Climate Smart Agriculture Technologies, Innovations and Management Practices for Watermelon Value Chain

TRAINING OF TRAINERS' MANUAL

Yegon J.K., Moi T.K., Lelgut D.K., Otipa M., Chelimo E., Chebii T.K., Esilaba A.O., Wandera F.M., Odhiambo H.O., Wayua F., Nasirembe W., Ndubi J., Wambua J., Ndungu J.M., Otieno M., Nyaga A., Ndung'u J.N., Mwangi H.W., Momanyi V., Kirigua V.O. and Wasilwa L.A.

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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 Watermelon 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 Watermelon 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

AEZ	Agroecological zone
AIP	Agricultural Innovation Platform
APVC	Agriculture Product Value Chain
ASAL	Arid and Semi-Arid Land
CA	Conservation Agriculture
CCP	Critical Control Point
CIG	Common Interest Group
CL	Critical Limit
CTT	Core Team of Trainers
ESMF	Environmental and Social Management Framework
FFBBS	Farmer Field and Business Schools
FSMS	Food Safety Management System
GAP	Good Agricultural Practice
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
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	Kenya Climate Smart Agriculture Project
kg	Kilogram
LF	Lead Farmer
TIMPs	Technologies, Innovations and Management Practices
ToT	Training of Trainers
VMG	Vulnerable and Marginalized Group

INTRODUCTION

About this manual

This training of trainers' manual consist of two parts. 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 Watermelon value chain, Content of the Training, Training Design and Facilitators Guidelines.

SECTION 1: BACKGROUND

1.1 The Role of Watermelon in the Kenyan Economy

Watermelon (*Citrullus lanatus*) is one of the widely cultivated crops in the world, accounting up to 6.8 % of the global area devoted to vegetable production. Horticulture Validated Report 2016-2017, showed that the production of watermelon increased by 47% between 2015 and 2016. According to the report, the area under watermelon was 7,017 ha in 2017 up from 6,345 ha in 2016, producing 119,991 tons valued at KES 2.897 billion. The area, production and value increased by 11%, 37% and 47% respectively in 2017.

Watermelon is grown mainly in arid and semi-arid counties under irrigation, in irrigation schemes and near rivers. The crop is mainly produced in Eastern, Central, Coastal and Rift Valley Regions, where most of the produce is marketed locally with little being exported. Under good management, up to 20 tons can be achieved from one ha in a season and at a farm gate price of KES 25/kg, a farmer can generate about KES 0.5 million. Therefore, Watermelon contributes immensely to the national food security, poverty eradication, and economic development.

However, the production of watermelon in the country is constrained by diverse challenges that include; low yielding varieties, poor crop management practices, emerging pests and diseases and land degradation attributed to harmful activities.

1.2 Role of Watermelon as Food and Nutrition Security

Watermelon pulp is the most commonly eaten part of the fruit. In other countries the rinds are also edible, either as stir-fried, stewed, or pickled. Watermelon juice can be made into wine or other traditional brews. The seeds can be roasted, salted, and eaten as snacks and are high in magnesium, folate, iron and the good fats (monounsaturated and polyunsaturated) that are good at lowering cholesterol levels in the blood. The fresh fruits provide essential micro nutrients and anti-oxidants, carotenoids, Vitamins A, B6 and C, lycopene, and potassium while the rinds contain citrulline which is an essential amino acid and fiber. In addition, the fruit is used as a source of water during dry periods as it contains approximately 92% water and therefore a classical climate smart crop. Further, watermelon crop residues can be used as supplemental fodder for livestock during the dry season.

Basically, watermelon is inexpensive, nutritious and readily available to all socio-economic groups in Africa throughout the year. It is a traditional food in Africa with the potential to improve nutrition, boost food security, foster rural development, and support sustainable land conservation. There exists the opportunity to popularize watermelon so that the Kenyan communities can benefit from its production through sustainable income generation and improved health.

1.3 Watermelon value chain as climate smart innovation

Climate change presents the greatest challenge to productivity and sustainable growth of the agricultural sector in Kenya, due to extreme events such as drought, floods and changes

in temperature. Horticultural crops in particular are sensitive to climate change because of their high demand for water and their strict temperature requirements. The fluctuation of rainfall and rise in temperature result in drought or flooding, lack of water for irrigation and influx of insect pests and disease epidemics that can affect the suitability of areas for growing horticultural crops. Under Good Agricultural Practices (GAPs), Watermelon has the potential to produce high yields with less inputs, compared to other fruit crops and thus can transform livelihoods with respect to income and nutrition security. The available watermelon technologies enables the crop to escape from the adverse effects of climate change by either the varieties portraying early maturity, being resistant/tolerant to insect pest and diseases and being tolerant to limited precipitation.

1.4 Objectives of the Training

The objective of this training is to equip farmer trainers with knowledge and skills necessary to increase productivity through adoption of Good Agricultural Practices (GAPs) principles and practices. Specifically, the objectives of this training are to:

1. Provide farmers trainers with relevant attitude, knowledge and skills in watermelon farming as a business and market assessment techniques for market led production
2. Enhance farmer trainers knowledge and skills in watermelon GAP, including on-farm Watermelon variety selection, establishment and management of fields
3. Equip farmers trainers with knowledge and skills in post-harvest and value addition of watermelon
4. Provide farmer trainers with knowledge and skills in participatory techniques for effective facilitation of adult learning processes through FFBS and developing inclusive stakeholder partnership development for sustainable upscaling of the watermelon value chain

SECTION 2: TRAINING CONTENT

2.1 Orientation of the Module

The training content is organized into 14 modules**,** which are targeted and orientated to ensure the adoption and up-scaling of watermelon value chain technology, innovation and management practices (TIMPs), for improved productivity and competitiveness in a market driven production system. The purpose of these modules is to enhance the knowledge and capacities of trainers in understanding and disseminating climate-smart watermelon 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 the trainee is exposed to training content

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 Watermelon value chain

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
1	Climate change and climate smart agriculture	• The impact of climate crisis to watermelon production • Adoption of climate smart technologies innovations and management practices (TIMPs) for Watermelon value chain to mitigate climate change	• Potential impact of climate change on watermelon production explained to Master Trainers • Climate smart techniques for watermelon outlined	3 hours
2	Farmer Field and Business School (FFBS) approach	• Develop skills for exploratory learning to enhance adoption and uptake of TIMPs	• Improved technologies/ innovations and agronomic practices for Watermelon availed	5 hours 40 minutes
3	Good Agricultural Practices (GAP) and Food Safety Management System (FSMS) - Hazard Analysis Critical Control Points (HACCP) Plan	• Enhance food safety through lowering presence of hazardous solids/ organisms/ pollutants and pathogens	• Food safety through prudent lowering of presence of hazardous solids/ organisms/ pollutants and pathogens enhanced	6 hours
4	Watermelon production niche and climate requirements	• Identify areas which are suitable for Watermelon production	• Watermelon production niches based on their suitability identified	4 hours
5	Watermelon variety selection	• Awareness on improved watermelon varieties	• Knowledge on new improved varieties enhanced	3 hours 30 minutes
6	Watermelon seed systems	• Formal and informal seed systems operations	• The formal and informal seed supply systems analyzed.	2 hours 30 minutes

7	Watermelon climate smart agronomic practices	• Options for innovative climate smart agronomics practices for increased watermelon production	• Water and input manipulations analyzed	3 hours 30 minutes
8	Integrated soil and water management practices for Watermelon production	• Soil, water and fertility enhancing techniques availed	• All techniques analyzed for possible benefits	5 hours
9	Watermelon Crop Health	• Major pest, disease and weed control mechanisms availed to the Master Trainers.	• Yield loss of watermelon by the major pests, diseases, and weeds assessed	6 hours
10	Watermelon harvesting and post- harvest management	• Storage technologies to reduce losses in quantity and quality	• Knowledge on proper harvesting techniques and storage facilities, hygiene and monitoring enhanced	3 hours
11	Watermelon value addition	• Various Watermelon products	• Value addition and Watermelon products identified for the farming communities and business entities • Opportunities Identified and Prioritized	5 hours 30 minutes
12	Mechanization of watermelon production activities	• Adaptation of mechanized operations of watermelon from crop establishment, through management to post-harvest handling	• Options of reducing drudgery through mechanization and increased productivity availed to farmer groups.	4 hours

13	Watermelon business and marketing	• Review available business options in watermelon value chain	• Type of aggregations by farmers availed for considerations	3 hours 20 minutes
14	Watermelon cross cutting issues (i) Innovation Platforms (ii) Gender mainstreaming and social inclusion (iii) Policy	• Articulate how voluntary marketing Groups can draw benefits from Watermelon value chain • Options of employment opportunities in Watermelon production • Sites for information profiled at the county levels	• Access to information on watermelon production enhanced • Opportunities for marginalized groups identified and gains made • Policy options for enhanced Water production identified	9 hours 40 minutes
TOTAL				**65 hours 40 minutes**

SECTION 3: TRAINING DESIGN

3.1 Delivery System

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

1. **Establishment of a team of facilitators**

   a) 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.

   b) Each of the Mater trainers will facilitate trainers of farmers and other stakeholders to acquire knowledge and skills in facilitating Farmer-led Field and Business Schools through practical demonstrations.

2. **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, MoALFC will facilitate the initial training of trainers'. They will also provide mentorship to farmers' trainers during the first year of LF trainings and 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's to form partnership with stakeholders for sustainability. They will also support LF's to form their training and Watermelon TIMPs 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 the growth of individual or Watermelon farmer groups.

3.3 Training Duration

The proposed ToT course for Master Trainers consists of 14 modules, which shall take a total of 65 hours 40 minutes. 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 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 LCD projections. Each participant will require one felt pen while the trainers will require two sets of felt pens.
4. Visual aids like 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 should be 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 sites and market areas.

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 3trainers 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 fruit and green groceries 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 far away, preferably less than 10 minutes' drive.

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 in. As a golden rule, do not lecture them but facilitate, listen and let them feel like equals to each other and to 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 can 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, buzz groups, 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 and have at least 5 Watermelon demonstration plots planted with Watermelon
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 the assistants
5. **One day** - arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at the proposed residence
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 (section 4.4)

The evaluation strategy should take two directions; the first being the individual trainees evaluated through evaluation forms without conferring or refereeing to each other. The evaluation forms are then collected and analyzed by the CTT members.

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 Watermelon Production			
3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			
4. Watermelon production Niches and Climatic Requirements			

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

The second direction for evaluation is trainee's 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 present, the CTT members should only give points of clarifications if any misunderstanding occurred but 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.

4.8 Key references

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

Watermelon reference material will consist of the following:

a) Watermelon production manuals/ guides

b) Pamphlets/brochures

c) Factsheets on specific TIMPs

d) Journal Articles

4.8.1 Guide on the use of the information

The trainers will be advised to issue farmers with at most 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 Watermelon 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.

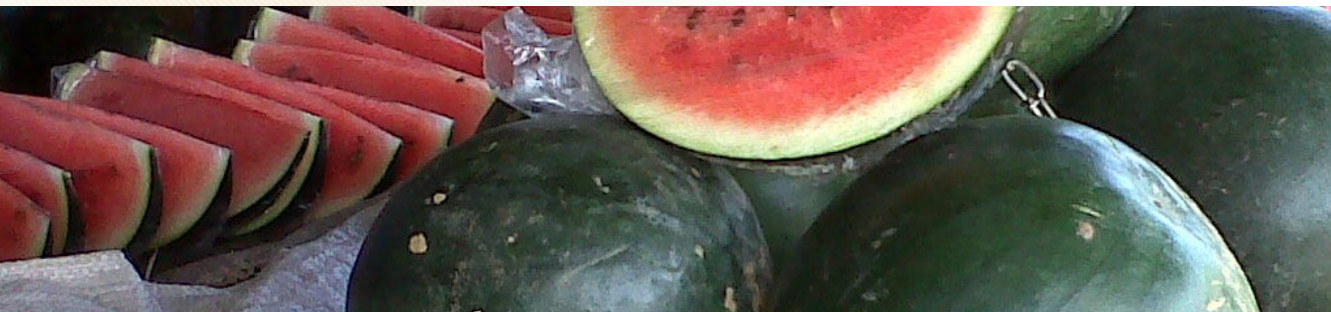
Figure 1: Left: Young Crop in KALRO Marigat and Right: Watermelon fruits marketed locally

PART II: TRAINING MODULES

This part presents the content of 14 modules of training namely: Climate change and climate smart agriculture, Farmer Field and Business school (FFBS) approach, Watermelon production niche and climate requirements, Good Agricultural Practices (GAP) and Food Safety Management System (FSMS), Watermelon variety selection, Watermelon seed systems, Watermelon climate smart agronomic practices, Integrated soil and water management practices for Watermelon, Watermelon Crop Health, Watermelon harvesting and Post-harvest management, Watermelon value addition, Mechanization of Watermelon production activities, Watermelon business and Marketing, and Watermelon 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. Participants' handouts



MODULE 1

CLIMATE CHANGE AND CLIMATE SMART AGRICULTURE

1.1 Introduction

The impacts of climate change 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 on agriculture 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 variability 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 and private 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.

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 Watermelon Value Chain			
Sessions	**Training Methods**	**Training Materials**	**Duration**
1.6.1 Introduction and levelling of expectations	• Personal Introduction • Plenary Presentation • Plenary discussion	• Projector • Laptop • Flip charts • Felt pens	30 minutes
1.6.2 Introduction to climate change and variability	• Plenary Presentation • Case study videos • Plenary discussion	• Projector • Laptop • Videos • Flip charts • Felt pens • Participants' handouts	50 minutes
1.6.3. Concept of Climate smart agriculture (CSA) in Watermelon	• Plenary Presentation • Plenary discussion	• Projector • Laptop • Videos • Flip charts • Felt pens • Participants' handouts	40 minutes
1.6.4 Projected future climate scenarios affecting Watermelon and how to manage	• Plenary Presentation • Case study videos • Plenary discussion	• Projector • Laptop • Flip charts • Felt pens • Participants' handouts	40 minutes
1.6.5. Module review	• Participants' questions and comments • Facilitator' summary	• Module review • Flip charts • Felt pens	20 minutes
TOTAL			**3 hours**

1.7 Facilitator's Guidelines

1.7.1. Introduction and Levelling of Expectations (30 minutes)	Session Guide
The trainer introduces the trainees to this module on climate change and climate smart agriculture). **Trainees' expectation (20 minutes)** *The facilitator organizes the trainees into groups to state and list their expectations.*	• PowerPoint presentation • Distribute Participants' handouts

*(***Module Objectives (10 minutes)** *(The trainer presents module objectives).* By the end of the module training, the trainee should be able to: • Explain climate change and adaptations. • Describe Climate Smart Agriculture (CSA). • Describe and explain available climate smart crop management practices in Watermelon production. • Explain the benefits of selected climate smart crop management practices in Watermelon production.	
1.7.2 Introduction to Climate Change and Climate Variability (50 minutes)	**Session guide**
Plenary presentation (35 minutes) • 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 **Case study videos and discussion (15 minutes)** • The impact of climate change	• PowerPoint presentation • Plenary discussion • Video presentation
1.7.3 Concept of Climate Smart Agriculture (CSA) (40 minutes)	**Session Guide**
(The trainer presents the principles underpinning CSA and the link to deliverable objectives). **Plenary Presentation (30 minutes)** • Definition of the CSA approach and their characteristics • The three pillars of CSA (productivity, Adaptation and Mitigation • Why CSA is needed **Plenary discussion (10 minutes)** Discussions on the CSA concept	• PowerPoint presentation • Participants' handouts • Plenary discussion.

1.7.4 Projected Future Scenarios that will Impact Productivity (40 minutes)	Session Guide
(The trainer presents and discusses the future climatic projections focusing on rainfall and temperature, which directly impacts on crop yields) **Plenary presentation (20 minutes)** • Projected impacts on food production and needed adaptation measures especially for Watermelon. **Video presentation and discussion (20 minutes)** • Short video on showing projections of rainfall and temperature.	• PowerPoint presentation • Video presentation • Plenary discussion
1.7.5 Module Review (20 minutes)	**Session Guide**
(The trainer leads the trainees in summarizing the key points discussed in the module)	• Plenary discussion

1.8 Participants' handouts

- Climate Change and CSA factsheets
- Climate Change and CSA brochures and Leaflets

Reference

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 WATERMELON PRODUCTION

2.1. Introduction

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 Watermelon production to farmers. The trainees will thereafter facilitate farmers in the Common Interest Groups (CIGs) to learn by doing the available Technologies, TIMPs from a common plot of FFBS and then implement what they have learnt to their individual farms in order to meet the KCSAP project objective of increased productivity and building resilience to climate change. FFBS also empowers the learners with various skills in leadership, 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 Watermelon production profitable and sustainable.

Training of trainers is a cost-effective way of introducing new approaches that require new skills to trainers, facilitators and institutions that leads to a common vision and common methodology, for moving into new areas of extension and education. The vision inherent in Farmer Field and Business Schools is that trainers work alongside farmers as advisors and facilitators, encouraging independence, analysis and organization. The FFBS methods promote exploration, discovery and adaptation under local conditions. The "right way" means not only building on suitable science and technological methods, but also fitting into local ecological, social, economic and historical contexts. Finding the "right way" means that all stakeholders need to participate and gain ownership of the process.

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, teaching and facilitating described and explained.
2. Approaches to effective facilitation and participatory learning for FFBS demonstrated and explained.
3. Knowledge and analytical skills to design simple experiments for testing options identified and demonstrated.
4. Shift from the traditional focus to improving productivity to farming business proposition explained and facilitated.

2.3. Module Target Group

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

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 Watermelon value chain target Counties. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts.

2.5. Module Duration

The Module is expected to last for a time duration of 5 hours 40 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.	• Setting norms and group discussion on expectations • Plenary presentation	• Laptop • Projector • Flip charts • Mark pens	20 minutes
2.6.2 Overview of FFBS key activities	• Plenary presentation • Plenary discussions	• Pictorials • Laptop • Projector	1 hour
2.6.3 Introduction to Communication and communication skills	• Plenary presentation • Group exercise	• Projector • Laptop • Flip charts • Felt pens	1 hour
2.6.4 Facilitation and leadership skills	• Plenary presentation • Plenary discussion	• Projector • Laptop	1 hour
2.6.5 Organization and management in FFBS	• Plenary presentation • Plenary discussion	• Projector • Laptop	1 hour
2.6.6 Developing FFBS Curriculum for the Watermelon value chain	• Plenary presentation • Group Exercise	• Projector • Laptop • Flip charts • Felt pens	1 hour
2.6.7 Module review	• Presentation • Plenary discussion	• Projector • Laptop • Flip charts • Felt pens	20 minutes
TOTAL			**5 hours 40 minutes**

2.7 Facilitator's guidelines

2.7.1 Introduction, Climate Setting of Leveling Expectations and Objectives (20 minutes)	Session Guide
(The trainer welcomes trainees and thereafter invites them to state their expectations). **Trainee introduction and climate setting (10 minutes)** Introduction of participants, setting training norms, formation of FFBS sub groups (working groups) and trainees to share their expectations **Module Objectives (10 minutes)** *The facilitator presents modules objectives* By the end of the module, the trainee should be able to: • Describe and explain concept of Farmer Field and Business School approach, teaching and facilitation. • 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.	• 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 • PowerPoint presentation on the Objectives of the FFBS training module
2.7.2 Overview of FFBS key activities (1 hour)	**Session guide**
Plenary presentation (45 minutes) The facilitator takes the trainees through the main concepts and pillars of FFBS which includes: • The definition of FFBS • Participatory Technology Development (PTD) for the Watermelon value chain TIMPs • Agro ecosystems Analysis (AESA) of the Watermelon value chain TIMPs • Concept of what is this what is that • FFBS principle of Integrated production and pest management (IPPM)	• PowerPoint presentation • Plenary discussion

• FFBS Business concept and opportunities in the Watermelon value chain stages **Plenary discussion (15 minutes)** • Pillars of FFBS	
2.7.3 Introduction to Communication and Communication skills (1 hour)	**Session guide**
Group exercise to gage the understanding of trainees **(45 minutes)** • What is communication? • Communication channels • Barriers to effective communication and • How to effectively communicate **Plenary presentation (15 minutes)** Communication and communication skills	• Group exercise • PowerPoint presentation • Participants' handouts
2.7.4 Facilitation and leadership skills (1 hour)	**Session guide**
Plenary presentation (45 minutes) • 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 **Plenary discussion (15 minutes)** • Discussion on facilitation	• PowerPoint presentation • Participants' handouts • Plenary discussion
2.7.5 Organization and management in FFBS (1 hour)	**Session guide**
Plenary presentation (45 minutes) Steps of FFBS implementation framework: • Ground working. • Training of Facilitators. • Establishing PTDs at the FFBS. • Season long FFBS sessions.	• PowerPoint presentation • Participants' handouts • Plenary discussion

• Evaluation of PTDs. • Field days. • Graduation. • Establishment of Lead FFBS. • Follow ups. **Plenary discussion (15 minutes)** • FFBS implementation Framework	
2.7.6 Developing FFBS Curriculum for the Watermelon value chain (1 hour)	**Session guide**
Plenary presentation (30 minutes) Steps of participatory technology development on the Watermelon value chain production • Identify the major constraints to increased yields of Watermelon 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 Watermelon value chain **Group exercises (30 minutes)** • 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	Group exercises on • Pair wise matrix ranking of constraints and TIMPs in Watermelon value chain • Curriculum development based on the value chain growth stages • Presentations of the group exercises on flip charts • PowerPoint presentations on PTD and curriculum development
2.7.7 Module review (20 minutes)	**Session guide**
• Participants Questions and answers • Facilitators Summary • Guideline on FFBS Watermelon action plans	• PowerPoint presentation • Plenary discussion • Module summary

2.8 Participants' Handouts

- FFBS Factsheets
- FFBS brochures and leaflets

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

MODULE 3

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

3.1. Introduction

Declining food safety, reduced food quality, unsustainable farming practices and negative environmental impact from agricultural activities plague the food sector and impose risks in the agricultural sector. These can be mitigated by adoption of Good Agricultural Practices (GAPs). The GAPs mitigate risks through risk prevention, risk analysis and promotion of sustainable agriculture by means of Integrated Pest and Disease Management (IPDM) and Integrated Crop Management (ICM). On the other hand, worker safety and health along with traceability requirements are a major concern to modern consumers. The GAPs are vital in protecting consumer health by ensuring safety within the food chain. It is imperative to operate from the table upstream to include suppliers of agricultural inputs and providers of logistics and farm equipment. Therefore, GAPs constitute a certification system for agriculture, specifying procedures that must be implemented to produce and supply food that is safe for consumers and wholesome use of sustainable methods.

Food safety assures food quality based on the absence or occurrence of hazards that are risky to human and animal health. 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 from the farm to fork continuum. Currently, there is an increasing public concern on the negative environmental and health impacts of agro-chemicals as well as microbial pathogens and their toxins. Control of the hazards occurrence is done by implementation of an effective Food Safety Management Systems (FSMS) through Hazard Analysis Critical Control Points (HACCP) protocols. It involves a seven step management system that provides the framework for monitoring the entire food chain. This makes it more of a preventive, rather than a reactive tool designed to identify and control potential problems before they occur.

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

3.2. Module Learning Outcomes

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

1. GAPs on food safety and enhanced quality along the Watermelon 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. Worker safety and health within the Watermelon production system explained
4. Traceability in food safety and quality along the Watermelon value chain mapped and implemented.

3.3. Module Target Group

This module targets public and private agricultural extension agents, service providers and lead farmers based at the 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 Watermelon value chain target Counties. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts.

3.5. Module Duration

The Module is estimated to take 6 hours

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	• Groups to bring out expectations • Plenary presentation	• Module objectives • Marker pens • Flip charts • Projector • Laptop	30 minutes
3.6.2 Understanding what is GAP and its application in the Watermelon value chain	• Plenary presentation • Plenary discussion	• 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	• Plenary presentation • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop • Pictorials/video clips • Data sheets	20 minutes

3.6.4 Review of GAP requirements for audit and types of protocols possible	• Plenary presentation • Plenary discussion	• Data forms • Flip charts • Marker pens • Projector • Laptop • Pictorials/video clips • Data sheets	30 minutes
3.6.5 Introduction to Site Selection	• Plenary Presentation • Plenary discussion	• Projector • Laptop	20 minutes
3.6.6 GAP checklists and Audit	• Plenary presentation • Group exercise	• Flip charts • Marker pens • Projector • Laptop	30 minutes
3.6.7 Safe use of Pesticides and calibration of sprayers and nozzles	• Group work on nozzles • Rate of discharge • Safety guidelines	• 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 crop value chains	• Plenary presentation • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop, • Pictorials/video clips	30 minutes
3.6.9 Determination of food safety risk/ hazards in crop value chains (hazard analysis)	• Plenary presentation • Group exercise	• 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 Watermelon value chain	• Plenary Presentation • Group exercise	• Projector • Laptop • Flip charts • Marker pens	30 minutes
3.6.11 Prevention and corrective measures for CCPs in Watermelon value chain	• Plenary Presentation • Group exercise	• Flip charts • Marker pens • PowerPoint projector • Laptop • Pictorials/video clips	30 minutes
3.6.12 Module review	• Participants' questions and comments • Facilitator's summary	• Participants' hand outs • Module review	20 minutes
TOTAL			**6 hours**

3.7 Facilitator's Guidelines

3.7.1 Introduction and Levelling of Expectations (30 minutes)	**Session Guide**
The facilitator welcomes trainees to the module and introduces him/herself, stating profile and experience of working with farmers. **Trainees' introductions and expectations (20 minutes)** The facilitator invites the trainees to state their expectations after brain storming in their respective county groups **Module Objectives (10 minutes)** *The facilitator presents module's objectives.* By the end of the module, the trainee should be able to: • Appreciate GAPs on matters of food safety and quality along the watermelon value chain.	• Summarize trainees' Expectations on a flipchart • PowerPoint presentation

• Describe optimization and utilization of resources (water, soil, manure, fertilizers, and other inputs), environmental protection and conservation. • Explain worker safety and health within the watermelon production system. • Map and implement traceability in food safety and quality along the crop value chain	
3.7.2 Understanding what is GAP and its Application in the Watermelon Value Chain (30 minutes)	**Session Guide**
Facilitator leads discussions on understanding of GAPs and its relevance to actors in the Watermelon value chain **Plenary Presentation (20 minutes)** • Understanding GAPs in the context of watermelon production • Explain the role of GAPs in safe and sustainable food production system for growers and consumers of watermelon. • Understanding GAPs as the key to high watermelon market destinations **Plenary discussion (10 minutes)** GAP application in the Watermelon value chain	• 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 (20 minutes)	**Session Guide**
Facilitator guides discussions on the key determinants of site suitability for agricultural activities. **Plenary presentation and discussion (20 minutes)** • Factors to be considered in an agricultural site selection (Site history, slope of land, type of soil versus crop, water sources and physical quality, soil and water analysis)	• PowerPoint presentation • Participants' handouts • Plenary discussion

• The need for documentation in a farm assurance system • Types of mandatory farm records • General guidelines to Conservationn Agriculture (CA)	
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 for watermelon production. • Good soil management practices (appropriate crop rotations and manure application) • Careful management of water resources and efficient use of water for rain-fed watermelon production via irrigation. • Proper selection of watermelon and varieties to meet local consumer needs. • Adoption of IPM practices to minimize the potential impact of pest control practices on workers, food, and environment. • Minimizing contamination at harvest, on-farm processing and storage.	• PowerPoint presentation • Participants' handouts • Plenary session
3.7.5 Introduction to Site Selection (20 minutes)	**Session Guide**
The facilitator introduces the various factors involved in site selection through pictorials/video clips PPT's and farm walks. **Plenary Presentation and discussions (20 minutes)** • Factors to be considered in an agricultural site selection (Site history, slope of land, type of soil versus crop, water sources and physical quality, soil and water analysis)	• PowerPoint presentation • Participants' handouts

• The need for documentation in a farm assurance system • Types of mandatory farm records • General guidelines to Conservation Agriculture (CA)	
3.7.6 GAP Checklists and Audit (30 minutes)	**Session Guide**
Facilitator guides the trainees on self-assessment (Internal audit and corrective measures for non-compliance) **Plenary presentation (15 minutes)** • Need for mandatory records in GAPs • Internal Audit procedures • Practical on Mock Audits • Interpretation of audit reports • Compliance and corrective actions **Group exercise (15 minutes)** • Groups audit a farm or a process within the training site • Present audit results, verdict and corrective actions	• PowerPoint presentation • Global GAP checklists • Participants' handouts • Group exercise
3.7.7 Safe Use of Pesticides and Calibration of Sprayers and Nozzles (1 hour)	**Session Guide**
The facilitator organizes the groups to identify the level of knowledge on pesticide use and safety; Determination of less hazardous pesticides, fungicides and herbicides, quantities to apply and respective Post Harvest Intervals (PHIs). **Group exercise (30 minutes)** Practical session on how to handle different types of pesticides, fungicides and herbicides together with their calibrations **Plenary presentation (30 minutes)** • Guided knapsack calibration • Different types of nozzles and their uses • Pesticide safety	• PowerPoint presentation • Pesticide containers • Knapsack sprayers • Nozzles • Participants hand outs • Group exercise

3.7.8 Understanding Food Safety (30 minutes)	
(The facilitator introduces the 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 crops 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 watermelon 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 watermelon production chain. • Listing the types of hazards that cause illness or death. • Determine factors influencing likely occurrence of hazards severity. • 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 crop production • Produce flow diagrams for the crop	• PowerPoint presentation • Participants' hand outs • Group exercise

3.7.10 Determination of Critical Control Points (CCP) in Crop Value Chains (30 minutes)	
The facilitator introduces the topic on determination of Critical Control Points (CCP) **Plenary presentation (15 minutes)** • Why is important to determine CCP in watermelon 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. **Group Exercise (15 minutes)** • Groups to identify and establish critical control points and critical limits.	• PowerPoint presentation • Participants' handouts • Group exercise
3.7.11 Prevention and Corrective Measures for CCP in Crop Value Chains (30 minutes)	**Session Guide**
The facilitator introduces the topic on prevention and control of possible hazards **Plenary presentation (15 minutes)** • Establishment of corrective actions against CCP • Establishment of verification procedures for CCP • Establishment of record-keeping and documentation procedures • How to develop HACCP plan and Food safety tool kit for the watermelon value chain **Group exercise (15 minutes)** Groups to identify and establish corrective actions and verification procedures for crop value chain.	• PowerPoint presentation • Participants' handouts • Group exercises

3.7.12 Module Review (20 minutes)	Session Guide
(The facilitator leads the trainees in summarizing the key points discussed in the module)	• Plenary discussion • Plenary presentation

3.8.Participants' Handouts

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

References

1. Hazard Analysis Critical Control Point Principles and Application Guidelines (2018). National Advisory Committee on Hazards Criteria for Foods
2. FAO. (2010) Food Safety Manual for Farmer Field Schools: A training reference guide on food safety in global FFS Programmes. Food and Agriculture Organization
3. GlobalG.A.P. (2019). GlobalG.A.P. General Requirements. Version 5.2 GlobalG.A.P., Cologne, Germany

MODULE 4

WATERMELON PRODUCTION NICHES AND CLIMATIC REQUIREMENTS

4.1 Introduction

Watermelon is commercially grown under irrigation often as a pure stand or intercropped with newly established fruit tree orchards. Due to the crop's high temperature requirement during the growing season of between 18° and 35°C, the bulk of watermelon production is from irrigated farms in the Arid and Semi-arid Lands (ASALs). Consequently, there is scarce information on the quantity of watermelons produced on rain-fed systems. The knowledge on the production niches and climatic conditions for Watermelon production is therefore crucial for improved productivity and commercialization of the crop.

This module exposes farmer trainers to the different suitable agro-climatic zones prescribing ideal altitudes, soils, temperature, and rainfall levels among other characteristics for Watermelon production. While these agro-climatic factors are critical for growth and yield performance of watermelon, they also provide favorable conditions for pests, diseases, weeds and beneficial soil-borne microbes. It is therefore important for farmers to be trained on the suitable agro-ecological zones and innovative management practices for better Watermelon performance and yields.

4.2 Module Learning outcomes

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

1. Importance of Watermelon in Kenya's economy explained and appreciated.
2. Knowledge of altitudes and soil types for Watermelon production enhanced.
3. Climatic conditions (temperatures, rainfall and humidity) required for Watermelon production understood.
4. Specific county agro-ecological zones for Watermelon production, explained and understood.

4.3 Module Target Group

This module is intended for public and private agricultural extension providers, lead farmers and Watermelon value chain actors in the targeted counties of Kenya.

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 Watermelon value chain in the targeted Counties. The facilitators using this module should familiarize themselves with the training materials and handouts for participants.

4.5 Module Duration

The Module session is expected to last for a time duration of 4 hours.

4.6 Module Summary

Module 4: Watermelon production niches and climatic requirements			
Sessions	**Training methods**	**Training materials**	**Time**
4.6.1 Introductions and climate setting	• Preliminaries • Self-introduction • Setting norms & rules • Plenary discussion • Group exercise	• Flips charts • Felt pens • Laptop • Projector	20 minutes
4.6.2 Importance of Watermelon in Kenya's economy	• Presentations • Plenary discussion	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts	40 minute
4.6.3 Watermelon production ecological/ climatic requirements for optimal yields	• Presentations • Plenary discussion	• Flips charts • Felt pens • Laptop • Participants' handouts • Projector	1 hour
4.6.4 Watermelon production Agro-ecological zones (AEZs)- average yields, and constraints in the target Counties	• Group exercise • Plenary Presentation • Plenary discussion	• Flips charts • Felt pens • Laptop • Projector	1 hour
4.6.5 Gain practical knowledge on specific county agro-ecological zones for Watermelon production	• Group exercise • Presentations • Plenary discussion • Video/photo show	• Flips charts • Felt pens • Laptop • Projector	40 minutes
4.6.6 Module review	• Discussions/conclusion and way forward	• Flip charts • Felt pens • Laptop	20 minutes
TOTAL			**4 hours**

4.7 Guidelines to Facilitators

<table>
<tr><th colspan="2">Module 4: Watermelon Production and Appropriate Climatic Requirements</th></tr>
<tr><th>4.7.1. Introductions and Climate Setting (20 minutes)</th><th>Session Guide</th></tr>
<tr><td>(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations)

Expectations (10 minutes)

The trainees to form groups (e.g. county based) and list their expectations, norms and rules.

The facilitator presents module objectives

Objectives (10 minutes)

By the end of the module, the trainee should be able to:
• To appreciate the importance of Watermelon in Kenya’s economy.
• Indicate and describe altitudes and soil types/ characteristics for Watermelon production.
• Describe climatic conditions (temperatures, rainfall and humidity) required for Watermelon production.
• Gain practical knowledge on specific county agro-ecological zones for Watermelon production.
• Understand and be able to apply innovative Watermelon production and management technologies in the suitable areas of the counties.</td><td>• Summarize the facilitator/trainees involvement in Watermelon value chains
• PowerPoint presentation</td></tr>
<tr><th>4.7.2 Importance of Watermelon in Kenya’s Economy (40 minutes)</th><th></th></tr>
<tr><td>Plenary Presentation (25 minutes)
• Origin of Watermelon
• Watermelon in Kenyan households
• Key counties producing Watermelon in Kenya
• General Watermelon production trends in Kenya
• Watermelon consumption and markets

Guided discussions by the Facilitator (15 minutes)

Questions/answers/comments</td><td>• PowerPoint presentation
• Participants’ handouts
• Plenary discussion</td></tr>
</table>

4.7.3 Watermelon Production Ecological/Climatic Requirements (1 hour)	
Plenary Presentation (45 minutes) • Altitude and Agro-ecological zones for Watermelon production • Climatic conditions (Rainfall, Temperatures and humidity) suitable for watermelon production • Soils soil types, pH, general fertility requirements for Watermelon production **Facilitator's guided discussion (15 minutes)** Questions/answers/comments	• PowerPoint presentation • Participants' handouts • Plenary discussion
4.7.4. Watermelon Production AEZs (villages), Average Yields, and Constraints in the Target Counties (1 hour)	**Session Guide**
Plenary Presentation (30 minutes) Facilitator guides the participants in reviewing and discussing suitability maps (County by County) **Group exercise (15 minutes)** Trainees to bring out specific county or sub-county AEZs, land size, yields and constraints to Watermelon production and present in the plenary: • Agro-ecological zones (AEZs) and % area suitable for Watermelon • Average land/farm size under Watermelon production in Kenya • Average yield of Watermelon per unit farm area • Constraints to Watermelon production • Opportunities to addressing the constraints **Discussions/presentations from the groups (15 minutes)** Let the trainees/groups share the group exercise outcomes	• PowerPoint presentation • Group work • Open discussions with the guidance of the facilitator • Plenary discussion

4.7.5. Practical Knowledge on Specific County Agro-Ecological Zones for Watermelon Production (40 minutes)	Session Guide
Plenary presentation (20 minutes) • Facilitator guides trainees through the practical knowledge applicable to specific county agro-ecological zones for Watermelon production **Plenary discussions and video/photo show (20 minutes)**	• PowerPoint presentation • Video/photo show • Plenary discussion • Plenary discussion
4.7.6. Module Review (20 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Summary of the main points from the training **(10 minute)** • Objectives and expectations (review done on basis of the expectations listed earlier) • Trainees to recall the Watermelon production ecological/climatic requirements, Watermelon 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 identify the issues for the way forward. **Facilitator's guided discussion (10 minutes)**	• The last participants' handouts/training materials • Summarize the main points of the module on a flip chart and display • Plenary discussion

4.8 Handouts for Participants

- Watermelon production guides
- Watermelon leaflets and brochures
- Watermelon factsheets

MODULE 5

WATERMELON VARIETY SELECTION

5.1. Introduction

Watermelon varieties differ in traits such as fruit shape, which can be round to oblong, rind pattern (crimson type, jubilee type, all-sweet type, black/dark green), fruit size (3 to 16 kg), and flesh color (red, dark red, pink, orange, yellow and white). Watermelon varieties also fall into three broad classes based on how the seed were developed. These are open-pollinated, F1 hybrid, and triploid or seedless types.

Open-pollinated varieties are less expensive than F1 hybrid varieties. The advantages of F1 hybrid seed are that they exhibit increased uniformity of type and time of harvest as compared to open-pollinated seed and can exhibit as much as a 20 percent to 40 percent increase in yields under similar conditions. The disadvantages of F1 hybrid seed is that it is costly, which can be as much as five to 10 times more than the open-pollinated seed. The Super-Small type watermelon varieties produce small fruit with very small seeds. These varieties have exceptional flesh quality and colour. Seedless watermelons are available with red, orange or yellow flesh and various rind patterns. These cultivars have exceptional flesh quality and colour. The fruit can range from small, medium or large size depending on the cultivar. Selecting the best watermelon variety is the most important decision made by a farmer. Planting a variety that is not suited for the available market and the particular production situation leads to lower profits or possibly crop failure. In addition to market acceptability, a variety must have acceptable yield, be adapted to the production area and have the highest level of preferred attributes.

This module exposes Master Trainers to the improved Watermelon varieties recommended for diverse uses and targeted production environments. In order to optimize Watermelon yields, variety evaluation in the changing climate and farming environments is an important component for the selection of high yielding commercial varieties. The improved high yielding varieties are key to achievement of increased incomes as well as food and nutrition security. While introducing the improved varieties good agricultural practices will be mainstreamed in the process to ensure the technologies are environmentally sustainable and safe to consumers.

5.2 Learning Outcomes

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

1. Climatic and ecological requirements for watermelon described.
2. Various improved Watermelon varieties, their ecological areas of cultivation and their uses identified and compared.
3. Watermelon varieties suited for counties of interest identified.

5.3 Module Target Group

This module targets public and private agricultural extension agents, service providers and lead farmers based at 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 Watermelon value chain target Counties. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts and training materials.

5.5 Module Duration

The Module is estimated to take 3 hours 30 minutes.

5.6 Module Summary

Module 5. Watermelon Variety Selection			
Sessions	**Training Methods**	**Training Materials**	Time
5.6.1. Introduction and Objectives Expectations	• Plenary presentation • Group discussion and presentation of expectations	• Flips charts • Felt pens • Laptop • Projector	30 minutes
5.6.2. Introduction to the various improved Watermelon varieties, their ecological areas of cultivation and their attributes and uses.	• Group Exercises to identify local Watermelon landraces and varieties • Plenary Presentations • Plenary discussion	• Flips charts • Felt pens • Laptop • Projector • Manila papers	1 hour
5.6.3 Recommended varieties for specific regions	• Plenary Presentation • Group exercise • Field demonstration	• Flips charts • Felt pens • Laptop • Projector • Manila papers	1 hour
5.6.4 Interpretation of the labels on a seed package	• Plenary Presentation • Group exercise • Plenary discussions	• Flips charts • Felt pens • Laptop • Projector • Manila papers	30 minutes
5.6.5 Module review	• Group Exercise • Facilitator's summary	• Participants' handouts • Flip charts • Felt pens	30 minutes
TOTAL			**3 hours 30 minutes**

5.7. Facilitator's Guidelines

Module 5: Watermelon Variety Selection	
5.7. 1 Introduction,Levelling of Expectations and Objectives (30 minutes)	**Session Guide**
Introduction (15 minutes) *(The facilitator welcomes trainees to the module and there after 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: 1. Describe the Watermelon crop and its climatic and ecological requirements. 2. Identify and compare the improved watermelon varieties their ecological areas of cultivation. 3. Identify the watermelon varieties suited to the counties of interest.	• Summarize trainees' "expectations" and display. • Distribute participants' handouts • Module objectives,
5.7.2 Introduction to Improved Watermelon Varieties. (1 hour)	**Session Guide**
(The facilitator describes the watermelon crop and guides the trainees in identifying the improved watermelon varieties). **Group exercise and discussion (30 minutes)** Ask trainees to highlight and describe some of the watermelon varieties they know. **Plenary Presentation (30 minutes)** • Improved watermelon varieties. • Categories of watermelon varieties and comparison of various hybrid varieties. *Show trainees the photographs of each variety and its full description.*	• Distribute participants' handouts • Group exercise • Plenary discussion
5.7.3 Recommended Watermelon Varieties for the Target Counties (1 hours)	**Session Guide**
Plenary Presentation **Varieties for the target counties (15 minutes)** • Watermelon growing regions and the new regions which are being targeted for watermelon cultivation in Kenya.	• Distribute participants' handouts. • PowerPoint presentation

• Watermelon varieties suited for each target county • Climatic conditions for the target counties (semi-arid, rain-fed and irrigated) **Group exercises (15 minutes)** Trainees discuss and lits watermelon varieties grown in their counties **Field demonstration (30 hour)** *(Identify farmers' fields with various watermelon varieties).* • Visit the watermelon plots with the trainees and assist them to identify and study the different varieties. • After the field visit facilitate them to recall what they learnt and discuss any issue that may arise. (can also use watermelon fruit samples/pictures for the different varieties)	• Group exercise • Field demonstration
5.7.4 Interpretation of the Labels on a Seed Package (30 minutes)	**Session Guide**
Plenary Presentation (15 minutes) • Certified seed sources for Watermelon identified and adopted. • Information on a seed package label understood e.g. date of packing, shelf life, germination percentage, purity percentage, expiry etc. **Group exercise (15 minutes)** • Circulate samples of packed certified Watermelon Seeds • Identify key information on the labels of watermelon seed packages provided.	• Distribute participants' handouts • Group exercise • Plenary discussion
5.7.5 Module review (30 minutes)	Session Guide
(The facilitator should be able to lead the trainees in reviewing the module) Together with the trainees review the main points about improved Watermelon varieties • What new ideas have you learnt from this module? • What are some of the problems and issues that you have become more aware of in Watermelon varieties? • What questions do you still have about identification of Watermelon varieties?	• The last participants' handouts • Summary of the main points from the module.

5.8. Participants' Handouts

- Watermelon leaflets and brochures
- Watermelon factsheets

MODULE 6

WATERMELON SEED SYSTEMS

6.1 Introduction

A seed system is the channel through which farmers get seeds of the new crop varieties they need. Effective seed systems have the potential to increase production quickly and transform the livelihoods of farmers. They give farmers access to good-quality seed and knowledge of improved practices and their harvests can increase substantially. Informal seed systems models are commonly adopted by most farmers across various crop value chains but lack the capacity to increase yields. For example, farmers often rely on seed distribution from their fellow farmers, which is just too slow for new varieties to have a major impact. In parallel, formal seed systems tend to focus on high value crops such as watermelon.

The development of impact-oriented seed systems can contribute importantly to the Sustainable Development Goals envisioned by the government through the agriculture sector. Watermelon growing requires appropriate seed variety for optimal yields, hence the need to select high yielding commercial varieties that will improve farmers' incomes, while at the same time the technologies are friendly to the environment in terms of pest, disease and drought tolerance. This module exposes Master Trainers to the various seed systems and the importance of quality seed in Watermelon production. It seeks to understand and document the formal seed production to enable farmers venture into commercial production of Watermelon.

6.2 Module learning outcomes

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

1. The main Watermelon seed systems in Kenya explained and appreciated.
2. Seed production in formal seed system described.
3. Seedlings sources as a complimentary seed system identified

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 2 hours 30 minutes

6.6 Module Summary

Module 6: Watermelon Seed System			
Sessions	**Training methods**	**Training materials**	**Time**
6.6.1 Introduction, objectives and expectations	• Self-introduction • Plenary presentations • Plenary discussion	• Flips charts • Marker pens • Laptop • Projector	30 minutes
6.6.2 Definition of seed and seed system in Kenya	• Group exercise • Plenary presentations	• Flips charts • Marker pens • Laptop • Projector	30 minutes
6.6.3 Formal seed system in Kenya	• Plenary Presentation • Plenary discussion	• Laptop • Projector • Flips charts • Marker pens	1 hour
6.6.4 Module review and discussions	• Group exercise • Plenary discussion • Plenary presentation	• Flips charts	30minutes
Total			**2 hours 30 minutes**

6.7 Facilitator's Guidelines

Module 6: Watermelon Seed System	
6.7.1. Introduction, Levelling of Expectations and Objectives (30 minutes)	**Session Guide**
Introduction (20 minutes) *(The facilitator welcomes trainees to the module and thereafter invites them introduce themselves and state their expectations).* **6.7.1. Module Objectives (10 minutes)** *(The facilitator presents modules objectives)* By the end of the module, the trainee should be able to: • Appreciate Watermelon seed systems and its importance in production. • Describe seed production in formal seed system. • Explain seedlings sources as a complimentary seed system	• Summarize Trainees' "Expectations" and display. • PowerPoint Presentation • Plenary discussion • Distribute participants' handouts

6.7.2. Definition of seed and seed system in Kenya (30 minutes)	Session Guide
Group exercise and presentations: (15 minutes) • What is quality seed? **Plenary Presentation (15 minutes)** • Definition of a seed system and characteristics of main seed systems (formal and complementary seed sources named) • Commodity corridors	• Group exercise • PowerPoint presentation • Distribute participants' handouts
6.7.3 Formal seed systems in Kenya (1 hour)	**Session Guide**
Plenary presentation and discussion (40 minutes) • 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 **Plenary Discussion (20 minutes)** • Formal seed systems	• PowerPoint presentation • Distribute participants' handouts
6.7.4 Module review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Summarize the module together with the trainees and have a recap of the main components in: • Watermelon seed systems and their characteristics • The importance of using certified seed *(Discuss the knowledge acquired and skills learnt from this module with the trainees. What are the observations made by trainees from this module?)*	• Participants' handouts • Summarize the main points from the module on a flip chart and display

6.8 Participants' Handouts

- Watermelon leaflets
- Watermelon fact sheets and brochures

MODULE 7

CLIMATE SMART AGRONOMIC PRACTICES FOR WATERMELON

7.1 Introduction

The low yields realized in watermelon production by farmers is as a result of non adoption of the improved crop management practices developed by agricultural researchers. Some of the improved agronomic practices available for these farmers include, timely land preparation, use of recommended fertilizer types, correct plant spacing, use of rhizobia and biofix for nitrogen fixation, knowledge of physiological maturity indices and how to improve on harvesting techniques to avoid losses

In order to optimize productivity of Watermelon, 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 can enable Watermelon farmers increase its productivity. In this respect, climate smart agronomic practices come to the fore. Therefore, there is need to equip farmer facilitators from the targeted counties with skills and knowledge that will enable them train farmers on innovative climate smart Watermelon agronomic practices that include; seed selection techniques, and disease and pest management strategies for increased production.

7.2 Module Learning outcomes

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

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

7.3 Module Target Group and Categories

This module is intended for public and private agricultural extension agents, service providers and Watermelon value chain actors in the targeted Counties of Kenya.

7.4 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 Watermelon value chain in the targeted Counties.

The facilitators using this module should familiarize themselves with the training materials and handouts for participants.

7.5. Module Duration

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

7.6 Module Summary

Module 7: Watermelon climate smart agronomic practices			
Sessions	**Training methods**	**Training materials**	**Time**
7.6.1 Introductions and climate setting, objectives and expectations	• Self-introduction • Setting norms & rules • Plenary presentation • Plenary discussion • Group exercise	• Flips charts • Felt pens • Laptop • Projector	30 minutes
7.6.2 Agronomic practices for Watermelon production	• Presentations • Group exercise (Group tour nearby farm for layout demonstration) • Plenary discussions (From the farm visit)	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts	1 hour
7.6.3 Appropriate inputs and their recommended application rates for optimum production of Watermelon	• Presentations • Group exercise (trainees enlist inputs and application rates for different counties) • Plenary discussions (share group work results)	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts	1 hour
7.6.4 Module review and discussion	• Discussion/conclusion and way forward	• Flip charts • Felt pens • Laptop • Projector	30 minutes
TOTAL			**3 hours 30 minutes**

7.7 Guidelines for Facilitators

Module 7: Climate Smart Agronomic Practices for Watermelon	
7.7.1. Introductions and Climate Setting (30 minutes)	**Session Guide**
Preliminaries *The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations* **Expectations (15 minutes)** The trainees form groups (e.g., county based) and list their expectations from the module *The facilitator presents the module objectives.* **Objectives (15 minutes)** By the end of the training module, the trainee should be able to: • Describe and explain and e agronomic practices for Watermelon production. • Describe appropriate inputs and their correct application rates for Watermelon production. • Outline region specific Watermelon production agronomic practices. • Specify the correct timing for all operations including application of inputs in Watermelon production..	• 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 Watermelon production (1 hour	
Plenary Presentation (20 minutes) The facilitator presents critical factors on: • Factors for selecting Watermelon production as an enterprise • Climate smart land preparation practices • Climate smart planting (Seed rates and plant density) • Thinning • Pruning • Training • Weed control • Pests and disease control • Cropping systems • Spacing (inter-and intra-row spacing) • Conservation agriculture principles/benefits	• PowerPoint Presentation • Plenary discussion • Distribute participants' handouts/training materials • Practical exercise

Practical exercise (30 minutes) Guided groups tours to model farms to observe various sowing and management techniques **Plenary discussion (10 minutes)** Questions/answers and comments	
7.7.3. Appropriate inputs for the optimal production of Watermelon and their correct/recommended application rates (30 minutes)	**Session Guide**
Group exercise (30 minutes) • The facilitator guides trainees to list or/and present the required inputs for use in Watermelon production • The trainees get into county groups to provide lists of Watermelon inputs and their application rates as practiced by farmers. • The groups present their results in the plenary - opening up for questions, answers and discussion. **Plenary presentation and plenary discussion (10minutes)** • The recommended Watermelon inputs (seeds, fertilizers, manures, among others), their application rates and appropriate time of application for optimal yields	• PowerPoint Presentation • Distribute participants' handouts • Groups exercise • Plenary discussion
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 and presented per county. • Randomly (average of 10 cases) trainees identify key issues for the way forward.	• Participants' handouts • Summarize the main points of the module on a flip chart and display

7.8. Handouts for Participants

1. Watermelon production guides.
2. Watermelon leaflets and brochures
3. Watermelon Factsheets

MODULE 8

INTEGRATED SOIL AND WATER MANAGEMENT PRACTICES FOR WATERMELON PRODUCTION

8.1 Introduction

Poor soil conditions and unreliable moisture availability in most smallholder dryland 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 Watermelon production systems. Integrated Soil Fertility Management (ISFM), through conservation agriculture offers the sustainable options for improving soil fertility in the advent of climate change adaptation.

Watermelon is mostly cultivated by smallholder farmers with minimal inputs. Drought management technologies to mitigate drought effects in Watermelon production are available. However, farmers have not realized their full benefits due to limited integration of the developed Integrated Natural Resource Management (INRM) and sustainable intensification practices in their production systems. This module exposes public and private extension agents, service providers, lead farmers and facilitators to the integrated soil and water management practices for enhanced Watermelon production

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 systems explained.
4. Water harvesting technologies, soil and water management practices 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 and private extension agents, lead farmers and service providers in the Watermelon 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 Watermelon production			
Sessions	**Training methods**	**Training materials**	**Duration**
8.6.1 Introduction, objectives and expectations	• Self-introduction • Plenary presentation • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop	30 minutes
8.6.2 Soil composition, properties and health,	• Plenary Presentations • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	30 minutes
8.6.3 Soil and plant tissue sampling and analysis	• Plenary Presentations • Field demonstrations (Conduct soil and plant tissue sampling and analysis)	• Projector • Laptop • Participants' handouts • Soil and plant tissue sampling tools	1 hour
8.6.4. Soil fertility and plant nutrition	• Plenary Presentation • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	30 minutes

8.6.5 Soil health and (ISFM) for climate resilient cropping systems	• Plenary presentation • Plenary discussion	• Flip charts • Marker pens • Laptop • Projector • Participants' handouts	30 minutes
8.6.6 Soil and water management and water harvesting technologies	• Plenary presentation • Plenary discussion	• Flip charts • Marker pens • Laptop • Projector • Participants' handouts	30 minutes
8.6.7 Soil degradation and reclamation	• Presentations • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	30 minutes
8.6.8 Problematic soils and their management	• Presentations • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	30 minutes
8.6.9 Module review and discussion	• Discussion	• Flip charts	30minutes
Total			**5 hours**

8.7 Facilitator's Guidelines

Module 8: Integrated soil and water management practices for Watermelon production	
8.7.1. Introduction, Objectives and Expectations (30 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations) **Module Objectives (30 minutes)** *(The facilitator presents modules objectives)* By the end of the module, the trainee should be able to: • Appreciate soil composition and what constitutes a healthy soil, including soil classification.	• Summarize trainees' "Expectations" and display. • PowerPoint presentation • Participants' handouts

• 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.	
8.7.2. Soil composition, properties and health (30 minutes)	**Session Guide**
(The facilitator presents on soil composition, properties and health). **Plenary presentation (20 minutes)** Soil composition, properties and health • Description of soil composition • Description of soil properties • Describe what soil health is all about **Plenary discussion (10minutes)** Let the trainees recall what they have learnt and discuss any issues that may arise	• PowerPoint presentation • Participants' handouts • Plenary discussion
8.7.3. Soil and plant tissue sampling and analysis (1 hour)	**Session Guide**
Plenary Presentation (30 minutes) • Overview of the soil sampling methods • Soil analysis results and interpretation • Overview of soil analysis results using available examples • Soil sampling guidelines **Practical exercise on soil sampling (30 minutes)** • soil sampling methods	• PowerPoint presentation • Participants' handouts • Practical exercise and demonstration

8.7.4. Soil fertility and plant nutrition (30 minutes)	Session Guide
Plenary Presentation (20 minutes) • Potential role of different soil management techniques in addressing soil fertility challenges in Watermelon smallholder farming systems • Integrated Soil Fertility Management techniques • Soil management guidelines **Plenary discussion (10 minutes)** Let the trainees recall what they have learnt and discuss any issues that may arise.	• PowerPoint presentation • Plenary discussion • Participants' handouts
8.7.5 Soil health and (ISFM) for climate resilient cropping systems (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Soil health • Introduction to 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 • Watermelon intercrops and crop rotation as climate resilient cropping systems **Plenary discussion (10 minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Participants' handouts
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 Watermelon productivity • Tillage systems that conserve water for Watermelon use.	• PowerPoint presentation • Participants' handouts • Plenary discussion

• Principles of soil fertility management for increased Watermelon productivity • Methods of soil fertility management for increased Watermelon productivity **Plenary discussion (10 minutes)** Let the trainees recall what they have learnt and discuss any issues that may arise.	
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 have learnt and discuss any issues that may arise.	• PowerPoint presentation • 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 have learnt and discuss any issues that may arise.	• PowerPoint presentation • Participants' handouts • Brochures, leaflets and manual
8.7.9. Module review (30 minutes)	**Session Guide**
The facilitator leads the trainees in reviewing the module) Summarize the main points of the training review the main points together with the trainees. Discuss with trainees about new things learnt from this Module. Let them identify some of the problems and any other issues arising from the module.	• The last participants' handouts • Summary of the main points from the module on a flip chart and display

8.8. Participants' Handouts

- KALRO-KCEP CRAL (2019) Soil Management Extension Manual [
- KALRO-KCEP CRAL (2019) Soil Management Leaflets
- KCEP-CRAL Pamphlets 2019
- OFRA Technical Training Manual

MODULE 9

WATERMELON CROP HEALTH

9.1 Introduction

Watermelon production is often constrained by damage caused by a range of insects, diseases, nematodes and weeds. Further, an acute shortage of knowledge among Watermelon farmers on the recommended crop health management options gets farmers frustrated and most of them may abandon the crop if timely interventions are not prioritized. Pests such as aphids and white flies suck cellular sap from young tender plant tissues, rendering infested plants unable to manufacture and translocate nutrients to various utilization locations and to eliminate metabolic waste products from the plants.

Aphids, Thrips, Cutworms, Rind worms, melon worms, root maggots, and seed corn maggot feed on the various parts of plants by chewing, sucking and scaping. These creates wounds for phytopathogen entry, thus causing plant death leading to lowering crop yields. Phytopathogens cause plant diseases, which alter the sequence of metabolic activities such as respiration, photosynthesis, nutrient translocation, growth and development. Weeds present competition for growth and development resources needed by the Watermelon crop i.e. moisture, nutrients, light and space. This has significantly reduced productivity and profitability of Watermelon over time. This module is therefore meant to help Master Trainers understand the ecology, impact and recommended management practices for diseases, pests and weeds to reduce production costs and improve Watermelon yields.

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 Watermelon described and explained.
3. Knowledge on major diseases, their development, economic losses and their control.
4. Integrated Disease Management approaches and scouting for threshold determination.
5. Integrated weed management strategies for Watermelon.
6. Safe use of agro-chemicals (pesticides, fungicides and herbicides) explained and appreciated.

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.

9.6 Module Summary

Module 8: Crop Health			
Sessions	**Training methods**	**Training materials**	**Time**
9.6.1 Introduction, objectives and expectations	• Self-introductions • Group exercise • Plenary presentation • Plenary discussion	• Flips charts • Marker pens • Laptop • Projector	30 minutes
9.6.2 Major Watermelon pests that cause economic losses and their control methods;	• Group work • Plenary presentation • Plenary discussion • Practical exercise	• Flips charts • Marker pens • Projector • Laptop • Participants' handouts	1 hour
9.6.3 Sustainable Integrated Pest Management Practices for Watermelon	• Plenary presentation • Plenary discussion	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	30 minutes
9.6.4 Major Watermelon diseases that cause economic losses and conditions that favor their development including their control methods	• Group work • Plenary Presentation • Plenary discussion • Practical session	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	1 hour

9.6.5 Sustainable Integrated Management of Watermelon diseases.	• Presentations • Plenary discussion • Field demonstration	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	1 hour
9.6.6 Integrated weed management (Major weeds of Watermelon)	• Plenary Presentation • Plenary discussion • Field demonstration	• 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)	• Presentations • Practical exercise • Plenary discussion	• Projector • Laptop • Flip charts • Marker pens • Participants' handouts	30 minutes
9.6.8 Module Review	• Discussion/ Recap of the module • Take away messages	• Flip charts • Marker pens • Participants' handouts	30 minutes
TOTAL			**6 hours**

9.7 Facilitator's Guidelines

Module 9: Watermelon Crop Health	
9.7.1. Introduction and levelling of expectations and objectives (30 minutes)	**Session Guide**
Introduction (15 minutes) *(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations)* **Module Objectives (15 minutes)** *(The facilitator presents modules objectives)* `	• Summarize trainees' "Expectations" • PowerPoint presentation • Participants' handouts

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 Watermelon. • Explain safe use of agro-chemicals (insecticides, fungicides, herbicides and ocaricides).	
9.7.2. Major Watermelon pests that cause economic losses and their control methods; emerging/migratory pests (1 hour)	**Session Guide**
(The facilitator makes a presentation on the common Watermelon pests that are of economic importance). **Group work (15 minutes)** • Trainees to share Watermelon pest information from their respective Counties **Plenary Presentation (20 minutes)** • Naming and description of pests. • Symptoms of their infestation/type of damage • Data on economic significance of the common Watermelon pests **Practical exercise (15 minutes)** • Identification of Watermelon pests from provided specimens **Discussion (10 minutes)** • Let the trainees recall what they have learnt and discuss any issue that may arise	• PowerPoint presentation • Group exercise • Practical exercise • Participants' handouts
9.7.3. Sustainable Integrated Pest Management (IPM) practices in Watermelon; 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	• PowerPoint presentation • Participants' handouts

• An overview on the safe use of agro-chemicals (demonstration on how to select most suitable pesticides, for the management of pests in Watermelon) **Discussion (10 minutes)** Let the trainees recall what they have learnt and seek clarification on the principles of sustainable IPM options	
9.7.4. Major Watermelon diseases that cause economic losses, conditions that favour their development and their control methods (1 hour)	**Session Guide**
Group work (15 minutes) • Determination of Watermelon diseases in specific Counties **Plenary Presentation (15 minutes)** • Presentations on Watermelon diseases and conditions that favor their development **Practical Exercise (30 minutes)** • Identification of major disease species causing economic damage based on samples presented	• PowerPoint presentation • Participants' handouts • Disease identification guidelines • Practical exercise
9.7.5. Sustainable Integrated Diseases Management (IDM); scouting and threshold determination (1 hour)	**Session Guide**
Plenary presentation (30 minutes) • Critical considerations for scouting and when to implement Watermelon disease control measures • Presentation on Integrated Disease Management (IDM) in Watermelon • An overview on the safe use of recommended agro-chemicals (demonstration on how to select most suitable pesticides for the management of major Watermelon diseases). **Field visit (30 minutes)** - Visit to a nearby Watermelon field for collection and identification of diseased Watermelon samples	• PowerPoint presentation • Participants' handouts • Disease management guidelines • Field demonstration

9.7.6 Integrated weed management (Major weeds of Watermelon) (1 hour	Session Guide
Plenary presentation (45 minutes) • Identification of weeds • Major types of weed in the Watermelon field • Integrated weed management options **Plenary discussion (15 minutes)** Integrated weed management	• PowerPoint presentation • Participants' handouts • Plenary discussion
9.7.7. Safe Use of agro-chemicals and sources of registered chemicals (PCPB registered products) (40 minutes)	**Session Guide**
Practical (20 minutes) Trainees go into their groups and discuss: • Ways used by farmers in mixing of pesticides/ ITK products; and their consideration on safe use of pesticides Representative group leaders give presentation on findings of the discussion **Plenary presentation (10 minutes)** Facilitator makes presentation on: • Safe use of pesticides • Let the trainees ask questions on any of the covered topical issues and critical areas to share with farmers on safe use of pesticides	• PowerPoint presentation by facilitator and representative group leaders • Demonstration of proper use of knap sack sprayer, protective gear and calibration of pesticides, sourcing for registered pesticide information online: on PCPB website • Distribute participants hand-outs (brochures, leaflets and manuals) • Pest, disease and weed management guidelines
9.7.7. 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 major pests, their impact and management options in watermelon production. • Major pests of Watermelon and their economic impacts on Watermelon production. • Integrated Pest Management (IPM) options for Watermelon	• The last participants' handouts • Summarize the main points from the module on a flip chart and display

• Major diseases of Watermelon and their economic impact on Watermelon production. • Integrated Disease Management (IDM) options for Watermelon • Major weeds of Watermelon and their economic impacts on Watermelon production. • Integrated Weed Management (IWM) options for Watermelon *(Discuss with trainees about new things learnt from this Module. What are some of the issues that need clarification)?*	

9.8. Participants' handouts

- Fact sheets on Watermelon pest identification and control
- Factsheets on Watermelon disease identification and their control
- Factsheets on Watermelon weeds identification and their management
- Mwangi, H.W. Weed Management manual. KALRO-Kabete

MODULE 10

WATERMELON HARVESTING AND POST-HARVEST MANAGEMENT

10.1 Introduction to the Module

Inappropriate harvesting, and postharvest handling methods are major production constraints that cause postharvest loss and waste along the watermelon value chain. The postharvest losses are estimated upwards of 30%. Microbial spoilage of watermelon juice is due to the activity of several microorganisms. This is manifested as a water soaking appearance. These reduce the gains from investments made on watermelon productivity enhancement. Harvested watermelon if not properly handled, is prone to fungal and bacterial rots. Postharvest losses also occur during transportation from field to homestead, and from the homestead to the market if the carrier material is not appropriate. Widespread dissemination of the available climate smart TIMPs through farmer awareness, training and demonstrations can reduce the losses. This module introduces service providers and lead farmer trainers to watermelon postharvest value chain, constraints and opportunities in postharvest value chain and climate smart and gender friendly postharvest TIMPs for minimizing the losses and enhancing quality of the watermelon.

10.2 Module Learning Outcomes

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

1. The whole range of postharvest practices for watermelon explained.
2. Constraints and opportunities in watermelon postharvest value chain explained.
3. Climate smart and gender-friendly postharvest practices for minimizing the losses and enhancing quality of watermelon explained and demonstrated.

10.3 Module Target Group

This module targets Public and private agricultural extension agents, service providers and lead farmers based at the sub county and ward levels.

10.4 Module Users

This module is intended for use by Master Trainers who are members of the CTT and Lead Farmers in the watermelon 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.

10.6 Module Summary

Module 19: Watermelon Harvesting and Postharvest Management			
Sessions	**Training Methods**	**Training Materials**	**Time**
10.1 Introductions, expectations and objectives	• Personal introduction • Group work • Plenary presentation	• Flip charts • Felt pens • Projector • Laptop	20 minutes
10.2. Constraints and opportunities in post-harvest management of watermelon	• Group exercise • Plenary presentations	• Flip charts • Participants' handouts, • Videos	40 minutes
10.3. Watermelon postharvest TIMPs • Maturity indices • Harvesting • Field assembly and packaging • Control of postharvest rots and decay • Sorting, grading and packaging • Storage • Cooling (Zero Energy Coolers, charcoal coolers)	• Group work • Brainstorming sessions • Plenary presentation • Practical demonstration	• Projector • Laptop • Participants' handouts • Materials for demos (watermelons, refractometer, bags, crates, etc.)	1 hours 30 minutes
10.4. Module review	• Facilitator's summary • Group exercise	• Flip charts • Projector • Laptop • Module evaluation forms	30 minutes
TOTAL			**3 hours**

10.7 Facilitators Guidelines

Module 10. Water Harvesting and Postharvest Management	
10.7.1 Introduction and levelling of expectations and objectives (20 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and invites trainees to introduce themselves and state their expectations) **Introduction and Module Objectives (10 minutes)** *(The facilitator presents module's objectives)* By the end of the module trainees should be able to: • Explain the correct maturity indices and harvesting practices for watermelon • Explain the whole range of postharvest practices for watermelon • Explain the constraints and opportunities in watermelon postharvest value chain • Explain climate smart and gender-friendly postharvest TIMPs for minimizing the losses and enhancing quality of watermelon **Expectations (10 minutes)** *Assist the trainees to state their expectations based on the objectives*	• Participants' handouts • Training Program • PowerPoint presentation • Summarize trainees' "Expectations" and display on flip chart/ board.
10.7.2 Constraints and opportunities in postharvest handling of watermelon (40 minutes)	**Session Guide**
(Highlight the watermelon postharvest value chain – harvesting, field assembly and packaging, sorting, grading and packaging, storage, cooling, control of postharvest rots and decay). **Group work (30 minutes)** • Trainees discuss constraints in the postharvest handling of watermelon, and suggest solutions **Group presentation (10 minutes)** Trainees present results of group work in plenary	• PowerPoint presentation • Participants' handouts
10.7.3 Watermelon postharvest value chain TIMPs (1 hour 30 minutes)	**Session Guide**

Plenary Presentation (1 hour) • Maturity indices and harvesting of watermelon (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 • Watermelon harvesting methods • Field assembly and packaging • Sorting, grading and packaging • Storage • Cooling (Zero Energy Coolers, Charcoal coolers) **Practical demonstrations (30 minutes)** • Determination of sugar content (Brix) as a maturity index for harvesting, using refractometer • Sorting and grading (watermelons purchased from the market and grading into various grades with reference to existing standards)	• PowerPoint presentation • Participants handouts • Materials for demos (watermelons, refractometer, bags, crates, etc.)
10.4 Module review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) **Plenary presentation (10 min)** Together with the trainees, summarize the main points of the training. **Group Exercise (20 min)** Together with the trainees review the main points about watermelon harvesting and post-harvest handling • What new ideas 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?	Summary of the main points from the Module

10.8. Participant's Handouts

- Wayua F., Ndambuki J., Wasilwa, L.A (2021). brochure on watermelon postharvest handling. KALRO / KCSAP Project

MODULE 11

WATERMELON VALUE ADDITION

11.1. Introduction

Watermelon is one of the major fruit in Kenya, mainly eaten as dessert in the diet and in many occasions eaten alone in market places. This module introduces farmer trainers to the importance of Watermelon in addressing food and nutrition security at the household, community and industrial levels. The module also covers the various Watermelon value added products, constraints in value addition and their suggested solutions. It is anticipated that developments in processing and value addition will enhance production and consumption of this crop towards 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 Watermelon as a food and nutrition security crop explained and appreciated.
2. Nutritional composition of Watermelon, health benefits, food security and income described.
3. Constraints in value addition and consumption of Watermelon, and suggest solutions identified
4. Watermelon-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 CTT and Lead Farmers in the Watermelon 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 5 hours 30 minutes.

11.6. Module Summary

Module 11. Watermelon value addition			
Sessions	**Training Methods**	**Training Materials**	**Time**
11.6.1. Introduction, Objectives Expectations	• Personal introduction • Group work • Plenary Presentation	• Flip charts • Projector • Laptop	30 minutes
11.6.2 Role of Watermelon as a food and nutrition security crop	• PowerPoint Presentation • Group exercise • Plenary Presentation	• Flip charts • Felt pens • Projector • laptop • Participants' handouts	30 minutes
11.6.3. Nutritional composition of Watermelon and its role in human health	• PowerPoint • Plenary presentation • Group exercise	• PowerPoint presentation • Flip charts • Felt pens • Participant handouts	45 min
11.6.4. Constraints in value addition and consumption of Watermelon	• Group exercise • Plenary Presentation	• List of value added products • Checklist for prioritization • Pair wise ranking tool • Flip charts • Felt pens • Participants' handouts • Projector • Laptop	45 min
11.6.5 Watermelon based value added products:	• Plenary Presentations • Plenary discussion • Practical demonstration • Sensory evaluation of value added Watermelon products • Field visit to processing firms / groups	• Projector • Laptop • Participant handouts • Assorted value addition equipment and ingredients (Watermelon, Watermelon flours, among others.) • Sensory evaluation forms	2 hours 30 minutes

11.6.6. Module review	• Plenary discussion • Presentations	• Flip charts • PowerPoint presentations • Module evaluation forms	30 minutes
TOTAL			**5 hours 30 minutes**

11.7. Facilitator's Guidelines

Module 11. Watermelon value addition	
11.7.1 Introduction, expectations and objectives (30 minutes)	**Session Guide**
Introduction and expectations (15 minutes) *(The facilitator welcomes trainees to the module on value addition of Watermelon. They are then invited 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 • Appreciate the role of Watermelon as a food and nutrition security crop. • Describe nutritional composition of Watermelon, health benefits, food security and income. • Identify constraints in value addition and consumption of Watermelon, and suggest solutions. • Explain how to make Watermelon-based value added products. • Explain the use of Watermelon vines as a nutritive livestock feed (immature fruits, fruit left-overs, among others).	• Participants' handouts • PowerPoint Presentation • Summarize trainees' expectations and display on flip chart/board.

11.7.2 Role of Watermelon as a food and nutrition security crop 30 minutes)	Session Guide
(The facilitator presents on malnutrition cases in Kenya and the importance of Watermelon in addressing food security and malnutrition challenges) **Plenary Presentation (15 minutes)** PowerPoint presentation highlighting the critical elements: • Micronutrient malnutrition cases in Kenya • Dietary nutrient requirements (focusing on VMGs) **Group Exercises (15 minutes)** Trainees discuss in groups, the main malnutrition challenges in their respective counties / regions	• PowerPoint presentation • Participants' handouts • Recipe books • Sample Watermelon and other processing ingredients • Group exercise
11.7.3 Watermelon nutritional composition and impact of consumption on human health (45 minutes)	
Plenary presentation (45 minutes) • Overview of the documented Watermelon nutritional composition and their role in human health and nutrition	• PowerPoint presentation • Participant handouts • Brochures, leaflets, manual, factsheets, posters
11.7.4. Constraints in value addition and consumption of Watermelon, and suggested solutions (45 minutes)	**Session Guide**
Group exercise (30 min) Groups discuss the constraints in Watermelon value addition and consumption **Plenary presentation (15 min)** Overview of constraints in value addition and consumption of Watermelon.	• PowerPoint presentation • Group Exercise

11.7.5 Watermelon based value added products (2 hours 30 min)	Session Guide
Plenary presentation (30 min) • Overview of Watermelon based value added products • Meaning of value addition • Requirements for value addition of Watermelon • Watermelon based value added products; sensory evaluation of the products **Practical exercise (2 hours)** • Demonstration on formulation of Watermelon based products • Practical on sensory evaluation of value added Watermelon products	• Participants handouts • Powerpoint presentation • Recipes • Sensory evaluation forms • Assorted value addition equipment and ingredients
11.7.6 Training review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing he module) Review the main points about Watermelon value addition together with the trainees. • What new ideas did you learn from this Module? • What are some of the problems and issues that you have become more aware of in Watermelon value addition? • What questions do you still have about Watermelon value addition?	• Summary of the main points from the Module.

11.8. Participants' Handouts

- Watermelon value addition factsheet
- Watermelon value addition pamphlets and leaflets.
- Recipe books

MODULE 12

MECHANIZATION OF WATERMELON PRODUCTION ACTIVITIES

12.1 Introduction

Agricultural mechanization supports in enhancing production, productivity and profitability in agriculture by achieving timeliness in farm operations. It comes along with precision in metering and placement of inputs, reducing available input losses, increasing utilization efficiency of costly inputs (seed, chemical, fertilizer, irrigation among others.), reducing unit cost of produce, enhancing profitability and competitiveness in the cost of operation. It also 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. Agricultural mechanization is one of the important inputs that has potential to revolutionize watermelon farming in Kenya especially when applied to seedbed preparation, planting, weeding, pest control, harvesting and post-harvest activities. This module is designed for training facilitators to acquire skills that are useful in mechanization of Watermelon farming.

12.2 Module learning outcomes

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

1. Climate smart tillage options identified and explained
2. Seedbed preparation of raised beds and direct sowing demonstrated
3. Laying out of irrigation structures demonstrated
4. Calibration of fertilizer, seed rates for planters and rollers demonstrated
5. Use of pest control implements and tools demonstrated
6. Harvesting and transportation of watermelon demonstrated.

12.3 Module Target Group and Categories

This module is intended for private 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 CTT. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts.

12.5 Module Duration

The Module is estimated to take a duration of 4 hours.

12.7 Module Summary

Module 12. Mechanization of Watermelon production activities			
Sessions	**Training methods**	**Training materials**	**Duration**
12.7.1 Introduction, objectives and expectations	• Personal introduction • Plenary Presentation • Plenary discussion	• Flip charts • Felt pens • Projector • Laptop	20 minutes
12.7.2 Climate smart tillage options	• Plenary Presentation • Plenary discussion	• Projector • Laptop • Flip chart • Felt pens • Participants' handouts	30 minutes
12.7.3 Seed-bed preparations 12.7.3.1 Preparation of raised beds 12.7.3.4 Preparation of ridges	• Plenary Presentation • Plenary discussion	• Projector • Laptop • Flip chart • Felt pens • Participants' handouts	20 minutes
12.7.4 Laying out of irrigation structures	• Plenary Presentations • Plenary discussion	• Flip chart • PowerPoint presentation • Participants' handouts • Practical session	30 minutes
12.7.5 Calibration of fertilizer, seed rates for planters and rollers demonstrated	• Plenary Presentation • Plenary discussion	• Projector • Laptop • Flip chart • Felt pens • Participants' handouts	30 minutes
12.7.6 Sowing demonstrated	• Plenary Presentation • Plenary discussion	• Projector • Laptop • Flip chart • Felt pens • Participants' handouts	30 minutes
12.7.7 Pest control equipment and tools usage	• Presentations • Plenary discussion	• Flip chart • PowerPoint presentation • Participants' handouts • Practical session	1 hour

12.7.8 Module review	• Presentations	• PowerPoint presentation	20 minutes
TOTAL			**4 hours**

12.7 Facilitator's Guidelines

12.7.1 Introduction, Objectives and Expectations (20 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations). *The facilitator presents module objectives* **Module Objectives** By the end of the module, the trainee should be able to: • Identify and explain climate smart tillage options. • Demonstrate seedbed preparation for raised beds and direct sowing • Demonstrate and explain layout of irrigation structures • Demonstrate calibration of planters for fertilizer and seed rates for planters and rollers • Demonstrate use of pest control implements and tools. • Explain how to harvest and transport Watermelon with minimum injury	• Summarize trainees' "Expectations" and display. • PowerPoint presentation • Participants' handouts
12.7.2. Climate smart tillage options (30 minutes)	**Session Guide**
(The facilitator presents on the commonly known Watermelon pests that are of economic importance) **Plenary Presentation (20 minutes)** • Overview of the Watermelon mechanization activities • Climate smart tillage options **Plenary discussion (10 minutes)** Let the trainees recall what they learned and discuss any issue that may arise	• PowerPoint presentation • Participants' handouts • Plenary discussion
12.7.3. Seed-bed preparations using raised beds and ridges (20 minutes)	**Session Guide**
Plenary Presentation (10 minutes) • Techniques and methods of raised bed design and construction • Techniques and methods of ridging	• PowerPoint presentation • Participants' handouts

Discussion (10 minutes) Let the trainees recall what they have learnt and discuss any issue that may arise.	• Plenary discussion
12.7.5. Irrigation layout and tools (30 minutes)	**Session Guide**
Plenary Presentation (10 minutes) • Techniques and methods of irrigation design and construction **Discussion (20 minutes)** Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint presentation • Participants' handouts • Plenary discussion
12.7.4. Calibration of fertilizer and seed rate for planters and soil firming (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Techniques and methods of planter seed and fertilizer rate determination and soil firming **Discussion (10 Minutes)** Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint presentation • Participants' handouts • Plenary discussion
12.7.5. Seed sowing (30 minutes)	**Session Guide**
Plenary Presentation (15 minutes) • Techniques and methods of seed and fertilizer placement **Discussion (5 minutes)** Let the trainees recall what they have learnt and discuss any issue that may arise.	• PowerPoint presentation • Participants' handouts • Plenary discussion
12.7.6. Pest control equipment and tools usage (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Techniques and methods of using pest control equipment; knap sack and boom sprayer **Plenary discussion (10 minutes)** Let the trainees recall what they learnt and discuss any issues that may arise	• PowerPoint presentation • Participants' handouts • Plenary discussion

12.7.7 Harvesting and transportation (1 hour)	Session Guide
Plenary Presentation (30 minutes) • Techniques and methods of using knives to harvest watermelon **Plenary discussion (30 minutes)** Let the trainees recall what they learnt and discuss any issues that may arise	• PowerPoint presentation • Participants' handouts • Plenary discussion
12.7.8 Module review (20 minutes)	**Session Guide**
The facilitator leads the trainees in reviewing the module) Summarize the main points of the training and together with the participants review the main points: • Various climate smart tillage operations • Seedbed preparation • Layout irrigation structures • Calibration of fertilizer and seed rate for planters and rollers • Sowing • Chemical application implements and tools operations • Harvest and transport with minimum injury *(Discuss with trainees about new things learnt from the module and any issues that may arise)*	• The last participants' handouts • Summarize the main points from the module on a flip chart and display

12.8 Participants' Handouts

- Watermelon mechanization factsheets
- Watermelon mechanization leaflets and brochures

MODULE 13
WATERMELON BUSINESS AND MARKERTING

13.1 Introduction

Watermelon is mainly produced in Eastern, Central, Coastal and Rift Valley Regions, where most of the produce is marketed locally with little being exported. Optimum production is realized under irrigation, where a farmer has potential to generate up to 20 tons in one hectare per season under good management giving KES 0.5 million at farm gate price of KES 25 per kilogram.

Markets and marketing of watermelon is a major issue of concern to small scale farmers and other actors in the Watermelon value chain in Kenya. Of particular concern is the inconsistency in supplying sufficient volumes required for trade, seasonal supply and price fluctuations. To strengthen the Watermelon value chain, it is important to equip farmer facilitators with the skills and knowledge on Watermelon farming business and marketing strategies. This module is designed to expose Master trainers in Watermelon farming business and marketing in Kenya.

13.2 Module Learning Outcomes

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

1. The business concept and emerging farming business models explained and appreciated.
2. Planning a farm business using SWOT analysis, farm budgeting and business plan described.
3. Tools for implementing a farm business, record keeping, break-even, gross-margin and entrepreneurship explained and described.
4. Marketing approaches of Watermelon identified.

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 CTT. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts.

13. 5 Module Duration

The Module is estimated to take a duration of 3 hours 20 minutes.

13.6 Module Summary

Module 13. Watermelon Business and Marketing			
Sessions	**Training Methods**	**Training Materials**	**Time**
13.6.1. Models for market-oriented production of watermelon. (Levelling of participants' expectations about the module and objectives)	• Introduction • Plenary discussion	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/flip chart holders	20 minutes
13.6.2. Developing a Business Plan for watermelon farm Business i. (Business concept and emerging farming business models) ii) Planning a farm business: SWOT Analysis, farm budgeting and business plan	• Plenary presentation • Plenary discussion • Group exercise	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/flip chart holders	1 hour
13.6.3. Marketing as a group - collective marketing	• Presentation and • Plenary discussions • Role play exercise	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/flip chart holders	30 minutes
13.6.4 Profitability analysis - Reviewing performance of watermelon agro enterprise (Implementing a farm business: Record keeping, Break-even, Gross margin, entrepreneurship	• Plenary presentation • Plenary discussion	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/flip chart holders	20 minutes
13.6.5 Scaling up plan of watermelon agro-enterprise development approach	• Group work • Plenary discussions	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/flip chart holders	30 minutes

13.6.6 Marketing Approaches (Contracted Watermelon production model, Watermelon marketing entrepreneurship model and Internet/online/ mobile marketing)	• Plenary presentation • Plenary discussion	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/flip chart holders	20 minutes
13.6.7. Training review	• Facilitator's summary • Plenary presentation • Plenary discussion	• Module review • Participants handouts	20 minutes
TOTAL			**3 hours 20 minutes**

13.7 Facilitators Guidelines

Module 13. Watermelon Business and Marketing	
13.7.1 Levelling participants' expectations about the module (10 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and thereafter invites them to state their expectations). *(The facilitator presents module objectives)* By the end of this module, the trainee is expected to: • Appreciate business concept and appreciate emerging and inclusive farmer-market linking models. • Describe how to plan a farm business using SWOT Analysis, farm budgeting and business plan. • Describe and explain the tools for implementing a farm business: cost of production, Record keeping, Break-even, Gross margin and entrepreneurship. • Identify the marketing approaches of Watermelon.	• Summarize trainees' "Expectations" and display on flip chart/board. • Participants handouts • PowerPoint presentation
13.7.2 Developing a business plan for Watermelon farm business (40 minutes)	**Session Guide**
(The facilitator to highlight elements of business concept and emerging farming business models) **Plenary Presentation (10 minutes)** • Business concept and emerging farming business models **Group Exercise (10 minutes)** • Discuss areas of adjustments in the models	• PowerPoint presentation • Participants' handouts • Group exercise

Planning a farm business using SWOT analysis, farm budgeting and business plan -20 minutes *(The facilitator highlights the components of SWOT matrix and their interactions to generate opportunities based on the other components)* **Plenary Presentation (10 minutes)** • SWOT analysis • Budgeting • Business planning **Group Exercise (10 minutes)** List the strengths, weaknesses, opportunities and threats in Watermelon farming as a business and marketing	
13.7.3 Marketing as a group - collective marketing (30 minutes)	**Session Guide**
(The facilitator highlights the importance and benefits of collective and group marketing **Presentation and discussions (10 minutes)** • Collective Marketing **Role play exercise (20 minutes)** • In groups of two, the trainees will do a role play, where they sell individually and where sell as a group.	• Participants 'handouts • Group exercise
13.7.4 Profitability analysis - Reviewing performance of watermelon agro enterprise (20 minutes)	**Session Guide**
(*The facilitator highlights the importance of the tools in managing Watermelon production as a farm business)* **Plenary Presentation (10 minutes)** • The farmer as an entrepreneur • Record keeping • Profitability assessment (cost of production, break-even & gross margin) **Plenary Discussion (10minutes)** • Profitability analysis	• PowerPoint presentation • Participants' handouts • Plenary discussion

13.7.5 Scaling up plan of watermelon agro-enterprise development approach (30 minutes)	Session Guide
Group and Plenary discussions (20 minutes) • In groups of three the participants discuss how to scale up watermelon agro-enterprise *The group leaders in each group present back to the whole plenary and discuss the outcomes.*	• Plenary discussion • Group exercise
13.7.6 Marketing strategies (20 minutes)	**Session Guide**
Plenary Presentation (10 minutes) (*The facilitator highlights the marketing strategies for the Watermelon farm business)* • Market research • Producer organizations • Contract farming • Online/internet marketing **Plenary Discussion (10 minutes)**	• Powerpoint presentation • Participants' handouts
13.7. 7 Training review (20 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module. Conclude by thanking the trainees) **Plenary Presentation (10 minutes)** *Summarize the main points of the training*	• Plenary presentation • Summary of the main points from the Module.

13.8. Participants' Handouts

- Watermelon Business and Marketing factsheets
- Watermelon production manual

References

1. MoALF-Kenya. (2015). Economic Review of Agriculture (ERA). Nairobi Kenya: Central Planning and Project Monitoring Unit. Ministry of Agriculture Livestock and Fisheries.
2. Mwangi, M. and Kariuki, S. (2015). Factors Determining Adoption of New Agricultural Technology by Smallholder Farmers in Developing Countries. Income and Factor Analysis of Watermelon Production in Ekiti State, Nigeria
3. Tawedzegwa M. (2012). Farming as a family business. Training manual. Zimbabwe agricultural competitiveness program.

MODULE 14

WATERMELON 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 Watermelon 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 herein.

Sub-module 14.1

Agricultural Innovation Platforms

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 reflective 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 solutions 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 upscaling of innovations in the Watermelon value chain

14.1.1. 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 understood

2. The characteristics of an innovation platform described and understood.
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 understood

14.1.2 Sub-Module Target Group and Categories

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

14.1.3 Sub-Module Users

This module is intended for use by Master trainers who are members of the CTT. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts.

14.1.4 Sub-Module Duration

The Module is estimated to take a duration of 3 hours

14.1.5 Module Summary

Sub-Module 14.1 Agricultural Innovation Platforms (AIP)			
Sessions	**Training methods**	**Training materials**	**Time**
14.1.6.1 Introduction, objectives and expectations	• Personal introduction • Plenary Presentation • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop	20 minutes
14.1.6.2 Definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational	• Plenary Presentation • Plenary discussion • Group exercise	• Flips charts • Felt pens • Projector • Laptop	30 minutes
14.1.6.3 Characteristics of an Agricultural Innovation Platform	• Plenary Presentation • Plenary discussion	• Flip charts • Felt pens • Projector • Laptop • Participants' handouts	30 minutes

14.1.6.4 Phases of an innovation platform (Initiation, Establishment, Management and Sustainability)	• Plenary presentation • Plenary discussion • Group Exercise	• Flips charts • Felt pens • Projector • Participants' handouts • Laptop	45 minutes
14.1.6. 5 Case studies of successful Agricultural Innovation Platforms	• Plenary presentation • Plenary discussion • Role plays	• Flips charts • Felt pens • Projector • PPT Presentation • Participants' handouts	15 minutes
14.1.6. 6 Benefits and challenges of Agricultural Innovation Platforms	• Plenary presentation • Plenary discussion • Role plays	• Flips charts • Felt pens • Projector • PPT presentation • Participants' handouts	10 minutes
14.1.6.7 Module review	• Plenary discussion	• 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, levelling of expectations and objectives (20 minutes)	**Session Guide**
(The facilitator welcomes trainees to the session and thereafter invites them to introduce themselves and state their expectations) **Module Objectives** (The facilitator presents modules objectives and levels out expectations) 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 • Explain how to initiate, establish, manage and sustain an agricultural Innovation Platform • Explain the benefits and challenges of Agricultural Innovation Platforms	• Summarize Trainees' "Expectations" and display. • PowerPoint Presentation
14.1.6.2 A definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational) (30 minutes)	**Session Guide**
Plenary presentation and discussion (30 minutes) • Past progression of research and extension models and their shortcomings • Agricultural Innovation Systems model and actualization through Agricultural Innovation Platforms • Definition of an innovation process • Types of innovations (products of innovation process)	• PowerPoint Presentation • Plenary discussion
14.1.6.3. Characteristics of an Agricultural Innovation Platform (30 minutes)	**Session Guide**
(The facilitator should present an overview of innovation platforms and their main characteristics). **Plenary Presentation (30 minutes)** • 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	• PowerPoint Presentation • Participants' handouts • Plenary discussion

Plenary discussion (15 minutes) Let the trainees recall what they learned and discuss any issue that may arise.	
14.1.6.4 Phases of an innovation platform (Initiation, Establishment, Management and Sustenance (45 minutes)	**Session Guide**
Plenary Presentation (45 minutes) **Initiation phase** • Mobilization of stakeholders in the Watermelon value chain for challenge identification • General description of the value chain within a specific area **Establishment Phase** • Clear prioritization of the key value Chain challenges or compelling agenda (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 **Management Phase** • 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. **Sustainability and scaling Phase** • 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.	• PowerPoint Presentation • Participants' handouts • Plenary discussion

Plenary discussion (10 minutes) Let the trainees recall what they learned and discuss any issue that may arise.	
14.1.7.5 Case studies of successful AIPS (15 minutes)	**Session Guide**
Plenary Presentation and discussion • successful innovation platforms and their achievements	• PowerPoint Presentation • Plenary discussion
14.1.7.6 Benefits and challenges of AIPS (10 minutes)	**Session Guide**
Plenary Presentation • Benefits of Agricultural innovation platforms • Challenges of Agricultural Innovation platforms	• PowerPoint Presentation • Plenary discussion
14.1.7.7 Module review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training and together with the trainees and review the main points on: • 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 *(Discuss with trainees' new things learnt from this Module. What are some of the problems and issues that they have become more aware of in the module?)*	• Participants' Handouts • Summarize the main points from the module on a flip chart and display

14.1.8 Participants' Handouts

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

References

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* 2(6).
3. Makini F., Kamau G., Makello M., Adekunle A., Mburathi G., (2013). Operational field guide for developing and managing local agricultural innovation platforms

SUB-MODULE 14.2

WATERMELON GENDER, VULNERABLE AND MARGINALIZED GROUPS (VMGs), SOCIO, ENVIRONMENTAL CONCERNS AND COHESION

14.2.1 Introduction.

Watermelon is a major agro-enterprise and therefore all the gender categories (men, women, youth vulnerable marginalized groups (VMGs) are involved in its value chain from production, marketing and consumption. However, women perform most of the crop's production activities such as planting and weeding while men mostly perform the task of marketing.

Despite this significant contribution by women, gender inequalities exist in all areas of the value chain. Some of these gender inequalities include: division of labour, access to and control of resources and decision making within and beyond the household. These inequalities limit the access of women, youth and VMGs and 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 lack of 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.

Watermelon 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 module is to ensure that gender mainstreaming and social inclusion in Watermelon TIMPs is enhanced by field agricultural practitioners and extension officers as an effort geared towards achieving Climate Smart Agriculture "triple win" in target counties

4.2.2 Sub-Module learning outcomes

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

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

14.2.3 Sub-Module Target Group

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

14.2.4 Sub-Module Users

This module is intended for use by Master Trainers who are members of the 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 participants' handouts.

14.2.5 Sub-Module Duration

The Module is estimated to take a duration of 3 hours and 30 minutes

14.2.6 Sub-Module Summary

Sub-Module 14.2 Gender mainstreaming and social inclusion in the Watermelon value chain			
Sessions	**Training methods**	**Training materials**	**Duration**
14.2.6.1 Introduction, expectations and objectives	• Personal introductions • Plenary Presentation • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants' handouts	30 minutes
14.2.6.2 Gender mainstreaming in Watermelon value chain	• Plenary presentation • Group Exercise • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	30 minutes
14.2.6.3 Youth empowerment in Watermelon value chain	• Plenary presentation • Group exercise • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	30 minutes
14.2.6.4 Women empowerment in Watermelon value chain	• Plenary presentations • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	30 minutes

14.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	• Plenary Presentation • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	30 minutes
14.2.6.6 Environmental and Social Management Framework (FSMF) tool	• Plenary presentation • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	30 minutes
14.2.6.7 Module Review	• Plenary discussion	• 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 Watermelon value	
14.2.7.1 Introduction, Objectives and Expectations (30 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and thereafter invites them to state their expectations) **Module Objectives (30 minutes)** *The facilitator presents modules objectives* By the end of the module training, the trainee should be able to: - • Understand gender mainstreaming and social inclusion, in the Watermelon value chain • Understand youth empowerment in the Watermelon value chain • Appreciate women empowerment in the Watermelon value chain • Recognize strategies for inclusion of vulnerable and marginalized groups in the Watermelon value chain • Understand the ESMF tool	• Summarize Trainees "Expectations" and display. • PowerPoint Presentation • Group exercise • Objectives and Training Program

14.2.7.2 Gender mainstreaming and social inclusion in Watermelon value chain (30 Minutes)	Session Guide
(The facilitator should present and explain what is gender mainstreaming, who does what activity, who has access to what resources among others. and why gender mainstreaming is important in Watermelon value chain). **Plenary Presentation (20 minutes)** • Definition of gender • What is gender mainstreaming and why it is important? • Who does what? (gender division of roles in Watermelon 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 issue that may arise	• PowerPoint presentation, Group exercise • Plenary discussion • Participants' handouts • Group exercise • Plenary discussion
14.2.7.3 Youth empowerment in Watermelon value chain s (1 hour)	**Session Guide**
Plenary Presentation (40 minutes) • Why agriculture is not attractive to youth • Youth's role in the value chain • Strategies to empower youth in Watermelon value chain **Group exercise and discussion (20 minute)** Let the trainees recall what they have learnt and discuss any issue that may arise.	• PowerPoint Presentation • Group exercise • Plenary discussion • Participants' handouts
14.2.7.4 Women empowerment in Watermelon value chain (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Women's role in the value chain • Challenges facing women in the value chain • Strategies for empowering women in the value chain **Plenary discussion (10 minutes)** Let the trainees recall what they have learnt and discuss any issue that may arise	• PowerPoint Presentation • Distribute participants' handouts • Plenary discussion • Participants' handouts

14.2.7.5. Strategies for inclusion of vulnerable and marginalized groups in Watermelon value chain (30 minutes)	Session Guide
Plenary presentation (20 minutes) • Who are vulnerable and marginalized groups (VMGs) • Why gender inequality exists • Social inclusion and why • Strategies of inclusion of VMG **Plenary discussion (10 minutes)** Let the trainees recall what they have learnt and discuss any issue that may arise	• PowerPoint Presentation • Plenary discussion • Participants' handouts
14.2.7.6. Environmental and social management framework (ESMF) (30 minutes)	**Session Guide**
Plenary presentation (20 minutes) • Objective of ESMF in the Watermelon value chain • Environmental and social safeguards of Watermelon • Safeguard policies triggered by the project **Plenary discussion (10 minutes)** Let the trainees recall what they learned and discuss any issue that may arise	• PowerPoint Presentation • Plenary discussion
14.2.7.7. Module review (30 minutes)	**Session Guide**
The facilitator leads the participants in reviewing the module) Summarize the main points of the training and together with the trainees review the main points: • What is gender mainstreaming and why it is important? • Youth empowerment in Watermelon value chain • Women empowerment in Watermelon value chain • Strategies for inclusion of vulnerable and marginalized groups in Watermelon value chain • Environmental and Social Management Framework of Watermelon value chain activities Let the trainees recall what they have learnt and discuss any issue that may arise.	• Summarize the main points on from the module on a flip chart and display • Plenary discussion

14.2.8 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 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 also identifies Agriculture as the engine of growth through transformation of smallholder and subsistence agriculture to an innovative and commercially oriented sector. Kenya promulgated the new constitution in 2010 which proposes two levels of governments (national & county) with defined functions.

Agriculture is one of the devolved governance functions. However, agriculture in Kenya is facing 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. Therefore, agricultural policy in Kenya 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 small scale farmers; appropriate and participatory policy formulation and environmental sustainability.

This module introduces the Master Trainers to the design and implementation of effective climate-smart-sensitive agricultural policy options to promote the transition to climate-smart agriculture at the smallholder level. The policy context of this module is structured around six topics.

14.3.2 Module Learning Outcomes

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

1. The role of agricultural policy frameworks in Kenya explained and appreciated.
2. Climate-smart agriculture practices, policy options and approaches identified and understood.
3. Climate-smart-sensitive policy cycle understood and explained.
4. Implementation of the climate-smart-sensitive policy at the county level described and understood.
5. Financing and Investments for Climate-smart Agriculture explained and understood.
6. The need for a Technology Policy outlined and understood.

14.3.3 Module Target Group

This module is intended for service providers, policy makers, public extension agents and relevant stakeholders in the design and implementation of effective, climate-smart-sensitive agricultural policies.

14.3.4 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 thoroughly familiarize themselves with the required participant's handouts.

14.3.5 Module Duration

The Module is estimated to take 3 hours.

14.3.6 Module Summary

Module 14.3: Climate-Smart Agricultural Policy Options			
Sessions	**Training methods**	**Training materials**	**Time**
14.3.6.1 Introduction, learning expectations and outcomes	• Personal introductions • Group discussion • Plenary discussions • Plenary presentation	• Flips charts • Felt pens • Projector • Laptop	20 minutes
14.3.6.2 Agricultural Policy Frameworks in Kenya	• Presentations • Practical exercise • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop	20 minutes
14.3.6.3 Climate-smart agriculture practices, policy options and approaches	• Presentations • Practical exercises • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	30 minutes
14.3.6.4 Climate-smart-sensitive policy cycle	• Presentations • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	20 minutes
14.3.6.5 Implementation of the climate-smart-sensitive policy at the county level	• Presentations • Practical exercise • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	20 minutes
14.3.6.6 Financing and Investments for Climate-smart Agriculture	• Presentations • Practical exercise • Plenary discussion	• Flips charts • Felt pens • Projector • Laptop • Participants handouts	30 minutes

14.3.6.7 Technology Policy	• Plenary Presentation • Plenary discussions	• Flips charts • Felt pens • PowerPoint • Laptop • Participants Handouts	20 minutes
14.3.6.8 Module Review	• Plenary discussion	• Flip charts • Felt pens	20 minutes
TOTAL			**3 hours**

14.3.7 Facilitator's Guidelines

Sub-Module 14.3: Climate-Smart Agricultural Policy Options	
14.3.7.1 Introduction, Expectations and Outcomes (30 Minutes)	**Session Guide**
(The facilitator welcomes trainees to the module session and then invites them to introduce themselves and state their expectations). **Trainees Expectations (15 minutes)** *(The facilitator requests the participants to form groups and list their expectations)* **Module Objectives (15 minutes)** *(The facilitator presents module learning Objectives)* By the end of this module the trainee should be able to: • Explain the role of agricultural policy frameworks in Kenya • Identify climate-smart agriculture practices, options and approaches • Recount the stages in climate-smart-sensitive policy cycle • Describe the phases in the implementation of the climate-smart-sensitive policy at the county level • Evaluate and select financing and investments options for Climate-smart Agriculture • Explain the need for technology policy	• Summarize Participants' expectations" • PowerPoint presentation • Distribute participants handouts

14.3.7.2 Agricultural Policy Frameworks in Kenya (30minutes)	
Plenary Presentation (20 minutes) • The role of agricultural policy frameworks in Kenya **Practical Exercise (10 minutes)** *(The facilitator requests the trainees to form groups and identify the gaps in agricultural policy frameworks and the existing agricultural policies).*	• PowerPoint presentation • Distribute participants' handouts • Group exercise
14.3.7.3 Climate-smart agriculture practices, policy options and approaches (30 minutes)	**Session guide**
Plenary Presentation (15 minutes) • Considerations for climate-smart production systems • Existing systems, practices and methods suitable for climate smart agriculture • Institutional and policy options • Ensuring farmer organizations for market access • Gendered approach **Practical Exercise and plenary Discussions (15 minutes)** *(The facilitator requests the trainees to form groups and identify the existing climate-smart agriculture practices and the relevant policy options for implementation).*	• PowerPoint presentation • Distribute participants' handouts • Group exercise
14.3.7.4 Climate-smart-sensitive policy cycle (20 minutes)	**Session Guide**
Plenary Presentation (10 minutes) • Stages in the climate-smart-sensitive policy cycle **Plenary Discussions (10 minutes)** • Climate-smart-sensitive policy cycle	• PowerPoint presentation • Distribute participants' handouts • Plenary discussion
14.3.7.5 Implementation of the climate-smart-sensitive policy at the county level (20 minutes)	**Session Guide**
Plenary Presentation (10 minutes) • Phases in the implementation of the climate-smart-sensitive policy at the county level **Practical exercise (10 minutes)** *(The facilitator requests the trainees to form groups and develop a programme showing steps, activities and stakeholders for the implementation of climate-smart policies).*	• PowerPoint Presentation • Distribute participants' handouts • Practical exercise

14.3.7.6 Policy financing and investments for Climate-smart Agriculture (1 hour)	Session Guide
Plenary presentation (15 minutes) • Why financing is needed • Financing gaps • Sources of financing • Financing mechanisms • Connecting action to financing • Types of subsidies to farmers **Group exercises (15 minutes)** *(The facilitator requests the trainees to form groups and identify potential sources of financing, financing mechanisms and connecting action to financing)*.	• PowerPoint presentation • Distribute • participants' handouts • Practical exercise
14.3.7.7 Need of Technology Policy (20 minutes)	**Session guide**
Plenary Presentation (10 minutes) • What is a technology policy? • Why do we need technology policy? • Is technology policy inconsistent with a market oriented economy? • Technology policy in Kenya **Plenary Discussions (10 minutes)**	• PowerPoint presentation • Distribute participants' handouts
14.3.7.8 Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) • Summarize the main points of the training and together with the trainees review the main points. • Trainees lists the main points leant during the training • Discuss with trainees new things learnt from this Module • Ask the trainees what are some of the problems and issues that they have become more aware of in the module	• Q& A session • Recap the main points • Test understanding • Participatory evaluation of the session

14.3.8 Participants' handouts

1. Climate-Smart Agricultural Policy Options factsheets
2. Climate-Smart Agricultural Policy Options guide

References

1. Alila, P.O. and Atieno, R. (2006). Agricultural policy in Kenya: issues and processes: A paper for the Future Agricultures Consortium workshop, Institute of Development Studies, 20-22 March 2006. Future Agricultures.
2. 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 programmes.
3. FAO (2016) The Gender in Agricultural Policies Analysis Tool (GAP). Agriculture. Policies, Practices and Financing for Food Security, Adaptation and Mitigation.
4. FAO (2016) "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.
6. GoK (2007). Kenya adopted 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.

KENYA CLIMATE SMART AGRICULTURE PROJECT

WATERMELON VALUE CHAIN TRAINING OF TRAINERS WORKSHOP FOR WEST POKOT COUNTY

TRAINING VENUE: KALRO-DAIRY RESEARCH INSTITUTE NAIVASHA

DATES: 25th September to 5th October, 2021 (DRAFT PROGRAMME)

Time	Activity	Duration	Responsible
Day 0: Sunday	Travel and Arrival at Naivasha	Whole day	Secretariat
Day 1: Monday	**Chair:** **Rapporteur:**		
8.00 a.m.-8.30 a.m.	Registration	30 minutes	Secretariat
	Opening Prayer and Introductions		Mr. Jimmy K. Yegon
8.30 a.m.-10.00a.m.	**Official opening of the Watermelon Value Chain ToT Workshop**	1 hour 30 minutes	**Mr. Timon Moi (Chair)**
	Watermelon ToT Workshop Objectives		Mr. Jimmy K. Yegon
	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 minutes	Mr. Mark Otieno
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	

Time	Activity	Duration	Responsible
11.00 a.m.– 12.00 noon.	Farmer field and business school (FFBS) approach in Watermelon production	1 hour	Mr. Mark Otieno
12.00 noon –1.00 p.m.	Climate Change and Climate Smart Agriculture in Watermelon value chain	1 hour	Mr. Jimmy Yegon
1.00 p.m.- 2 .00 p.m.	**LUNCH BREAK**	**1hour**	
2.00 p.m. – 4. p.m.	Watermelon variety selection	2 hours	Dr David Lelgut
4.00 p.m. – 4.30 p.m	**HEALTH BREAK**	**30 minutes**	
Close of Day 1			
Day 2: Tuesday	**Chair:** **Rapporteur:**	**Period**	
8.00 a.m. – 8.30 a.m.	Registration, Prayer Recap of Day1 activities	30 minutes	Mr. Mark Otieno
8.30 a.m. – 10.30 a.m.	Watermelon Production Niches and Climatic requirements	2 hours	Mr. Timon Moi
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	
11.00 a.m.–1.00 p.m.	Watermelon Climate smart agronomic practices	2 hours	Mr. Thomas Chebii
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**	**1hour**	
2.00 p.m.– 4.00 p.m.	Watermelon Seed Systems	2 hours	Mr. Jimmy K. Yegon
4.00 p.m.	**HEALTH BREAK**	**30 minutes**	
Close of day 2			
Day 3 Wednesday	**Chair:** **Rapporteur:**	**Period**	
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 2 activities	30 minutes	Mr. Mark Otieno
8.30 a.m.–10.30 a.m.	Watermelon Crop Health (Pests, Diseases and Weeds).	2 hours	Mr. Harun Odhiambo
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	
11.00 a.m.–12.00 noon	Integrated soil and water management practices for Watermelon production Part 1	2 hours	Mr. Fredrick Wandera
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**	1 hour	
2.00 p.m.–4.00 p.m.		2 hours	Dr. Francis Wayua
4.00 p.m. – 4.30 p.m	**HEALTH BREAK**	**30 minutes**	
Close of day 3			
Day 4 Thursday	**Chair:** **Rapporteur:**	**Period**	

Time	Activity	Duration	Responsible
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 3 activities	30 minutes	Mr. Mark Otieno
8.30 a.m. – 10.30 a.m.	Mechanization of Watermelon production	2 hours	Eng. Nasirembe
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	
11.00 a.m. – 1.00 p.m.	Integrated soil and water management practices for Watermelon production Part II	2 hours	Mr. Fredrick Wandera
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**	1 hour	
2.00 p.m.–4.00 p.m.	Watermelon harvesting and postharvest management	2 hours	Dr Francis Wayua
4.00 p.m. – 4.30 pm	**HEALTH BREAK**	**30 minutes**	
Close of day 4			
Day 5: Friday	**Chair:** **Rapporteur:**	**Period**	
8.00 a.m.– 11.00 a.m.	Registration, Prayer and Travel to KALRO Marigat Watermelon farm	3 hours	Jimmy Yegon/ Thomas Chebii
11.00 a.m.-11.30 a.m.	**HEALTH BREAK**	**30 minutes**	
11.30 a.m.–1.30 p.m.	Field excursion: in KALRO Marigat Watermelon farm	2 hours	All
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**	1 hour	
2.00 p.m.-5.00 p.m.	Travel back to KALRO (DRI) Naivasha	3 hours	All
5.00 p.m. – 5.30 pm	**HEALTH BREAK**	**30 minutes**	
Close of Day 5			
Day 6 Saturday	**Chair:** **Rapporteur:**	**Period**	
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 4 &5 activities	30 minutes	Mr. Mark Otieno
8.30 a.m.–10.30 a.m.	Food Safety Management System (HACCP) and Good Agricultural Practices (GAP) in watermelon value chain.	2 hours	Mr. John Ndung'u Ng'ang'a
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	
11.30 a.m. – 1.30 p.m.	Watermelon value addition part I: (Theory on the importance of value addition, value added products and their nutritional benefits)	2 hours	Mr. James Ndambuki
1.30 p.m.-2.15 p.m.	**LUNCH BREAK**	1 hour	

Time	Activity	Duration	Responsible
2.15 p.m. – 4.15 p.m.	Watermelon value addition part II: (Demonstration of recipes for various value-added products of watermelon).	2 hours	Mr. James Ndambuki/Dr. Francis Wayua
4.15 pm – 4.45 p.m.	**HEALTH BREAK**	**30 minutes**	
Close of Day 6			
Day 7: Sunday	**Chair:** **Rapporteur:**	**Period**	
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of Day 6 activities	30 minutes	Mr. Mark Otieno
8.30 a.m. - 10.30 a.m.	Watermelon Business and Marketing	2 hours	Mr. John Ndungu/ Dr. Wambua
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	
11.00 a.m.– 1.00 p.m.	Agricultural Innovation Platforms (AIPs)	2 hours	Dr. Geoffrey Kamau
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**		
2.00 p.m.-4.00 p.m.	Agricultural policy	2 hours	Mr. John Ndungu/ Dr. Wambua
4.00 p.m – 4.30 pm	**HEALTH BREAK**	**30 minutes**	
Close of Day 7			
Day 8: Monday	**Chair:** **Rapporteur:**	**Period**	
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 7 activities	30 minutes	Mr. Mark Otieno
8.30 a.m.-9.30 a.m.	Agricultural policy	1 hour	Mr. John Ndungu/ Dr. Wambua
9.30 a.m.– 11.00 a.m.	• Gender mainstreaming and social inclusion in Watermelon value chain	1 hour 30 minutes	Dr. Jessica Ndubi
11.00 a.m. -11.30 a.m.	**HEALTH BREAK**		
11.30 a.m.– 1.30 p.m.	• Gender mainstreaming and social inclusion in Watermelon value chain	2 hours	Dr. Jessica Ndubi
1.30 pm – 2.30 pm	**LUNCH BREAK**	1 hour	
2.30 p.m.– 3.00 p.m.	• Course Evaluation	30 minutes	Mr. Mark Otieno
3.00 p.m. – 3.30 p.m.	Presentations of County Action plans	30 minutes	Mr. Mark Otieno
3.30 p.m.-4.00 p.m.	• Way forward	30 minutes	Dr. Charles Lungaho

Time	Activity	Duration	Responsible
4.00 p.m.-5.00 p.m.	**Official Closing of ToT Workshop** • 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 • Closing Prayer	1 hour	**Chair:** Ms. Violet Kirigua
Day 9 Tuesday	Departure from Naivasha		
8.00 a.m.	Registration, Prayer and Departure		**ALL**

ANNEX 2: GENERAL REFERENCE MATERIALS

	Category / Modules	Publication title	Reference types	No of Pages	Farmer Category A= New entrant/ Watermelon Elite farmer B= Elite Watermelon Farmer
1	Climate change and climate smart agriculture	Climate change and climate smart agriculture factsheets	Factsheet		**AB**
2	Farmer Field Business School (FFBS) approach	Khisa Godrick (2004) Farmer Field School Methodology: Training of Trainers Manual. Sustainet East Africa; (2010) Farmer Field School: A Technical Manual. Factsheets on Farmer Field Business School (FFBS)	Field Booklet Field Booklet Factsheets	42 41	**AB** **AB** **AB**
3	Good Agricultural Practices (GAP) and Food Safety Management System (FSMS) - Hazard Analysis Critical Control Points (HACCP) Plan	FAO (1998) Hazard Analysis and Critical Control Point (HACCP) system and guidelines for its application USDA (2006) Guideline for Countries on the Food Safety and Inspection Service's Equivalence Process Factsheets Good Agricultural Practices (GAP) and Food Safety Management System (FSMS)	Book Manual Factsheets	120 14	**B** **B** **AB**

4	Watermelon production niche and climatic requirements	Factsheets on Watermelon Production niche and climatic requirements SHEP PLUS (2019) Watermelon Production	Factsheet Guide		**AB** **AB**
5	Watermelon variety selection	Watermelon Variety Factsheets SHEP PLUS (2019) Watermelon Production	Factsheets Guide		**AB** **AB**
6	Watermelon seed systems	Watermelon Seed System factsheets	Factsheets		**AB**
7	Watermelon climate smart agronomic practices	Horticultural Handbook (A guide for farmers and extension officers)	Manual		**AB**
8	Integrated soil and water management practices for Watermelon production	Isaya V. Sijali, (2001). Drip Irrigation: Options for smallholder farmers in eastern and southern Africa. Technical Handbook No. 24. SIDA's Regional Land Management Unit, Nairobi. Esilaba, A.O.*et al*. (2019). KCEP-CRAL Climate Smart Agriculture Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya	Manual Manual Manual	35	**AB** **AB** **AB**

9	Watermelon Crop Health	Satyagopal, K. et. al. (2014). AESA based IPM package for Watermelon. pp 40. A Practical Guide to Identification and Control Watermelon Diseases (2014). Tropica Seeds. Basavangudi, Bangalore, India Watermelon Crop Health Fact sheets	Manual Guide Factsheets	56 38	**AB** **AB** **AB**
10	Watermelon harvesting and post- harvest management	Watermelon harvest and post-harvest factsheets	Factsheets		**AB**
11	Watermelon value addition	Watermelon Value addition factsheets	Factsheets		**AB**
12	Mechanization of watermelon production activities	Watermelon Mechanization factsheets	Factsheets		**AB**
13	Watermelon business and marketing	Watermelon Business and Marketing factsheets	Factsheets		**AB**
14	**Watermelon cross cutting issues**				
	(i) Innovation Platforms	Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional change.	Research paper	17 Pages	**B**

		Makini F. *et. al.* (2018) Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya. *FARA Research Report* 2(6) AIP factsheets	Research paper Factsheets	17 Pages	**B** **AB**
	(ii) Gender mainstreaming and social inclusion	Commonwealth Secretariat (2001), Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and Other Stakeholders, Gender Management System, Commonwealth Secretariat, London	Book	46	**B**
	iii) Policy	GOK (2007). Kenya Vision 2030 MoALFC (2017) Kenya climate smart agriculture strategy 2017 – 2026 Agricultural sector transformation and growth strategy 2019 – 2029 MoALFC (2021) Draft National Agricultural Research System Policy Policy options factsheets	Policy Document Policy Document Policy Document Policy Document Factsheets	25 Pages 100 Pages 32 Pages 48 Pages	

ANNEX 3: FFBS LEARNING MATERIALS

PARTICIPATORY TECHNOLOGY DEVELOPMENT (PTD) AND CURRICULUM ON WATERMELON CROP SPACING MANAGEMENT

Value Chain	Watermelon
Learning Enterprise	Watermelon
Funded Enterprise	Watermelon VC at production level
Background Problem	Low Watermelon production due to poor spacing
Objective	To increase production through improved spacing management strategies

Factors to consider:

- Land topography
- Runs (blocks should face East to West)
- Certified seeds of preferred Watermelon variety
- Local seeds from the farmers.

Setting the P.T.D blocks:

- Plots to be laid (5x5) M, arranged three in a row with a footpath of 1M apart.
- Improved Watermelon varieties and the farmers local variety
- The blocks must be right angled.
- The number of planting holes must be equal in each plot.
- The recommended spacing 1.5m x 1m
- During data collections: collect the data using 3-4 plants in the midst of 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 plant
- Leaf width and length
- vine length
- No of fruits per plant
- Average weight of fruit
- Fruit yields /unit area (counts and weight)

Setting of Blocks

Plot 1 Spacing at 1.5m x 1m		Plot 2 Farmer practice

AGRO ECOSYSTEMS ANALYSIS (AESA) ON WATERMELON.

AESA NO ……

General information	**Agronomic data**
Variety	Average leaf length
Fertilizer type	Average plant height
Planting date	Average leaf width
Weather conditions	Number of leaves per plant
Time of observation	Weight of fruits per plant
	Weight of seeds per fruit
	Yield in Kg per plat

Diagram of crop of enemies and insects observed

Natural enemies	**Insects observed**
1	1.
2.	2
3.	3
4.	4.
Observations	**Recommendations**
Weeds	Weeding after 2 weeks
Holes on leaves	Keep monitoring and control pests
Yellow leaves	Add foliar feeds and control disease

KCSAP
Kenya Climate Smart Agriculture Project

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