation Platform	<ul style="list-style-type: none"> • PowerPoint Presentation • Plenary discussion 	<ul style="list-style-type: none"> • Flip charts • Felt pens • Projector • Laptop • PPT Presentation • Participants Handouts 	30 minutes
14.1.6.4 Phases of an innovation platform (Initiation, Establishment, Management and Sustainability)	<ul style="list-style-type: none"> • PowerPoint presentations • Plenary discussion • Group Exercise 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Projector • Laptop • Handouts • PPT Presentation 	45 minutes

14.1.6. 5 Case studies of successful Agricultural Innovation Platforms	<ul style="list-style-type: none"> • PowerPoint presentations • Plenary discussion • Role plays 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Projector • PPT Presentation • Laptop • Participants' handouts 	15 minutes
14.1.6. 6 Benefits and challenges of Agricultural Innovation Platforms	<ul style="list-style-type: none"> • PowerPoint presentations • Plenary discussion Role plays 	<ul style="list-style-type: none"> • Flips charts • Felt pens • Projector • Laptop • PPT presentation • Participants' handouts 	10 minutes
14.1.6.7 Module review	<ul style="list-style-type: none"> • Discussion 	<ul style="list-style-type: none"> • Flip Charts • Felt pens • Fact Sheets 	30 minutes
Total			3 hours

14.1.6 Facilitator's Guidelines

Sub Module 14.1: Agricultural Innovation Platform (AIP)

14.1.6.1 Introduction, expectations and objectives (20 minutes)

Session Guide

Introduction

(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations).

Module Objectives

(The facilitator presents modules objectives).

By the end of the module, the trainee should be able to:

- Define agricultural innovation systems, innovation process and innovations.
- Describe characteristics of an innovation platform.
- Describe how to initiate, establish, manage and sustain an agricultural Innovation Platform.
- Describe the benefits and challenges of Agricultural innovation platforms.

- Summarize Trainees' "Expectations" and display.
- PowerPoint Presentation

13.1.6.2 A definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational) (30 minutes)

Session Guide

- Past progression of research and extension models and their shortcomings.
- Agricultural Innovation Systems model and actualization through Agricultural Innovation Platforms.
- Definition of innovation process.
- Types of innovations (products of innovation process).

- PowerPoint Presentation
- Plenary discussion

14.1.6.3. Characteristics of an Agricultural Innovation Platform (30minutes)	Session Guide
<p><i>(The facilitator should present an overview of innovation platforms and their main characteristics).</i></p> <p>Plenary Presentation (30 minutes)</p> <ul style="list-style-type: none"> • Characteristics of Agricultural Innovation Platforms • Why Agricultural innovation platforms are used • Where to form Agricultural Innovation Platforms • Establishment of linkages between value chain actors in agricultural innovation platforms <p>Plenary discussion (15 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint Presentation • Participants' handouts • Plenary discussion
14.1.6.4 Phases of an innovation platform (Initiation, Establishment, Management and Sustenance (45 minutes)	Session Guide
<p>Plenary Presentation (45 minutes)</p> <p>Initiation phase</p> <ul style="list-style-type: none"> • Mobilization of stakeholders in the Maize value chain for challenge identification • General description of the value chain within a specific area <p>Establishment Phase</p> <ul style="list-style-type: none"> • Clear prioritization of the key value Chain challenge or compelling agenda in the (weakness in the chain) • Vision of the AIP formulated with clear goals • Development of a business plan with clear milestones to guide operations of the AIP • Formation of a main committee to coordinate platform activities. • Formation of diverse sub-committees with clear roles <p>Management Phase</p> <ul style="list-style-type: none"> • Keeping stakeholders focused on the business plan to ensure an inclusive and transparent process. • Neutral facilitation to ensure joint strategy building and action and the coordination of support activities. • Managing emerging experts taking up leading roles and issues as champions. <p>Sustainability and scaling Phase</p> <ul style="list-style-type: none"> • Changing roles of initiator, local stakeholders and Private sector • Local stakeholders lead and own AIP while Initiator backstops and private sector supports and seize opportunity • Embarking on fresh issues or challenges • Maintaining capacity acquired to address new issues or challenges in subsequent cycles. <p>Plenary discussion (10 minutes)</p> <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • PowerPoint Presentation • Participants Handouts • Plenary discussion

14.1.7. 5 Case studies of successful AIPS (15 minutes)	Session Guide
<p>Plenary Presentation and discussion</p> <ul style="list-style-type: none"> • successful innovation platforms and their achievements 	<ul style="list-style-type: none"> • PowerPoint Presentation • Plenary discussion
14.1.7. 6 Benefits and challenges of AIPS (10 minutes)	Session Guide
<p>Plenary Presentation</p> <ul style="list-style-type: none"> • Benefits of Agricultural innovation platforms • Challenges of Agricultural Innovation platforms 	<ul style="list-style-type: none"> • PowerPoint Presentation • Plenary discussion
14.1.6.5. Module review (30 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summarize the main points of the training and together with the trainees review the main points on:</p> <ul style="list-style-type: none"> • Agricultural Innovation Systems, Innovation process and different Innovations • AIP characteristics, why and where to form them • The four Phases of Innovation Platforms • The benefits and challenges of innovation Platforms <p><i>(Discuss with trainees new skills and ideas learnt from this module. What are some of the problems and issues that they have become more aware of in the module?)</i></p>	<ul style="list-style-type: none"> • Participants’ Handouts • Summarize the main points from the module on a flip chart and display

14.1.7 Reference Materials

14.1.7.1 Participants’ Handouts

Kamau G.M. (2020) Agricultural Innovation Platform Factsheet

Kamau G.M. (2020) Agricultural Innovation Platform Phases Fact sheets

14.1.7.2References

1. Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional change
2. Makini F., Mulinge W., Mose L., Salasya B., Kamau G., Makelo M., and On’gala, J. (2018). Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya. FARA Research Results Vol2(6)
3. Makini F., Kamau G., Makello M., Adekunle A., Mburathi G., (2013). Operational field guide for developing and managing local agricultural innovation platforms KARI ISSN 978-9966-30-004-1

SUB-MODULE 14.2 MAIZE GENDER, VULNERABLE AND MARGINALIZED GROUPS (VMGs), SOCIO, ENVIRONMENTAL CONCERNS AND COHESION

14.2.1 Introduction to the Sub-Module

Maize is a major agro-enterprise in the country involving all the gender categories (men, women, youth vulnerable marginalized groups (VMGs) in its value chain from production, marketing and consumption. Women perform most of the crop's production activities comprising weeding while men mostly perform the task of marketing.

Although the women's contribution is huge, gender inequalities still exist in all areas of the Maize value chain. Some gender inequalities include: division of labour, access to and control of resources and decision making within and beyond the household. These inequalities limit women, youth and VMGs access to benefits from the various Technologies, Innovations and Management Practices (TIMPs) at different nodes of the value chain. At the macro-level, effective participation of women and youth in groups and market activities is constrained by their low decision making power, lack of voice and access to financial resources. Gender analysis examines the productive, community and reproductive roles of men and women; access, control and ownership of resources; levels of power relations; differential needs, constraints and opportunities; and impact of these differences (positive/ negative) on lives of men, women, youth and the VMGs.

Maize value chain TIMPs interventions, when designed and implemented with gender equitable principles, can foster adoption leading to increased productivity as well as enhanced social and environmental impacts.

The overall objective of this sub module is to ensure that gender mainstreaming and social inclusion in Maize value chain are enhanced by the field agricultural practitioners and extension officers in an effort geared towards achieving Climate Smart Agriculture "triple win" in target counties.

14.2.2 Sub module learning outcomes

By the end of the training sub module, the following outcomes must be achieved:

1. The concept of gender mainstreaming and social inclusion in Maize value chain appreciated.
2. Youth empowerment in Maize value chain explained.
3. Women empowerment in Maize value chain explained and understood.
4. Strategies for inclusion of vulnerable and marginalized groups in Maize value chain understood and applied.
5. Knowledge on environmental and social management framework (ESMF) tool explained and demonstrated.

14.2.3 Sub module Target Group

This sub module is intended for service providers and county public extension agents

14.2.4 Sub module Users

This sub module is intended for use by master trainers who are members of the Core Team of Trainers (CTT). This module outlines the learning outcomes, the category of trainees targeted, module summary, and participants' handouts. The facilitator using this module should thoroughly familiarize themselves with the participant's handouts.

14.2.5 Sub module Duration

The sub module is estimated to take a duration of **3 hours and 30 minutes**.

14.2.6 Module Summary

Sub-Module 14.2: Gender mainstreaming and social inclusion in the Maize value chain			
Sessions	Training methods	Training materials	Duration
14.2.6.1 Introduction, expectations and objectives	<ul style="list-style-type: none"> • Personal introduction • Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • PowerPoint Presentation • Laptop • Participants' handouts 	30 minutes
14.2.6.2 Gender mainstreaming in Maize value chain	<ul style="list-style-type: none"> • PowerPoint Presentations • Group Exercise • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • PowerPoint Presentation • Participants handouts 	30 minutes
14.2.6.3 Youth empowerment in Maize value chain	<ul style="list-style-type: none"> • PowerPoint Presentations • Group exercise • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • PowerPoint Presentation • Participants handouts 	30 minutes
14.2.6.4 Women empowerment in Maize value chain	<ul style="list-style-type: none"> • PowerPoint Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • PowerPoint Presentation • Participants handouts 	30 minutes
14.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	<ul style="list-style-type: none"> • PowerPoint Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • PowerPoint Presentation • Participants handouts 	30 minutes
14.2.6.6 Environmental and Social Management Framework	<ul style="list-style-type: none"> • PowerPoint Presentations • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens • PowerPoint Presentation • Participants handouts 	30 minutes

14.2.6.7 Module Review	<ul style="list-style-type: none"> • Plenary discussion 	<ul style="list-style-type: none"> • Flips charts • Felt pens 	30 minutes
Total			3 hours 30 minutes

14.2.7 Facilitator’s Guidelines

Sub Module 14.2: Gender mainstreaming and social inclusion in Maize value	
14.2.7.1 Introduction, Objectives and Expectations (30 minutes) <i>(The facilitator welcomes trainees to the sub module and thereafter invites them to introduce themselves and state their expectations).</i> Sub module Objectives (30 Minutes) <i>The facilitator presents modules objectives</i> By the end of the module training, the trainee should be to: <ul style="list-style-type: none"> • Appreciate gender mainstreaming and social inclusion, in Maize value chain. • Explain youth empowerment in Maize value chain. • Appreciate women empowerment in Maize value chain. • Recognize strategies for inclusion of vulnerable and marginalized groups in Maize value chain. • Explain the environmental and social management framework (ESMF) tool. 	Session Guide <ul style="list-style-type: none"> • Summarize trainees “expectations” and display. PowerPoint Presentation • Group exercise • Objectives and Training Program
14.2.7.2 Gender mainstreaming and social inclusion in Maize value chain (30 minutes) <i>(The facilitator presents and explain what gender mainstreaming is, who does what activity, who has access to what resources among others. and why gender mainstreaming is important in Maize value chain).</i> Plenary Presentation (20 minutes) <ul style="list-style-type: none"> • Definition of gender • What is gender mainstreaming and why it is important? • Who does what? (gender division of roles in Maize value chain) • Who owns what? (access and control of resources & benefits) • Who makes which decisions? • Existing policies in support of gender mainstreaming. Group exercise and discussion (10 minutes) Let the trainees recall what they learned and discuss any issues that may arise	Session Guide <ul style="list-style-type: none"> • PowerPoint presentation, Group exercise • Plenary discussion • Participants’ handouts • Group exercise • Plenary discussion

<p>14.2.7.3 Youth empowerment in Maize value chains (1 hour)</p> <p>Plenary Presentation (40 minutes)</p> <ul style="list-style-type: none"> • Why agriculture is not attractive to youth • Youth's role in the value chain • Strategies to empower youth in Maize value chain. <p>Group exercise and discussion (20 Minute) Let the trainees recall what they learned and discuss any issues that may arise.</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint Presentation • Group exercise • Plenary discussion • Participants' handouts
<p>14.2.7.4 Women empowerment in Maize value chain (30 minutes)</p> <p>Plenary Presentation (20 minutes)</p> <ul style="list-style-type: none"> • Women's role in the value chain • Challenges facing women in the value chain • Strategies for empowering women in the value chain <p>Plenary discussion (10 minutes) Let the trainees recall what they learned and discuss any issues that may arise.</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint Presentation • Distribute participants' handouts • Plenary discussion • Participants' handouts
<p>14.2.7.5. Strategies for inclusion of vulnerable and marginalized groups in Maize value chain (30 minutes)</p> <p>Plenary presentation (20 min)</p> <ul style="list-style-type: none"> • Who are vulnerable and marginalized groups (VMGs) • Why gender inequality exists • Social inclusion and why • Strategies of inclusion of VMG. <p>Plenary discussion (10 minutes) Let the trainees recall what they learned and discuss any issues that may arise.</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint Presentation • Plenary discussion • Participants' handouts
<p>14.2.7.6. Environmental and social management framework (ESMF) (30 minutes)</p> <p>Plenary presentation (20 minutes)</p> <ul style="list-style-type: none"> • Objective of ESMF in Maize value chain • Environmental and social safeguards of Maize • Safeguard policies triggered by the project <p>Plenary discussion (10 minutes) Let the trainees recall what they learned and discuss any issues that may arise.</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint Presentation • Plenary discussion

14.2.7.7. Module review (30 minutes)	Session Guide
<p><i>The facilitator leads the participants in reviewing the module)</i> Summarize the main points of the training and together with the trainees review the main points:</p> <ul style="list-style-type: none"> • What is gender mainstreaming and why it is important? • Youth empowerment in Maize value chain • Women empowerment in Maize value chain • Strategies for inclusion of vulnerable and marginalized groups in Maize value chain • Environmental and Social Management Framework of maize activities. <p>Let the trainees recall what they learned and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> • Summary of the main points on from the module on a flip chart and display

14.2.8 Reference Materials

14.2.8.1 Participants' handouts

- Gender mainstreaming and social inclusion factsheets
- Gender mainstreaming and social inclusion guides

Reference

Commonwealth secretariat, (2001). Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and other stakeholders. Marlborough house, London.

SUB-MODULE 14.3 CLIMATE-SMART AGRICULTURAL POLICY OPTIONS

14.3.1 Introduction

Kenya adopted Vision 2030 in 2007 as a new blue print and roadmap for political, social and economic development of the country in the next two decades. The Vision identifies Agriculture as the engine of growth through transformation of smallholder and subsistence agriculture to innovatively and commercially oriented agriculture. Kenya promulgated the new constitution in 2010 with two levels of governments (national and county) having defined functions. Agriculture is one of the devolved governance functions. However, agriculture in Kenya faces many challenges and threats such as climate change, declining agricultural performance, limited high potential agricultural land and over-reliance on rain fed agriculture, limited diversification of Agricultural production, poor and inadequate rural infrastructure, inadequate and declining research in agriculture, agricultural sector financing and related activities and low technical capacity among the actors.

In Kenya, agricultural policy revolves around the main goals of increasing productivity and income growth, especially for smallholders; enhanced food security and equity, emphasis on irrigation to introduce stability in agricultural output, commercialization and intensification of production especially among smallholder farmers; appropriate and participatory policy formulation and environmental sustainability.

This module is designed to train Trainer of Trainers (ToTs') on skills that are useful in making smallholder farmers central in maize policy making in Kenya. This is through identifying policy options, classifying policy objectives and instruments, using policy cycle to develop and influence new policies and using policy validation cycle to update policies related to maize production and marketing. The national government maize policy of mopping up the glut during using the National Cereals and Produce Board (NCPB) has not been as efficient as intended. While the NCPB was meant to buy and distribute maize in the country, it has not resulted in stabilized prices thus occasioning losses to farmers. There is therefore need to rejuvenate the maize value chain by designing appropriate maize policies in supply, value addition and marketing. This module introduces the current agricultural policies to service providers, lead farmers, master trainers and relevant stakeholders in the design and implementation of effective climate-smart-sensitive agricultural policy options to promote the transition to climate-smart agriculture at the smallholder level.

14.3.1 Module Learning Outcomes

By the end of this sub module, the following training objectives must be achieved:

1. Crucial areas in the policy options that have the most impact on farmers identified.
2. Policy instruments for achieving stated objectives identified.
3. Use of policy development cycle in the development of new agricultural policies appreciated.
4. Use of policy validation cycle to update agricultural policies explained.

14.3.2 Module Target Group

This module targets agricultural extension, service providers and lead farmers.

14.3.4 Module Users

This module is intended to be used by a Master Trainer who is among the members of the core team trainers. The facilitator using this module should thoroughly familiarize and avail the participants' hand-outs.

14.3.5 Module Duration

The module is estimated to take **2 hours**

14.3.6 Module Summary

Module 14.3 Agricultural policy options for influencing maize production and marketing			
Sessions	Training Methods	Training Materials	Time
14.3.6.1. Introduction to the module and personal introduction	<ul style="list-style-type: none">• Personal introduction• Discussion	<ul style="list-style-type: none">• PowerPoint• Flip charts	15 minutes
14.3.6.2. Module Objectives	<ul style="list-style-type: none">• Personal introduction• Presentation	<ul style="list-style-type: none">• PowerPoint	10 minutes
14.3.6.3 National agricultural policies with smallholder farmers agency	<ul style="list-style-type: none">• Personal introduction• Presentation	<ul style="list-style-type: none">• PowerPoint	15 minutes
14.3.6.4. Policy options and their objectives	<ul style="list-style-type: none">• Plenary presentation	<ul style="list-style-type: none">• PowerPoint	10 minutes
14.3.6.5. Policy instruments	<ul style="list-style-type: none">• Plenary presentation• Plenary Discussion	<ul style="list-style-type: none">• PowerPoint	20 minutes
14.3.6.6. Policy development cycle	<ul style="list-style-type: none">• Plenary presentation• Plenary Discussion	<ul style="list-style-type: none">• PowerPoint	20 minutes
14.3.6.7. Policy validation cycle	<ul style="list-style-type: none">• Plenary presentation• Plenary Discussion	<ul style="list-style-type: none">• PowerPoint	20 minutes
14.3.6.8. Training review	<ul style="list-style-type: none">• Facilitator's summary:• Takeaways	<ul style="list-style-type: none">• Module review• Participants Handouts	10 minutes
TOTAL			2 hours

14.3.7 Facilitator’s Guidelines

<p>Module 14.3 Agricultural policy options to support maize production and marketing</p> <p>14.3.7.1 Introduction to the module and trainees expectations (15 minutes)</p>	<p>Session Guide</p>
<p>14.3.7.1 Module Title <i>(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations).</i></p> <p>Plenary Discussion</p> <ul style="list-style-type: none"> • Listed trainees expectations • Summarise trainees’ expectations 	<ul style="list-style-type: none"> • Hand-outs • Program • Note books • Felt pens • PowerPoint slides • Summarize trainees’ “Expectations” and display on flip chart/board.
<p>14.3.7.2 Module objectives (10 minutes)</p> <p><i>(The facilitator introduces the module and states the objectives and expectations).</i></p> <p>By the end of this module, the trainee should be able to:</p> <ul style="list-style-type: none"> • Identify crucial areas in the policy options that have the most impact on farmers. • Identify the policy instruments for achieving policy objectives. • Appreciate the use of policy development cycle in the development of new agricultural policies. • Explain the use of policy validation cycle to update agricultural policies. 	<ul style="list-style-type: none"> • PowerPoint slides • Factsheets
<p>14.3.7.3 National agricultural policies for smallholder farmers (15 minutes)</p> <p><i>(The facilitator to highlight the types of the National agricultural policies)</i></p> <p>Plenary Presentation (10 minutes) Make presentation on the available agricultural policies Discuss how the National agricultural policies fail to make smallholder farmers’ agency central (5 minutes)</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint slides • Handouts • Flipcharts

<p>14.3.7.4 Policy options and their objectives (10 minutes)</p> <p><i>(The facilitator highlights the types of policy options and their objectives relevant to mango production and marketing)</i></p> <p>Plenary Presentation (5 minutes) Make presentation on the available policy options and their objectives</p> <p>Discuss which policy options are applicable to maize production and marketing (5 minutes)</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • PowerPoint slides • Handouts • Flipcharts
<p>14.3.7.5 Policy instruments (20 minutes)</p> <p><i>(The facilitator describes the policy instruments)</i></p> <p>Plenary Presentation (10 minutes)</p> <p>Group Exercise (10 minutes)</p> <p>Discuss successes and failures of policy instruments in influencing production and marketing of mango</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • Handouts • Flip charts, • Manila papers, • Pelt pens
<p>14.3.7.6 Policy development cycle (20 minutes)</p> <p>Plenary Presentation (10 minutes) <i>(The facilitator discusses the components of policy cycle and their relationship to the production and marketing of mango)</i></p> <p>Plenary Discussion (10 minutes)</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • Use power point • Handouts
<p>14.3.7.7 Policy validation cycle (20 minutes)</p> <p>Plenary Presentation (10 minutes)</p> <p><i>(The facilitator highlights the components of policy validation cycle. The facilitator also discusses the relevance of policy validation in the production and marketing of mango)</i></p> <p>Plenary Discussion (10 minutes)</p>	<p>Session Guide</p> <ul style="list-style-type: none"> • Use power point • Handouts
<p>14.3. 7.8 Training review (10 minutes)</p> <p><i>(The facilitator leads the trainees in reviewing the module. Conclude by thanking the trainees)</i></p> <p>Plenary Presentation (10 minutes) Summarize the main points of the training</p>	<p>Session Guide</p> <p>Summary of the main points from the Module.</p>

14.2.8 Reference Materials

- Climate Smart Agricultural Policy options factsheets
- Climate Smart Agricultural Policy options briefs
- Climate Smart Agricultural Policy options Guide

References

1. Chronic Poverty Advisory Network (2012). Agriculture Policy Guide 2. Meeting the challenge of a new Pro-poor agricultural paradigm: The role of agricultural policies and programs. www.chronicpovertynetwork.org
2. Chirwa, E.; Dorward, A.; Kathule, R.; Kumwenda, I.; Kydd, J., Poole, N.; Poulton, C. & Stockbridge, M. (undated). Farmer Organization for market access: Principles for policy and practice. Imperial College London. University of Malawi. Agricultural Policy Research Unit. <http://www.imperial.ac.uk/agriculturalsciences/research/sections/aebm/projects/farmerorg.htm>
3. Food and Agriculture Organization of the United Nations (2016). The Gender in Agricultural Policies Analysis Tool (GAPo). FAO 2016.
4. Food and Agriculture Organization of the United Nations (FAO) (2010). “Climate-Smart” Agriculture. Policies, Practices and Financing for Food Security, Adaptation and Mitigation.
5. Ha-Joon Chang (2002). African Technology Policy Studies Network (ATPS). Who needs Technology Policy? Published by The African Technology Policy Studies Network, Nairobi, Kenya. ISBN: 9966-916-18-0
6. GoK (2007). Kenya Vision 2030.
7. GoK (2010). Kenya Constitution

ANNEXES

ANNEX 1: TRAINING PROGRAM

The training program presented here assumes that the trainees report on Sunday evening as the first day.

DATES: 23RD TO 31ST AUGUST 2021 (DRAFT PROGRAMME)

Time	Activity	Duration	Responsible
Day 0: Sunday 23 RD August 2021	Travel and Arrival in Naivasha	Whole day	KALRO Secretariat Jane Njiru /Gladys Mueni Value chain Leader: Dr. Ruth N. Musila
Day 1: Monday 24th August 2021	Chair: Dr. Joyce Maling'a (DIFCRI) Rapporteur: Dr. Ruth N. Musila		Facilitator
8.00 a.m.-8.30 a.m.	Registration	30 mins.	Secretariat
	Opening Prayer and Introductions		Dr Dickson Ligeyo
8.30 a.m.-10.00 a.m.	Official opening of the Maize Value Chain ToT Workshop	1hr 30 mins.	Dr. Lusike Wasilwa (Chair)
	Maize ToT Workshop Objectives		Dr. Ruth N. Musila
	Remarks from Director Crops Systems and Welcoming Deputy Director General – Crops		Dr. Lusike Wasilwa
	Remarks from Deputy Director General - Crops and Official Opening		Dr. Felister Makini
	GROUP PHOTO		ALL
10.00 a.m.-10.30 a.m.	Climate setting and class organization	30 mins.	Mr. Mark Otieno
10.30 a.m.-11.00 a.m.	HEALTH BREAK	30 mins.	ALL
11.00 a.m.– 12.00 a.m.	Farmer field and business school (FFBS) approach in Maize production	1 hr.	Mr. Mark Otieno
12.00 p.m. –1.00 p.m.	Climate Change and Climate Smart Agriculture in Maize value chain	1 hr.	Dr. Anthony Esilaba
1.00 p.m.- 2 .00 p.m.	LUNCH BREAK	1hr.	ALL

Time	Activity	Duration	Responsible
2.00 p.m. –4.00 p.m.	Maize production, niche and climatic requirements	2 hrs.	Mr. B. Muli
4.00 p.m.	TEA BREAK		ALL
<i>Close of Day 1</i>			
Day 2: Tuesday 25th August 2021	Chair: Dr. Joyce Malinga (DI SGC&I) Rapporteur: Dr Ruth Musial	Period	Facilitator
8.00 a.m. – 8.30 a.m.	Registration, Prayer Recap of Day1 activities	30 mins.	Mr. Mark Otieno Group 1
8.30 a.m. – 9.30 a.m.	Maize Crop Health: Maize pests	1 hr.	Dr Miriam Otipa
9.30 a.m.-10.30 a.m.	Maize Crop Health: Maize diseases	1 hr.	Dr Miriam Otipa
10.30 a.m.-11.00 a.m.	HEALTH BREAK	30 mins.	ALL
11.00 a.m.-1.00 p.m.	Maize harvesting and post-harvest management	2 hrs.	Mr. James Ndambuki
1.00 p.m.-2.00 p.m.	LUNCH BREAK	1hr.	ALL
2.00 p.m. - 3.00 p.m.	Maize value addition	1 hr.	Dr Francis Wayua
3.00 p.m.–4.00 p.m.	Maize value added products demonstrations and sensory evaluation	1 hr.	James Ndambuki/Dr Francis Wayua
4.00 p.m-4.30 p.m.	HEALTH BREAK	30 mins.	ALL
<i>End of day 2</i>			
Day Wednesday 26th August 2021	Chair: Dr. Dickson Ligeyo Rapporteur: James Ndambuki	Period	Facilitator
8.00 a.m. – 8.30 a.m.	Registration, Prayer Recap of Day 2 activities	30 mins.	Mr. Mark Otieno Group 2
8.30 a.m.– 10.30 a.m.	Maize variety and Selection	2 hrs.	Dr Murenga Mwimali/Dr Dickson Ligeyo/Dr Ruth Musila
10.30 a.m.-11.00 a.m.	HEALTH BREAK	30 mins.	ALL
11.00 a.m.–1.00 p.m.	Maize climate smart agronomic practices	2 hrs.	Mr. Benjamin Muli

Time	Activity	Duration	Responsible
1.00 p.m.-2.00 p.m.	LUNCH BREAK		ALL
2.00 p.m.-4.00 p.m.	Maize Seed Systems Commodity corridor approach to enhance Seed access and grain production and marketing	2 hrs.	Mr. David Karanja
4.00 p.m. - 4.30 p.m.	HEALTH BREAK	30 mins.	ALL
<i>Close of Day 3</i>			
Day 4 Thursday 27th August 20 21	Chair: Dr. A. O. Esilaba Rapporteur: Harun odhiambo	Period	Facilitator
4.00 a.m. - 5.00 p.m.	Excursion: Field trip to KALRO Kiboko/Naivasha Maize farm	Whole day	Dr Ruth Musila/Dr Murenga Mwimali
Day 5: Friday 28th August 20 21	Chair: Dr Ruth Musial Rapporteur: Mr. Charles Bett	Period	Facilitator
7.30 a.m. - 5.00 p.m.	Excursion: Field trip to KALRO Katumani	Whole day	Dr Murenga Mwimali
	Travel Back to Naivasha		
Day 6: Saturday 29th August 2021	Chair: Dr Ruth Musila Rapporteur: Charles Bett	Period	Facilitator
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 4 & 5 activities	30 mins.	Mr. Mark Otieno Group 3
8.30 a.m.–10.30 a.m.	Integrated soil and water management practices for Maize production Part 1	2 hrs.	Dr. A Esilaba
10.30 a.m.-11.00 a.m.	HEALTH BREAK	30 min.	ALL
11.00 a.m.-1.30 p.m.	Integrated soil and water management practices for Maize production Part 11	2 hrs. 30 mins.	Dr. A. Esilaba
1.30 p.m.-2.30 p.m.	LUNCH BREAK	1hr	ALL
2.30 p.m.– 4.00 p.m.	Mechanization of Maize production	1 hr. 30 min.	Eng. Nasirembe
4.00 p.m.-5.00 p.m.	Guidelines on action planning at County Level	1 hr.	Mr. Mark Otieno
5.00 p.m.	HEALTH BREAK		ALL

Time	Activity	Duration	Responsible
<i>Close of Day 6</i>			
Day 7: Sunday 30th August 2021	Chair: Dr Anthony Esilaba Rapporteur: James Ndambuki	Period	Facilitator
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of Day 6 activities	30 mins.	Mr. Mark Otieno Group 4
8.30 a.m. - 10.30 p.m.	Maize Business and Marketing	2 hrs.	Mr. Charles Bett
10.30 a.m.-11.00 a.m.	HEALTH BREAK		ALL
11.00 a.m.-1.00 p.m.	Climate-Smart Agricultural Policy Options	2 hrs.	Mr. Charles Bett
1.00 p.m.-2.00 p.m.	LUNCH BREAK		ALL
2.00 p.m.– 4.00 p.m.	Agricultural Innovation Platforms (AIPs)	2 hrs.	Dr. Geoffrey Kamau
4.00 p.m.-4.30 p.m.	HEALTH BREAK		ALL
<i>Close of Day 7</i>			
Day 8: Monday 31st August 2021	Chair: Dr. Anthony Esilaba Rapporteur: Mr. Mark Otieno	Period	Facilitator
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 7 activities	30 mins.	Mr. Mark Otieno Group 1
8.30 a.m.– 11.00 p.m.	Gender mainstreaming and social inclusions in the Maize value chain	2 hrs. 30 mins.	Dr Jessica Ndubi
11.00 a.m. -11.30 a.m.	HEALTH BREAK		ALL
11.30 a.m.-1.00 p.m.	<ul style="list-style-type: none"> • Course Evaluation • Presentations of County Action plans 	1 hr.	Mr. Mark Otieno
1.00 p.m.-2.00 p.m.	LUNCH BREAK		ALL
2.00 p.m.-3.00 p.m.	Way Forward	1 hr.	Dr. Charles Lungaho

Time	Activity	Duration	Responsible
3.00 p.m.-4.30 p.m.	Official Closing of The ToT Workshop <ul style="list-style-type: none"> • Remarks by the group Leader (Governor) • Remarks by the CPC • Remarks by KCSAP Crops coordinator- Ms. Violet Kirigua • Remarks by KCSAP NPCU -Dr. Charles Lungaho • Issuance of Certificates – Dr. Lusike Wasilwa Official Closing Address by Director Crops- Dr. Lusike Wasilwa <ul style="list-style-type: none"> • Closing Prayer 	1 hr. 30 mins.	Chair. Ms. Violet Kirigua
Close of Day 8			
Day 9 Tuesday 1st August 2021	Departure from Naivasha		
8.00 a.m.	Registration, Prayer and Departure		ALL

ANNEX 2: GENERAL REFERENCE MATERIALS

Category / Modules	Publication title	Reference types	No Pages	Farmer Category A= New entrant/Maize Elite farmer B= Elite maize Farmer
General Maize production	Maize production Guide in Kenya	Manual	25	A/B
	A Manual for Maize	Training Manual	26	A/B
Maize Varietal Selection		Leaflet	2	A/B
		Leaflet	2	A/B
		Leaflet	2	A/B
	Variety Characteristics and Production Guidelines of Traditional Crops	Training Manual	38	A/B
Maize Crop Health	Crop Management Guidelines			
	Integrated Pest Management (Cost saving Techniques for Smallholder Farmers)	Manual	34	B/A
Maize Business Management	Maize Production Guide	Manual	30	B/A
		Booklet	89	B
Gender Mainstreaming	Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and Other Stakeholders. Marlborough house, London.	Manual	100	B
Agricultural Innovation Platforms	Agricultural Innovation Platforms Guide	Book		A/B

ANNEX 3: FFBS LEARNING MATERIALS

Participatory Technology Development (Ptd) For Maize Crop Variety

Value Chain	Maize
Learning Enterprise	Maize
Funded Enterprise	Maize VC at production level
Background Problem	Low Maize production due to low yielding variety
Objective	To increase production through improved varieties

Factors to consider

- Land topography
- Runs (blocks should face East to West)
- Certified seeds of preferred varieties
- Material from farmers disease susceptible material

Setting the P.T.D blocks

- Plots to be laid (10x10) M, arranged three in a row with a footpath of 1M apart.
- Preferred Maize varieties
- Different Maize variety treatments
- The blocks must be right angled.
- During data collections: collect the data using 10 plants in each block.
- Other TIMPS should be applied equally in each block.
- Planting should be done on the same day in all blocks.
- Weeding and spraying should also be done the same time

Parameters Measurement

- No of leaves per crop
- Leaf width and length
- Crop height
- No of cobs per plant
- No of Maize grains per cob
- Average weight of 20 Maize cobs
- Yield /unit area

Setting of Blocks

Addressing low yielding varieties

Plot 1 H 6214		Plot 2 H 628	Plot 3 Composite	Plot 4 Farmers practice
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AGRO ECOSYSTEMS ANALYSIS (AESA) ON MAIZE.

AESA NO

General information

Fertilizer

Planting date.....

Agronomic data

Average Leaf length.....

Average plant height.....

Average Leaf width.....

Number of leaves/Plant.....

No of Cobs per plant.....

No of grains per cob.....

Yield in Kg per plot.....

Total yields per acre.....

Weather:

Time of observation:

Diagram of crop of enemies and insects observed

Natural Enemies

1.

2.

3.

insects observed

1.....

2.

3.....

Observation

1. weeds

2. Holes on the leaves

3. Yellow leaves

Recommendation

Weeding after 2 weeks

Keep monitoring and control pests





Kenya Climate Smart
Agriculture Project

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