



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

## TRAINING OF TRAINERS' MANUAL



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**OCTOBER 2021**





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**KALRO-NARIGP**

**OCTOBER 2021**

## **Disclaimer**

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## FOREWORD

The National Agricultural and Rural Inclusive Growth Project (NARIGP) tasked the Kenya Agricultural and Livestock Research Organization (KALRO) to develop and deliver context specific Climate Smart Agriculture (CSA) Technologies, Innovation and Management Practices (TIMPs). The TIMPs have been developed, validated and availed for dissemination and adoption. This Training of Trainers (ToT) Manual is an instructional guide to be used for teaching and learning step-by-step procedures of implementing CSA innovations for the Sweetpotato value chain. The training contents are drawn from the inventory of TIMPs that has been documented.

The contents of the training are arranged in progressive modules supported by extensive information from research and background data drawn from the TIMPs. Their relevance is based on the needs determined from 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. The training modules have uniform outline that ensures every aspect of the TIMPs is fully covered in a way that the trainees can absorb and relate to. Training topics covering a thematic area are grouped together while the roles of the resource persons are tapped in the planning of the training sessions. Various delivery methods are deployed and where possible demonstrations and practical work are incorporated to enable the trainees experience the actual field situations. 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 the above, therefore, enables replicating the training in several locations while maintaining the quality regardless of whether the trainers are varied.

It is highly advised that this manual should be used in conjunction with the respective Sweetpotato value chain TIMPs inventory document and facts sheets in order to provide accurate and valuable information for both public and private extension service providers. The use of the manual is therefore expected to enable achievement of the project's envisaged increased production, productivity and profitability.

I am greatly indebted to the value chain experts and all those who participated in the preparation of this manual whose use is expected to epitomize a new way of delivering training content for the desired changes in the agricultural sector.

**Eliud K Kireger, PhD, OGW**  
**Director General, KALRO**

## PREFACE

The National Agricultural and Rural Inclusive Growth Project (NARIGP) is funded by the Government of Kenya and the World Bank. The project runs for five years and is implemented in 21 Counties in the country at an approximate cost of KES 22 billion. The project development objective is “To increase agricultural productivity and profitability of targeted rural communities in selected Counties, and in the event of an Eligible Crisis or Emergency, to provide immediate and effective response.” To achieve the objective, the project is promoting adoption of climate smart agricultural Technologies, Innovations and Management Practices (TIMPs).



The project comprises of four (4) components: Component 1 involves strengthening (i) community-level institutions’ ability to identify and implement investments that improve their agricultural productivity, food security and nutritional status; and (ii) linkages to selected value chains and producer organizations. Component 2 deals with strengthening producer organizations and value chains development by building capacity to support members of targeted rural communities, which include Common Interest Groups (CIGs) and Vulnerable and Marginalized Groups (VMGs). Component 3 undertakes strengthening the capacity of County governments to support community-led development initiatives identified under Components 1 and 2. Component 4 is on project coordination, management, monitoring and evaluation.

Kenya Agricultural and 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 of prioritized value chains as an initial step towards promotion of their adoption. Of these, 13 are crop-based. They include roots and tubers (potato and sweetpotato); pulses (bean, green gram and cowpea); vegetables (tomato and indigenous vegetables); cereals (sorghum), nuts (macadamia and coconut) and fruits (banana, mango and avocado). The four (4) animal production-based value chains are apiculture, indigenous chicken (meat and eggs), dairy (cattle) and red meat (sheep and goats). In addition, 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. In addition, gaps that required further research were identified for subsequent development of TIMPs. This manual focuses on TIMPs that are ready for upscaling Sweetpotato value chain. It should be used in training County extension staff, service providers, community based facilitators and lead farmers. Those trained are expected to cascade the training to beneficiaries in the targeted smallholder farming, agro-pastoral and pastoral communities in the 21 project Counties of Kirinyaga, Kiambu, Murang'a, Nakuru, Bungoma, Trans Nzoia, Nandi, Vihiga, Kisii, Nyamira, Migori, Homa Bay, Makueni, Meru, Kitui, Embu, Kilifi, Kwale, Narok, Samburu and Turkana.

The National Project Coordination Unit is grateful to all who participated in the development and production of this manual for the Sweetpotato value chain. It is my hope that Counties and other users will adopt and optimally use the manual to increase productivity and profitability, which in the overall will improve the livelihood of the targeted farming communities.

**John Kimani**

**National Project Coordinator**

**National Agricultural and Rural Inclusive Growth Project**

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## LIST OF ABBREVIATIONS

<b>AEZ</b>	Agro-ecological zone
<b>AFA</b>	Agricultural Food Authority
<b>AIP</b>	Agricultural Innovation Platform
<b>APVC</b>	Agriculture Product Value Chain
<b>ASAL</b>	Arid and Semi-Arid Land
<b>B</b>	Boron
<b>CA</b>	Conservation Agriculture
<b>CCP</b>	Critical Control Point
<b>CIG</b>	Common Interest Group
<b>CL</b>	Critical Limit
<b>CTT</b>	Core Team of Trainers
<b>ESMF</b>	Environmental and Social Management Framework
<b>FFBS</b>	Farmer Field and Business Schools
<b>FSMS</b>	Food Safety Management System
<b>GAP</b>	Good Agricultural Practices
<b>ha</b>	Hectare
<b>HACCP</b>	Hazard Analysis Critical Control Points
<b>IDM</b>	Integrated Disease Management
<b>INRM</b>	Integrated Natural Resource Management
<b>IPM</b>	Integrated Pest Management
<b>ISFM</b>	Integrated Soil Fertility Management
<b>IWM</b>	Integrated Weed Management
<b>K</b>	Potassium
<b>KALRO</b>	Kenya Agricultural and Livestock Research Organization
<b>kg</b>	Kilogram
<b>LF</b>	Lead Farmer
<b>Mo</b>	Molybdenum
<b>N</b>	Nitrogen
<b>NARIGP</b>	National Agricultural and Rural Inclusive Growth Project
<b>P</b>	Phosphorus
<b>S</b>	Sulphur
<b>SSA</b>	Sub-Saharan Africa
<b>TIMPs</b>	Technologies, Innovations and Management Practices
<b>ToTs</b>	Training of Trainers
<b>VMG</b>	Vulnerable and Marginalized Group
<b>Zn</b>	Zinc

# 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 1

This part consists of four sections including the Background of the Sweetpotato value chain, Content of the Training, Training Design and Facilitators' Guidelines.

### SECTION 1: BACKGROUND

#### 1.1 The Role of Sweetpotato in the Kenyan Economy

Sweetpotato (*Ipomoea batatas*) is an important food, feed and vegetable crop in most developing countries. It has the potential to produce remarkably high yields if given the right growing conditions. More than 133 million tonnes are produced globally per year. The average root yield in Kenya is about 9.5 t/ha compared to the world average of about 14.2 t/ha and 30-50 t/ha obtained under experimental conditions. Sweetpotato value chain offers employment opportunities to various actors such as input suppliers, producers, transporters, processors and hoteliers at different nodes of the Value Chain.

#### 1.2 Role of Sweetpotato as a Food and Nutrition Security

The main nutritional material in sweetpotato tubers are carbohydrates (starches and simple sugars), protein, fat and fat-soluble vitamins (vitamin A, vitamin C, thiamin (B1), riboflavin (B2), niacin, and vitamin E), minerals (calcium, iron, magnesium, phosphorus, potassium, sodium, and zinc), and dietary fiber. Moreover, cultivars with a yellow flesh also contain significant amounts of carotenes. Potentially valuable proteins can be extracted from the peel during the processing of sweet potatoes. Sweet potato's tubers have anti-diabetic, anti-oxidant and anti-proliferative properties due to the presence of valuable nutritional and mineral components.

On average sweetpotato (boiled without the skin) contains 27 grams of carbs. The main components are starches, which make up 53% of the carb content. Simple sugars, such as glucose, fructose, sucrose, and maltose, comprise 32% of the carb content. Rapidly digested starch (80%) is quickly broken down and absorbed. Slowly digested starch (9%) breaks down more slowly and causes a smaller rise in blood sugar levels. Cooked sweetpotato have been reported to contain approximately 3.8 grams of fibre. The two main forms of fibre are the soluble (15–23%) in form of pectin, and the insoluble (77–85%) in form of cellulose, hemicellulose, and lignin.





### **1.3 Sweetpotato value chain as climate smart innovation**

The 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. Under Good Agricultural Practices (GAPs), Sweetpotato has the potential to produce high yields with less inputs thus, it can transform livelihoods with respect to income and nutrition security. Sweetpotato is an ideal food security crop and a key industrial raw material because it can be produced under adverse weather conditions and is adaptable to various farming and food systems. The crop has potential for commercialization and can contribute significantly towards Kenya's national goal of enhancing food and nutrition security, poverty alleviation, jobs creation, and industrial products. The available Sweetpotato 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 limiting 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 the adoption of Good Agricultural Practices (GAPs). Specifically, the objectives of this training are to:

- 1) Provide farmers trainers with relevant attitude, knowledge and skills in Sweetpotato farming as a business and market assessment techniques for market led production.
- 2) Enhance farmer trainers knowledge and skills in sweetpotato GAPs, including on-farm sweetpotato variety selection, establishment and management of fields.
- 3) Equip farmer trainers' with knowledge and skills in postharvest and value addition of sweetpotato.
- 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 up scaling of the Sweetpotato 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 upscaling of Sweetpotato 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 Sweetpotato 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**– Minimum 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 Sweetpotato value chain**

No.	Module name	Need addressed	Expected training outcomes	Duration
1	Climate change and climate smart agriculture	<ul style="list-style-type: none"> <li>The impact of climate crisis to Sweetpotato production</li> <li>Adoption of climate smart technologies innovations and management practices (TIMPs) for Sweetpotato value chain to mitigate climate change</li> </ul>	<ul style="list-style-type: none"> <li>Potential impact of climate change on Sweetpotato production explained to Master Trainers</li> <li>Climate smart techniques for Sweetpotato outlined</li> </ul>	3 hours
2	Farmer Field and Business School (FFBS) approach	<ul style="list-style-type: none"> <li>Develop skills for exploratory learning to enhance adoption and uptake of TIMPs</li> </ul>	<ul style="list-style-type: none"> <li>Improved technologies/ innovations and agronomic practices for Sweetpotato availed</li> </ul>	7 hours 30 minutes
3	Good Agricultural Practices (GAP) and Food Safety Management System (FSMS) - Hazard Analysis Critical Control Points (HACCP) plan	<ul style="list-style-type: none"> <li>Enhance food safety through lowering presence of hazardous solids/ organisms/ and pollutants pathogens</li> </ul>	<ul style="list-style-type: none"> <li>Food safety through prudent lowering of presence of hazardous solids/ organisms/ and pollutants pathogens enhanced</li> </ul>	6 hours
4	Sweetpotato production niche and climatic requirements	<ul style="list-style-type: none"> <li>Identify areas which are suitable for Sweetpotato production</li> </ul>	<ul style="list-style-type: none"> <li>Sweetpotato production niches based on their suitability identified</li> </ul>	4 hours
5	Sweetpotato variety selection	<ul style="list-style-type: none"> <li>Awareness on improved Sweetpotato varieties</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge on new improved varieties enhanced</li> </ul>	3 hours 30 minutes

6	Sweetpotato seed systems	<ul style="list-style-type: none"> <li>Formal and informal seed systems operations</li> </ul>	<ul style="list-style-type: none"> <li>The formal and informal seed supply systems analyzed.</li> </ul>	2 hours 30 minutes
7	Sweetpotato climate smart agronomic practices	<ul style="list-style-type: none"> <li>Options for innovative climate smart agronomics practices for increased Sweetpotato production</li> </ul>	<ul style="list-style-type: none"> <li>Water and input manipulations analyzed</li> </ul>	3 hours 30 minutes
8	Integrated soil and water management practices for Sweetpotato production	<ul style="list-style-type: none"> <li>Soil, water and fertility enhancing techniques availed</li> </ul>	<ul style="list-style-type: none"> <li>All techniques analyzed for possible benefits</li> </ul>	5 hours
9	Sweetpotato crop health	<ul style="list-style-type: none"> <li>Major pest, disease and weed control mechanisms availed to the Master Trainers.</li> </ul>	<ul style="list-style-type: none"> <li>Yield loss of Sweetpotato by the major pests, diseases, and weeds</li> </ul>	6 hours
10	Sweetpotato harvesting and post- harvest management	<ul style="list-style-type: none"> <li>Proper maturity determination and storage technologies to reduce losses in quantity and quality</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge on proper harvesting techniques and storage facilities, hygiene and monitoring enhanced</li> </ul>	3 hours
11	Sweetpotato value addition	<ul style="list-style-type: none"> <li>Various Sweetpotato products</li> </ul>	<ul style="list-style-type: none"> <li>Value addition and Sweetpotato products identified for the farming communities and business entities</li> <li>Opportunities identified and Prioritized</li> </ul>	6 hours 30 minutes

12	Mechanization of Sweetpotato production activities	<ul style="list-style-type: none"> <li>Adaptation of mechanized operations of Sweetpotato from crop establishment, through management to postharvest handling</li> </ul>	<ul style="list-style-type: none"> <li>Options of reducing drudgery through mechanization and increased productivity availed to farmer groups.</li> </ul>	4 hours
13	Sweetpotato business and marketing	<ul style="list-style-type: none"> <li>Review available business options in Sweetpotato value chain</li> </ul>	<ul style="list-style-type: none"> <li>Type of aggregations by farmers availed for considerations</li> </ul>	3 hours 20 minutes
14	<p>Sweetpotato cross cutting issues</p> <p>(i) Innovation Platforms</p> <p>(ii) Gender mainstreaming and social inclusion</p> <p>(iii) Policy</p>	<ul style="list-style-type: none"> <li>Articulate how voluntary marketing groups can draw benefits from Sweetpotato value chain</li> <li>Options of employment opportunities in Sweetpotato production</li> <li>Sites for information profiled at the county levels</li> </ul>	<ul style="list-style-type: none"> <li>Access to information on Sweetpotato production enhanced</li> <li>Opportunities for marginalized groups identified and gains made</li> <li>Policy options for enhanced Sweetpotato production identified</li> </ul>	9 hours 40 minutes
<b>Total duration</b>				<b>67 hours 30 minutes</b>

## 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 will be done using this manual and modules contained therein.
  - b) Each of the Master 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 agricultural sciences and State Department of Crop Development and Agricultural Research will facilitate initial training of trainers (ToTs) and other experts. They will also provide backstopping services.
- b) **County Government**— The County Government through NARIGP Coordinating Unit will select a team to be trained as TOTs. This will include County technical staff, service providers (SPs), CBFs and other experts who will further cascade the training to CIGs and VMGs. The CPCU will be expected to make follow up and backstop the TIMPs training.
- c) **Community Based Facilitators** – The CBFs will facilitate the CIGs and VMGs. They will be expected to follow up to ensure appropriate adoption at farmers' level. The CBFs will also plan and organize exchange visits to learn best practices.
- d) **Lead Farmers** – These are early adopters or role models at the community level. They mentor the CIG and VMG members and to allow their farms to be used as learning sites.

### 3.3 Training Duration

The proposed TOT course for Master Trainers consists of 14 modules, which shall take a total of 67 hours 30 minutes. This does not include 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 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 are distributed at the end of each module.

### 4.2 Preparation of Training Venue and Sites

The training venue will include the training room, field demonstration 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 3 trainers preferably at the sides or at the back of the training room. There should also be a desk for the trainer, their training materials and projector, a flip charts holder and white wall to act as a projector screen.
- b) **Demonstration Site** – Should be within a walking distance with plots for demonstrations.
- c) **Market Sites** – These include retail outlets (kiosks, stalls, shops and supermarkets), wholesale and aggregation points and processing sites if any. The operators should be informed in advance about the visits. These should not be very far away, preferably less than 10 minutes' drive.

### 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 trainer 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 and listen and let them feel like equals to each other and the CTT team members.

### 4.4 Training Program

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

### 4.5 Training Methods

The training methods proposed for each session are suitable for adult learners and appropriate for addressing knowledge, skills and attitudes of the participants. The choice of the methods has been informed by the competency issues being addressed, time available and experiences of the author of this manual. Depending on time available, the facilitator 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, have demonstration plots planted with Sweetpotato
2. **Four weeks** – Send out invitation letters to participants and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members
3. **Two weeks** – Confirm names of participants; reproduce training materials for facilitators and package, confirm preparedness of the field sites to be visited. Hold briefing of CTT members to finalize training plan. Confirm special guests if any
4. **Four days** – Confirm training sites preparedness, prepare sitting arrangements, and brief assistants
5. **One day** - Arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at residence proposed
6. **On first day** – Arrange for reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes:
  - Registration
  - Welcoming to venue by host
  - Elaborate introduction of CTT and participants
  - Introduction to the project and training course
  - Ground rules
  - Groups formation

#### 4.7 Evaluation of the Training

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

**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 Sweetpotato Production			
3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			

4. Sweetpotato production Niches and Climatic Requirements			
5. Sweetpotato variety selection and access to quality seeds.			
6. Sweetpotato Seed Systems			
7. Climate Smart Agronomic Practices			
8. Integrated Soil and Water Management Practices for Sweetpotato			
9. Sweetpotato Crop Health			
10. Sweetpotato Harvesting and Postharvest Management			
11. Sweetpotato Value Addition			
12. Mechanization of Sweetpotato production Activities			
13. Sweetpotato 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.

Sweetpotato reference material will consist of the following:

- a) Sweetpotato 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 Sweetpotato farming manual to be accompanied by two other publications e.g., information sheets, brochures, factsheets and poster. With subsequent training modules, they can develop their collection of publications.

## PART II: TRAINING MODULES

This part presents the content of 14 modules of training namely: Climate change and climate smart agriculture, Farmer Field and Business School (FFBS) approach, Sweetpotato production niche and climate requirements, Good Agricultural Practices (GAP) and Food Safety Management System (FSMS), Sweetpotato variety selection, Sweetpotato seed systems, Sweetpotato climate smart agronomics practices, Integrated soil and water management practices for Sweetpotato, Sweetpotato Crop Health, Sweetpotato harvesting and Postharvest management, Sweetpotato value addition, Mechanization of Sweetpotato production activities, Sweetpotato business and Marketing, and Sweetpotato 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 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 trained trainers. 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 Sweetpotato Value Chain**





Sessions	Training methods	Training materials	Duration
1.6.1 Introduction and levelling expectations	<ul style="list-style-type: none"> <li>• Personal introduction</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Felt pens</li> </ul>	30 minutes
1.6.2 Introduction to climate change and variability	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Case study videos</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Videos</li> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Participants' handouts</li> </ul>	50 minutes
1.6.3. Concept of Climate Smart Agriculture (CSA) in Sweetpotato	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Videos</li> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Participants' handouts</li> </ul>	40 minutes
1.6.4 Projected future climate scenarios affecting Sweetpotato and how to manage	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Case study videos</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Participants' handouts</li> </ul>	40 minutes
1.6.5. Module review	<ul style="list-style-type: none"> <li>• Participants' questions and comments</li> <li>• Facilitator' summary</li> </ul>	<ul style="list-style-type: none"> <li>• Module review</li> <li>• Flip charts</li> <li>• Felt pens</li> </ul>	20 minutes
<b>Total</b>			<b>3 hours</b>

## 1.7 Facilitator's Guidelines

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<b>1.7.1. Introduction and levelling of expectations (30 minutes)</b>	<b>Session guide</b>
<p><i>(The trainer introduces the trainees to this module on climate change and climate smart agriculture).</i></p> <p><b>Trainees’ expectation (20 minutes)</b></p> <p><i>The facilitator organizes the trainees into groups to state and list their expectations.</i></p> <p><b>Module objectives (10 minutes)</b></p> <p><i>(The trainer presents module objectives).</i></p> <p>By the end of the module training, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Explain climate change and adaptations.</li> <li>• Describe Climate Smart Agriculture (CSA).</li> <li>• Describe and explain available climate smart crop management practices in Sweetpotato production.</li> </ul> <p>Explain the benefits of selected climate smart crop management practices in Sweetpotato production</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants’ handouts</li> </ul>
<b>1.7.2 Introduction to climate change and climate variability (50 minutes)</b>	<b>Session guide</b>
<p><i>(The trainer proceeds to introduce the module basics).</i></p> <p><b>Plenary presentation (35 minutes)</b></p> <ul style="list-style-type: none"> <li>• Basic terminologies used in the module (weather, climate, variability, adaptation, coping).</li> <li>• Explain climate change and climate variability.</li> <li>• The causes of climate change.</li> <li>• Climate risks impacting agriculture.</li> <li>• Proposed adaptation and mitigation measures</li> </ul> <p><b>Case study videos and discussion (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• The impact of climate change</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> <li>• Video presentation</li> </ul>

<b>1.7.3 Concept of Climate Smart Agriculture (CSA) (40 minutes)</b>	<b>Session guide</b>
<p><i>(The trainer presents the principles underpinning CSA and the link to deliverable of project objectives).</i></p> <p><b>Plenary presentation (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Definition of the CSA approach and their characteristics</li> <li>• The three pillars of CSA (productivity, adaptation and mitigation)</li> <li>• Why CSA is needed</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Discussions on the CSA concept</p>	<ul style="list-style-type: none"> <li>• Powerpoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion.</li> </ul>
<b>1.7.4 Projected future scenarios that will impact productivity (40 minutes)</b>	<b>Session guide</b>
<p><i>(The trainer presents and discusses the future climatic projections focusing on rainfall and temperature, which directly impacts on crop yields)</i></p> <p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Projected impacts on food production and needed adaptation measures especially for Sweetpotato.</li> </ul> <p><b>Video presentation and discussion (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Short video on showing projections of rainfall and temperature.</li> </ul>	<ul style="list-style-type: none"> <li>• Powerpoint presentation</li> <li>• Video presentation</li> <li>• Plenary discussion</li> </ul>
<b>1.7.5 Module review (20 minutes)</b>	<b>Session guide</b>
<p><i>(The trainer leads the trainees in summarizing the key points discussed in the module)</i></p>	<ul style="list-style-type: none"> <li>• Plenary discussion</li> </ul>

## 1.8 Reference Materials

### 1.8.1 Participants' handouts

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

### 1.8.2 Further Reading

Esilaba, A.O.et al. (2021). KCEP-CRAL Farm level Agricultural Resilience and Adaptation to Climate Change Extension Manual. Kenya Agricultural and Livestock Research Organization, Kenya

## **MODULE 2: FARMER FIELD AND BUSINESS SCHOOL (FFBS) APPROACH IN SWEETPOTATO 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 sweetpotato 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. 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 Sweetpotato 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 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 the trained trainers. The trainers 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

<b>Module 2: Farmer Field and Business School approach</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Time</b>
2.6.1 Introduction, climate setting, leveling of expectations and objectives.	<ul style="list-style-type: none"> <li>Setting norms and group discussion on expectations</li> <li>Plenary presentation</li> </ul>	<ul style="list-style-type: none"> <li>Laptop</li> <li>Projector</li> <li>Flip charts</li> <li>Mark pens</li> </ul>	20 minutes
2.6.2 Overview of FFBS key activities	<ul style="list-style-type: none"> <li>Plenary presentation</li> <li>Plenary discussions</li> </ul>	<ul style="list-style-type: none"> <li>Pictorials</li> <li>Laptop</li> <li>Projector</li> </ul>	1 hour
2.6.3 Introduction to communication and communication skills	<ul style="list-style-type: none"> <li>Plenary presentation</li> <li>Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>Projector</li> <li>Laptop</li> <li>Flip charts</li> <li>Felt pens</li> </ul>	1 hour
2.6.4 Facilitation and leadership skills	<ul style="list-style-type: none"> <li>Plenary presentation</li> <li>Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>Projector</li> <li>Laptop</li> </ul>	1 hour
2.6.5 Organization and management in FFBS	<ul style="list-style-type: none"> <li>Plenary presentation</li> <li>Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>Projector</li> <li>Laptop</li> </ul>	1 hour
2.6.6 Developing FFBS curriculum for the Sweetpotato value chain	<ul style="list-style-type: none"> <li>Plenary presentation</li> <li>Group Exercise</li> </ul>	<ul style="list-style-type: none"> <li>Projector</li> <li>Laptop</li> <li>Flip charts</li> <li>Felt pens</li> </ul>	1 hour
2.6.7 Module review	<ul style="list-style-type: none"> <li>Presentation</li> <li>Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>Projector</li> <li>Laptop</li> <li>Flip charts</li> <li>Felt pens</li> </ul>	20 Minutes
<b>Total</b>			<b>5 hours 40 minutes</b>

## 2.7 Facilitator’s guidelines

<p><b>2.7.1 Introduction, climate setting leveling of expectations and objectives (20 minutes)</b></p>	<p><b>Session guide</b></p>
<p><i>(The trainer welcomes trainees and thereafter invites them to state their expectations).</i></p> <p><b>Trainee introduction and climate setting (10 minutes)</b></p> <p>Introduction of participants, setting training norms, formation of FFBS sub groups (working groups) and trainees to share their expectations</p> <p><b>Module objectives (10 minutes)</b></p> <p><i>The facilitator presents modules objectives</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Describe and explain concept of Farmer Field and Business School approach, teaching and facilitation.</li> <li>• Demonstrate and explain approaches to effective facilitation and participatory learning for FFBS.</li> <li>• Identify and demonstrate knowledge and analytical skills to design simple experiments for testing options.</li> <li>• Explain and facilitate shift from the traditional focus to improving productivity to farming business proposition.</li> </ul>	<ul style="list-style-type: none"> <li>• Provide checklist for introduction of trainees to help them build confidence in participation</li> <li>• Summarize and display trainees’ expectations</li> <li>• Assign roles to the Sub groups</li> <li>• Set Norms and nominate leaders</li> <li>• Powerpoint presentation on the objectives of the FFBS training module</li> </ul>
<p><b>2.7.2 Overview of FFBS key activities (1 hour)</b></p>	<p><b>Session guide</b></p>

<p><b>Plenary presentation (45 minutes)</b></p> <p>The facilitator takes the trainees through the main concepts and pillars of FFBS which includes:</p> <ul style="list-style-type: none"> <li>• The definition of FFBS</li> <li>• Participatory Technology Development (PTD) for the Sweetpotato value chain TIMPs</li> <li>• Agro ecosystems Analysis (AESAs) of the Sweetpotato value chain TIMPs</li> <li>• Concept of what is this what is that</li> <li>• FFBS principle of Integrated production and pest management (IPPM)</li> <li>• FFBS Business concept and opportunities in the Sweetpotato value chain stages</li> </ul> <p><b>Plenary discussion (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Pillars of FFBS</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> </ul>
<p><b>2.7.3 Introduction to communication and communication skills (1 hour)</b></p>	<p><b>Session guide</b></p>
<p>Group exercise to gauge the understanding of trainees (<b>45 minutes</b>)</p> <ul style="list-style-type: none"> <li>• What is communication?</li> <li>• Communication channels</li> <li>• Barriers to effective communication and</li> <li>• How to effectively communicate</li> </ul> <p><b>Plenary presentation (15 minutes)</b></p> <p>Communication and communication skills</p>	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> </ul>
<p><b>2.7.4 Facilitation and leadership skills (1 hour)</b></p>	<p><b>Session guide</b></p>

<p><b>Plenary presentation (45 minutes)</b></p> <ul style="list-style-type: none"> <li>• Definition of facilitation, facilitator and effective facilitation.</li> <li>• Qualities of a good facilitator.</li> <li>• Golden rules of facilitation.</li> <li>• Roles and responsibilities of FFBS Facilitators.</li> <li>• Difference between facilitation and teaching</li> <li>• Definition of leadership</li> <li>• Elements of leadership</li> <li>• Types of leadership</li> <li>• Characteristics of a good leader</li> </ul> <p><b>Plenary discussion (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Discussion on facilitation</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<p><b>2.7.5 Organization and management in FFBS (1 hour)</b></p>	<p><b>Session guide</b></p>
<p><b>Plenary presentation (45 minutes)</b></p> <p>Steps of FFBS implementation framework:</p> <ul style="list-style-type: none"> <li>• Ground working.</li> <li>• Training of Facilitators.</li> <li>• Establishing PTDs at the FFBS.</li> <li>• Season long FFBS sessions.</li> <li>• Evaluation of PTDs.</li> <li>• Field days.</li> <li>• Graduation.</li> <li>• Establishment of Lead FFBS.</li> <li>• Follow ups.</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<p><b>Plenary discussion (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• FFBS implementation Framework</li> </ul>	
<p><b>2.7.6 Developing FFBS curriculum for the Sweetpotato value chain (1 hour)</b></p>	<p><b>Session guide</b></p>

<p><b>Plenary presentation (30 minutes)</b></p> <p>Steps of Participatory Technology Development on the Sweetpotato value chain production</p> <ul style="list-style-type: none"> <li>• Identify the major constraints to increased yields of Sweetpotato value chain production</li> <li>• Ranking of constraints in order from highest.</li> <li>• Identify list of TIMPs to address the constraints</li> <li>• Rank the TIMPs in order from the most preferred</li> <li>• Develop PTD on the most preferred TIMP objective</li> <li>• Decide on the parameters for AESA</li> <li>• Develop FFBS curriculum using crop growth stage calendar for the Sweetpotato value chain</li> </ul> <p><b>Group exercises (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Constraint identification and ranking</li> <li>• TIMPs options identification and ranking</li> <li>• Identification of the growth stages of the value chain crop and development of FFBS training curriculum</li> </ul>	<p>Group exercises on</p> <ul style="list-style-type: none"> <li>• Pair wise matrix ranking of constraints and TIMPs in Sweetpotato value chain</li> <li>• Curriculum development based on the value chain growth stages</li> <li>• Presentations of the group exercises on flip charts</li> <li>• PowerPoint presentations on PTD and curriculum development</li> </ul>
<p><b>2.7.7 Module review (20 minutes)</b></p>	<p><b>Session guide</b></p>
<ul style="list-style-type: none"> <li>• Participants questions and answers</li> <li>• Facilitators Summary</li> <li>• Guideline on FFBS Sweetpotato plans</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> <li>• Module summary</li> </ul>

## 2.8 Reference materials

### 2.8.1. Participants' Handouts

- FFBS Factsheets
- FFBS Guides

### 2.8.2. Further reading

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

for food safety in global FFS programme.

# 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 Sweetpotato 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 Sweetpotato 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 Sweetpotato production system explained
4. Traceability in food safety and quality along the Sweetpotato 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 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 the trained trainers. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

### 3.5. Module Duration

The Module is estimated to take 6 hours.

### 3.6 Module Summary

<b>Module 3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Time</b>
3.6.1 Introduction, objectives and levelling of expectations	<ul style="list-style-type: none"> <li>• Groups to bring out expectations</li> <li>• Plenary presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Module objectives</li> <li>• Marker pens</li> <li>• Flip charts</li> <li>• Projector</li> <li>• Laptop</li> </ul>	30 minutes
3.6.2 Understanding what is GAP and its application in the Sweetpotato value chain	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Pictorials/video clips</li> </ul>	30 minutes
3.6.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk Assessment	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Pictorials/video clips</li> <li>• Data sheets</li> </ul>	20 minutes
3.6.4 Review of GAP requirements for audit and types of protocols possible	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Data forms</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> </ul>	30 minutes

		<ul style="list-style-type: none"> <li>• Laptop</li> <li>• Pictorials/video clips</li> <li>• Data sheets</li> </ul>	
3.6.5 Introduction to site selection	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> </ul>	20 minutes
3.6.6 GAP checklists and audit	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> </ul>	30 minutes
3.6.7 Safe use of Pesticides and calibration of sprayers and nozzles	<ul style="list-style-type: none"> <li>• Group work on nozzles</li> <li>• Rate of discharge</li> <li>• Safety guidelines</li> </ul>	<ul style="list-style-type: none"> <li>• Pictorials/video clips</li> <li>• Knapsacks</li> <li>• Measuring cylinders</li> <li>• Tape measure</li> <li>• Nozzles</li> <li>• Empty clean pesticide containers</li> </ul>	1 hour
3.6.8 Understanding of food safety management system in crop value chains	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop,</li> <li>• Pictorials/video clips</li> </ul>	30 minutes
3.6.9 Determination of food safety risk/ hazards in crop value chains (hazard analysis)	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Participants' hand outs</li> </ul>	30 minutes
3.6.10 Determination of Critical Control Points (CCPs) and Critical limits (CLs) in Sweetpotato value chain	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> </ul>	30 minutes

3.6.11 Prevention and corrective measures for CCPs in Sweetpotato value chain	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Powerpoint projector</li> <li>• Laptop</li> <li>• Pictorials/video clips</li> </ul>	30 minutes
3.6.12 Module review	<ul style="list-style-type: none"> <li>• Participants' questions and comments</li> <li>• Facilitator's summary</li> </ul>	<ul style="list-style-type: none"> <li>• Participants' hand outs</li> <li>• Module review</li> </ul>	20 minutes
<b>Total</b>			<b>6 hours</b>

### 3.7 Facilitator's Guidelines

3.7.1 Introduction and levelling of expectations (30 minutes)	Session guide
<p><i>The facilitator welcomes trainees to the module</i></p> <p><b>Trainees' introductions and expectations (20 minutes)</b></p> <p>The facilitator invites the trainees to state their expectations after brain storming in their respective county groups</p> <p><b>Module objectives (10 minutes)</b></p> <p><i>The facilitator presents module's objectives.</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Appreciate GAPs on matters of food safety and quality along the crop value chain.</li> <li>• Describe optimization and utilization of resources (water, soil, manure, fertilizers, and other inputs), environmental protection and conservation.</li> <li>• Explain worker safety and health within the crop production system.</li> <li>• Map and implement traceability in food safety and quality along the crop value chain.</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees' expectations on a flipchart</li> <li>• PowerPoint presentation</li> </ul>

<b>3.7.2 Understanding what is GAP and its application in the Sweetpotato value chain (30 minutes)</b>	<b>Session guide</b>
<p><i>Facilitator leads discussions on understanding of GAPs and its relevance to actors in the Sweetpotato value chain</i></p> <p><b>Plenary Presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Understanding GAP in the context of crop production</li> <li>• Explain the role of GAPs in safe and sustainable food production system for growers and consumers.</li> <li>• Understanding GAPs as the key to high commodity market destinations</li> </ul> <p><b>Plenary discussion (10 minutes)</b> GAP application in the Sweetpotato value chain</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<b>3.7.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk Assessment (20 minutes)</b>	<b>Session Guide</b>
<p><i>Facilitator guides discussions on the key determinants of site suitability for agricultural activities.</i></p> <p><b>Plenary presentation and discussion (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• 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)</li> <li>• The need for documentation in a farm assurance system</li> <li>• Types of mandatory farm records</li> <li>• General guidelines to conservation agriculture (CA)</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<b>3.7.4 Review of GAP requirements for audit and types of protocols possible (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator leads the trainees in summarizing the key points discussed in the module)</i></p> <p><b>Plenary presentation and discussion (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Methods and procedures required at on-farm level to obtain GAP certification in crops production.</li> <li>• Good soil management practices (appropriate crop rotations, manure application)</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary session</li> </ul>

<ul style="list-style-type: none"> <li>• Careful management of water resources and efficient use of water for rain-fed crop production via irrigation.</li> <li>• Selection of crop types and varieties to meet local consumer needs.</li> <li>• Adoption of IPM practices to minimize the potential impact of pest control actions on workers, food, and environmental and health safety.</li> <li>• Minimizing contamination at harvest, on-farm processing and storage.</li> </ul>	
<b>3.7.5 Introduction to site selection (20 minutes)</b>	<b>Session guide</b>
<p><i>The facilitator introduces the various factors involved in site selection through pictorials/video clips PPT's and farm walk</i></p> <p><b>Plenary presentation and discussions (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• 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)</li> <li>• The need for documentation in a farm assurance system</li> <li>• Types of mandatory farm records</li> <li>• General guidelines to conservation agriculture (CA)</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> </ul>
<b>3.7.6 GAP checklists and audit (30 minutes)</b>	<b>Session guide</b>
<p><i>Facilitator guides the trainees on self-assessment (Internal audit and corrective measures for non-compliance)</i></p> <p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Need for mandatory records in GAPs</li> <li>• Internal audit procedures</li> <li>• Practical on mock audits</li> <li>• Interpretation of audit reports</li> <li>• Compliance and corrective actions</li> </ul> <p><b>Group exercise (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Groups audit a farm or a process within the training site</li> <li>• Present audit results and verdict and corrective actions</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Global GAP checklists</li> <li>• Participants' handouts</li> <li>• Group exercise</li> </ul>

3.7.7 Safe use of pesticides and calibration of sprayers and nozzles (1 hour)	Session guide
<p><i>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 PHIs</i></p> <p><b>Group exercise (30 minutes)</b></p> <p>Practical session on how to handle different types of pesticides, fungicides and herbicides together with their calibrations</p> <p><b>Plenary presentation (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Guided knapsack calibration</li> <li>• Different types of nozzles and their uses</li> <li>• Pesticide safety</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Pesticide containers</li> <li>• Knapsack sprayers</li> <li>• Nozzles</li> <li>• Participants hand outs</li> <li>• Group exercise</li> </ul>
3.7.8 Understanding food safety (30 minutes)	
<p><i>The facilitator introduces the food safety system by defining it and sharing its benefits with the trainees).</i></p> <p><b>Plenary presentation and discussion</b></p> <ul style="list-style-type: none"> <li>• Overview of Food Safety Management Systems (FSMS).</li> <li>• Why food safety is important in crops production systems.</li> <li>• Risks to human/animal health due to chemical, biological and physical hazards exposure.</li> <li>• Legal and market requirements for food safety practice.</li> <li>• Food safety practices that reduce risks/hazards.</li> <li>• Use of HACCP tool/system for monitoring crop production</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>

3.7.9 Determination of food safety risks/hazards (30 minutes)	Session guide
<p><i>(Facilitator should guide discussions on the steps of identification of food safety hazards FSMS)</i></p> <p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Explain the concept of risk identification (Hazard analysis) in crop production chain.</li> <li>• Listing the types of hazards that cause illness or death.</li> <li>• Determine and identify factors influencing likely occurrence/severity of hazards.</li> <li>• List hazards alongside the possible control measures</li> <li>• Explain the concept in a flow diagram</li> </ul> <p><b>Group Exercise (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Groups to identify major risk/hazards at points of crop production</li> <li>• Produce flow diagrams for the crop</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' hand outs</li> <li>• Group exercise</li> </ul>
3.7.10 Determination of critical control points (CCP) in crop value chains (30 minutes)	
<p><i>The facilitator introduces the topic on determination of critical control points (CCP)</i></p> <p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Why is important to determine CCP in production chain (preventing, eliminating or reducing risks).</li> <li>• How to monitor and measure the CCP (point, step or procedure).</li> <li>• How to document the CCP.</li> <li>• How to establish critical limits (from standards or guidelines) for each CCP.</li> </ul> <p><b>Group Exercise (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Groups to identify and establish critical control points and critical limits.</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Group exercise</li> </ul>

3.7.11 Prevention and corrective measures for CCP in crop value chains (30 minutes)	Session guide
<p><i>The facilitator introduces the topic on prevention and control of possible hazards</i></p> <p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Establishment of corrective actions against CCP</li> <li>• Establish verification procedures for CCP</li> <li>• Establish record-keeping and documentation procedures</li> <li>• How to develop HACCP plan and Food safety tool kit for the crop value chain</li> </ul> <p><b>Group exercise (15 minutes)</b></p> <p>Groups to identify and establish corrective actions and verification procedures for crop value chain.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Group exercises</li> </ul>
3.7.12 Module review (20 minutes)	Session guide
<p><i>(The facilitator leads the trainees in summarizing the key points discussed in the module)</i></p>	<ul style="list-style-type: none"> <li>• Plenary discussion</li> <li>• Plenary presentation</li> </ul>

### 3.8. Reference materials

#### 3.8.1. Participants' Handouts

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

#### 3.8.2. Further reading

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). Global G.A.P. General Requirements. Version 5.2 GlobalG.A.P., Cologne, Germany.

# MODULE 4: SWEETPOTATO PRODUCTION NICHES AND CLIMATIC REQUIREMENTS

## 4.1 Introduction

Sweetpotato is of tropical origin and adapts well to warm climates. It is a climate resilient crop, with production in Kenya mostly rain-fed. Sweetpotato can adapt to climate change and with the unpredictable rainfall patterns, prolonged droughts and increasing demand for food supply, there's need for knowledge on the production niches and climatic conditions for Sweetpotato production. It is an important commercial and subsistence tuber crop mainly grown by smallholder farmers in Kenya for mainly local markets. The national average production is low and quality is highly compromised due to use of low yielding varieties and poor agronomic practices. The low yields have reduced the potential of the crop to contribute to enhanced livelihoods of communities in onion producing areas and the country at large. Consequently, there is need to equip farmers with knowledge on selection of suitable varieties and application of good agronomic practices to increase yields.

This module exposes farmer trainers to the different suitable agro-climatic zones, prescribing ideal altitudes, soils, temperature, and rainfall levels among other characteristics for Sweetpotato production. While these agro-climatic factors are critical for growth and yield performance of Sweetpotato, 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 Sweetpotato performance and yields. Farmers will benefit immensely from improved productivity and commercialization of the crop.

## 4.2 Module Learning outcomes

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

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

## 4.3 Module Target Group

This module is intended for public and private agricultural extension providers, Lead Farmers and Sweetpotato 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 the trained trainers. 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

<b>Module 4: Sweetpotato production niches and climatic requirements</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Time</b>
4.6.1 Introductions and climate setting	<ul style="list-style-type: none"> <li>• Preliminaries</li> <li>• Self introduction</li> <li>• Setting norms and rules</li> <li>• Plenary discussion</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	20 minutes
4.6.2 Importance of Sweetpotato in Kenya's economy	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> <li>• Participants' handouts</li> </ul>	40 minute
4.6.3 Sweetpotato production ecological/ climatic requirements for optimal yields	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Participants' handouts</li> <li>• Projector</li> </ul>	1 hour
4.6.4 Sweetpotato production Agro-ecological zones (AEZs)- average yields, and constraints in the target counties	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	1 hour
4.6.5 Gain practical knowledge on specific county agro-ecological zones for Sweetpotato production	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Presentations</li> <li>• Plenary discussion</li> <li>• Video/photo show</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	40 minutes
4.6.6 Module review	<ul style="list-style-type: none"> <li>• Discussions/ conclusion and way forward</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Laptop</li> </ul>	20 minutes
<b>Total</b>			<b>4 hours</b>

## 4.7 Facilitator Guidelines

Module 4: Sweetpotato production and appropriate climatic requirements	
<b>4.7.1. Introductions and climate setting (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations)</i></p> <p><b>Expectations (10 minutes)</b></p> <p>The trainees to form groups (e.g. county based) and list their expectations, norms and rules.</p> <p><i>The facilitator presents module objectives</i></p> <p><b>Objectives (10 minutes)</b></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• To define the importance of Sweetpotato in Kenya’s economy.</li> <li>• Indicate and describe altitudes and soil types/ characteristics for Sweetpotato production.</li> <li>• Describe climatic conditions (temperatures, rainfall and humidity) required for Sweetpotato production.</li> <li>• Gain practical knowledge on specific county agro-ecological zones for Sweetpotato production.</li> <li>• Understand and be able to apply innovative Sweetpotato production and management technologies in the suitable counties.</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize the facilitator/ trainees involvement in Sweetpotato value chains</li> <li>• PowerPoint presentation</li> </ul>
<b>4.7.2 Importance of Sweetpotato in Kenya’s economy (40 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (25 minutes)</b></p> <ul style="list-style-type: none"> <li>• Origin of Sweetpotato</li> <li>• Sweetpotato in Kenyan households</li> <li>• Key counties producing Sweetpotato in Kenya</li> <li>• General Sweetpotato production trends in Kenya</li> <li>• Sweetpotato consumption and markets</li> </ul> <p><b>Guided discussions by the facilitator (15 minutes)</b></p> <p>Questions/answers/comments</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants’ handouts</li> <li>• Plenary discussion</li> </ul>

<b>4.7.3 Sweetpotato production ecological/climatic requirements (1 hour)</b>	
<p><b>Plenary presentation (45 minutes)</b></p> <ul style="list-style-type: none"> <li>• Altitude and agro-ecological zones for Sweetpotato production</li> <li>• Climatic conditions (rainfall, temperatures and humidity)</li> <li>• Soils (soil types, pH, general fertility for Sweetpotato)</li> </ul> <p><b>Facilitator’s guided discussion (15 minutes)</b></p> <p>Questions/answers/comments</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants’ handouts</li> <li>• Plenary discussion</li> </ul>
<b>4.7.4. Sweetpotato production AEZs (villages), average yields, and constraints in the target counties (1 hour)</b>	<b>Session guide</b>
<p><b>Plenary presentation (30 minutes)</b></p> <p>Facilitator guides in reviewing and discussing suitability map (county by county)</p> <p><b>Group exercise (15 minutes)</b></p> <p>Trainees to bring out specific county or sub-county AEZs, land size, yields and constraints to Sweetpotato production and present in the plenary:</p> <ul style="list-style-type: none"> <li>• Agro-ecological zones (AEZs) and % area suitable for Sweetpotato</li> <li>• Average land/farm size under Sweetpotato production in Kenya</li> <li>• Average yield of Sweetpotato per unit farm area</li> <li>• Constraints to Sweetpotato production</li> <li>• Opportunities to addressing the constraints</li> </ul> <p><b>Discussions/presentations from the groups (15 minutes)</b></p> <p>Let the trainees/groups share the group exercise outcomes</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Group work</li> <li>• Open discussions with the guidance of the facilitator</li> <li>• Plenary discussion</li> </ul>
<b>4.7.5. Practical knowledge on specific county agro-ecological zones for Sweetpotato production (40 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Facilitator guides trainees on the practical knowledge applicable to specific county agro-ecological zones for Sweetpotato production</li> </ul> <p><b>Plenary discussions and video/photo show (20 minutes)</b></p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Video/photo show</li> <li>• Plenary discussion</li> <li>• Plenary discussion</li> </ul>

4.7.6. Module review (20 minutes)	Session guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summary of the main points from the training <b>(10 minute)</b></p> <ul style="list-style-type: none"> <li>• Objectives and expectations (review done on basis of the expectations listed earlier)</li> <li>• Trainees to recall the Sweetpotato production ecological/ climatic requirements, Sweetpotato production AEZs (villages) average yields, and constraints in the target Counties</li> <li>• Trainees to indicate new sets of skills and knowledge acquired from the module. The results are recorded per county presented</li> <li>• Trainees to randomly identify the issues for the way forward.</li> </ul> <p><b>Facilitator’s guided discussion (10 minutes)</b></p>	<ul style="list-style-type: none"> <li>• The last participants’ handouts/ training materials</li> <li>• Summarize the main points of the module on a flip chart and display</li> <li>• Plenary discussion</li> </ul>

## 4.8 Reference Materials

### 4.8.1 Participants’ handouts

- Sweetpotato production guides
- Sweetpotato leaflets and brochures
- Sweetpotato factsheets

# MODULE 5: SWEETPOTATO VARIETY SELECTION

## 5.1. Introduction

The sweetpotato tubers are variable in shape, size and color. Some are long and cylindrical, others short, thick and rounded at the ends. The skin may be whitish, dull straw-colored, light red or purple. Its flesh is also variable in color, texture, moisture and quality. Classification of varieties is usually based upon the shape of the leaves. Selecting the best Sweetpotato 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 Sweetpotato varieties recommended for diverse uses and targeted production environments. In order to optimize Sweetpotato 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 Sweetpotato described
2. Various improved Sweetpotato varieties, their ecological areas of cultivation and their uses identified and compared
3. Sweetpotato 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 the trained trainers. 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. Sweetpotato variety selection			
Sessions	Training methods	Training materials	Time
5.6.1. Introduction and objectives expectations	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group discussion and presentation of expectations</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	30 minutes
5.6.2. Introduction to the various improved Sweetpotato varieties, their ecological areas of cultivation and their attributes and uses.	<ul style="list-style-type: none"> <li>• Group exercises to identify local Sweetpotato landraces and varieties</li> <li>• Plenary presentations</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> <li>• Manila papers</li> </ul>	1 hour
5.6.3 Recommended varieties for specific regions	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group exercise</li> <li>• Field demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> <li>• Manila papers</li> </ul>	1 hour
5.6.4 Instructions on seed package interpreted and applied	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group exercise</li> <li>• Plenary discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> <li>• Manila papers</li> </ul>	30 minutes
5.6.5 Module review	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Facilitator's summary</li> </ul>	<ul style="list-style-type: none"> <li>• Participants' handouts</li> <li>• Flip charts</li> <li>• Felt pens</li> </ul>	30 minutes
<b>Total</b>			<b>3 hours 30 minutes</b>

## 5.7. Facilitator’s Guidelines

Module 5: Sweetpotato Variety Selection	
<b>5.7. 1 Introduction and levelling of expectations and objectives (30 minutes)</b>	<b>Session guide</b>
<p><b>Introduction (15 minutes)</b></p> <p><i>(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations.</i></p> <p><b>Module objectives (15 minutes)</b></p> <p>(The facilitator presents modules objectives)</p> <p>By the end of the module the trainee should be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the Sweetpotato crop and its climatic and ecological requirements.</li> <li>2. Identify and compare the various improved Sweetpotato varieties their ecological areas of cultivation and their uses.</li> <li>3. Identify the varieties suited to the counties of interest.</li> </ol>	<ul style="list-style-type: none"> <li>• Summarize trainees’ “expectations” and display.</li> <li>• Distribute participants’ handouts</li> <li>• Module objectives,</li> </ul>
<b>5.7.2 Introduction to Sweetpotato and the various improved Sweetpotato varieties and their uses (1 hour)</b>	<b>Session guide</b>
<p><i>(The facilitator describes the Sweetpotato crop and guides the trainees in identifying the various Sweetpotato improved varieties and their uses).</i></p> <p><b>Group exercise and discussion (30 minutes)</b></p> <p>Ask trainees highlight and describe some of the Sweetpotato varieties they know.</p> <p><b>Plenary presentation (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Improved Sweetpotato varieties.</li> <li>• Categories of Sweetpotato varieties and comparison of various hybrid varieties.</li> </ul> <p><i>Show trainees the photographs of each variety and the full description and its uses.</i></p>	<ul style="list-style-type: none"> <li>• Distribute participants’ handouts</li> <li>• Group exercise</li> <li>• Plenary discussion</li> </ul>

5.7.3 Recommended Sweetpotato varieties for the target counties (1 hour)	Session guide
<p><b>Plenary presentation</b></p> <p><b>Varieties for the target counties (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Sweetpotato growing regions and the new regions which are being targeted for Sweetpotato cultivation in Kenya.</li> <li>• Sweetpotato varieties suited for each county</li> <li>• County climate conditions for target county (semi-arid, rain-fed and irrigated)</li> </ul> <p><b>Group exercises (15 minutes)</b></p> <p>Trainees discuss and come up with Sweetpotato varieties in their county</p> <p><b>Field demonstration (30 hour)</b></p> <p><i>(Identify farmers' fields with various Sweetpotato varieties).</i></p> <ul style="list-style-type: none"> <li>• Visit the Sweetpotato plots with the trainees and assist them identify and study the various varieties.</li> <li>• After the field visit facilitate them to recall what they learned and discuss on any issue that may arise. (can also use Sweetpotato fruit samples/pictures for the various varieties)</li> </ul>	<ul style="list-style-type: none"> <li>• Distribute participants' handouts.</li> <li>• PowerPoint presentation</li> <li>• Group exercise</li> <li>• Field demonstration</li> </ul>
5.7.4 .Instructions on seed package interpreted and applied (30 minutes)	Session guide
<p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Certified seed sources for Sweetpotato identified and adopted.</li> <li>• Information on seed package understood e.g. date of packing, shelf life, germination percentage, purity percentage, expiry etc.</li> <li>• Preferred variety identified.</li> </ul> <p><b>Group exercise (15 minutes)</b></p> <p><i>Circulate samples of packed certified Sweetpotato seed</i></p> <p><i>Identify key information on Sweetpotato seed packages provided</i></p>	<ul style="list-style-type: none"> <li>• Distribute participants' handouts</li> <li>• Group exercise</li> <li>• Plenary discussion</li> </ul>

5.7.5 Module review (30 minutes)	Session Guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Together with the trainees, review the main points about improved Sweetpotato varieties</p> <ul style="list-style-type: none"> <li>• What new sets of skills and knowledge did you learn from this module?</li> <li>• What are some of the problems and issues that you have become more aware of in Sweetpotato varieties?</li> <li>• What questions do you still have about identification of Sweetpotato varieties?</li> </ul>	<ul style="list-style-type: none"> <li>• The last Participants' Handouts</li> <li>• Summary of the main points from the module.</li> </ul>

## 5.8. Reference materials

### 5.8.1 Participants' Handouts

- Sweetpotato leaflets and brochures
- Sweetpotato factsheets

# MODULE 6: SWEETPOTATO SEED SYSTEMS

## 6.1 Introduction

A seed system is the channel through which farmers get seeds of the improved crop varieties they need. Effective seed systems gives farmers access to quality seed which increases agricultural production. 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 Sweetpotato. The development of impact-oriented seed systems can contribute significantly to food security and transform farmers livelihoods.

Sweetpotato 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 Sweetpotato production. It seeks to understand and document the formal seed production to enable farmers venture into commercial production of Sweetpotato.

## 6.2 Module learning outcomes

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

1. The main Sweetpotato 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) and the trained trainers. The facilitators 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: Sweetpotato seed system			
Sessions	Training methods	Training materials	Time
6.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> <li>• Self-introduction</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Marker pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	30 minutes
6.6.2 Definition of seed and seed system in Kenya	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Plenary presentations</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Marker pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	30 minutes
6.6.3 Formal seed system in Kenya	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Laptop</li> <li>• Projector</li> <li>• Flips charts</li> <li>• Marker pens</li> </ul>	1 hour
6.6.4 Module review and discussions	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Plenary discussion</li> <li>• presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> </ul>	30minutes
<b>Total</b>			<b>2 hours 30 minutes</b>

## 6.7 Facilitator's Guidelines

Module 6: Sweetpotato seed system	
6.7.1. Introduction and levelling of expectations and objectives (30 minutes)	Session guide
<p><b>Introduction (20 minutes)</b></p> <p><i>(The facilitator welcomes trainees to the module and thereafter invites them introduce themselves and state their expectations).</i></p> <p><b>6.7.1. Module objectives (10 minutes)</b></p> <p><i>(The facilitator presents modules objectives)</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Appreciate Sweetpotato seed systems and its importance in production.</li> <li>• Describe seed production in formal seed system.</li> <li>• Explain planting materials sources as a complimentary seed system</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees' "expectations" and display.</li> <li>• Powerpoint presentation</li> <li>• Plenary discussion</li> <li>• Distribute participants' handouts</li> </ul>

<b>6.7.2. Definition of seed and seed system in Kenya (30 minutes)</b>	<b>Session guide</b>
<p><b>Group exercise and presentations: (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• What is quality seed?</li> </ul> <p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Definition of a seed system and characteristics of main seed systems (formal and complementary seeding sources named)</li> <li>• Commodity corridors</li> </ul>	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Powerpoint presentation</li> <li>• Distribute participants' handouts</li> </ul>
<b>6.7.3 Formal seed systems in Kenya (1 hour)</b>	<b>Session guide</b>
<p><b>Plenary presentation and discussion (40 minutes)</b></p> <ul style="list-style-type: none"> <li>• Legal requirements for seed certification</li> <li>• Seed certification process</li> <li>• Post certification activities for enforcing the seed act cap 326</li> <li>• Post certification activities for seed quality assurance</li> <li>• Seed importation and exportation requirements</li> </ul> <p><b>Plenary discussion (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Formal seed systems</li> </ul>	<ul style="list-style-type: none"> <li>• Powerpoint presentation</li> <li>• Distribute participants' handouts</li> </ul>
<b>6.7.4 Module review (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summarize the module together with the trainees and have a recap of the main components in:</p> <ul style="list-style-type: none"> <li>• Sweetpotato seed systems and their characteristics</li> <li>• The importance of using certified seed</li> </ul> <p><i>(Discuss the knowledge acquired and skills learnt from this module with the trainees. What are the observations made by trainees from this module?)</i></p>	<ul style="list-style-type: none"> <li>• Participants' handouts</li> <li>• Summarize the main points from the module on a flip chart and display</li> </ul>

## 6.8 Reference Materials

### 6.8.1 Participants' Handouts

- Sweetpotato leaflets
- Sweetpotato fact sheets and brochures

# MODULE 7: CLIMATE SMART AGRONOMIC PRACTICES FOR SWEETPOTATO

## 7.1 Introduction

The low yields realized in Sweetpotato production by farmers can be attributed to adoption of the improved crop management practices. Some of the improved agronomic practices available for these farmers include, timely land preparation, use of recommended fertilizer types, correct plant spacing, earthing up, knowledge of physiological maturity indices and how to improve on harvesting techniques to avoid losses

In order to optimize productivity of Sweetpotato, 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 Sweetpotato farmers increase its productivity. In this respect, climate smart agronomic practices come to the fore. There is need to equip farmer facilitators with skills and knowledge that will enable them train farmers on innovative climate smart Sweetpotato agronomic practices. These 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 Sweetpotato production described and explained.
2. Region specific agronomic practices for Sweetpotato production optimization outlined.
3. Appropriate inputs and their correct application rates for Sweetpotato production described.
4. Timing for operations or inputs application in Sweetpotato 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 Sweetpotato 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 the trained trainers. The trainers using this module should thoroughly familiarize themselves with the participants' handouts.

## 7.5 Module Duration

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

## 7.6 Module Summary

<b>Module 7: Sweetpotato climate smart agronomic practices</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Time</b>
7.6.1 Introductions and climate setting, objectives and expectations	<ul style="list-style-type: none"> <li>• Self-introduction</li> <li>• Setting norms and rules</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	30 minutes
7.6.2 Agronomic practices for Sweetpotato production	<ul style="list-style-type: none"> <li>• Plenary presentations</li> <li>• Group exercise tour (nearby farm for layout demonstration)</li> <li>• Plenary discussions (from the farm visit)</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> <li>• Participants' handouts</li> </ul>	1 hour
7.6.3. Site selection, land reparation, seed selection, planting, water requirement, pest management, weed management and crop rotation	<ul style="list-style-type: none"> <li>• Practical exercise (groups tour nearby farm for layout demonstration)</li> <li>• Plenary presentation</li> <li>• Plenary discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> <li>• Participants' handouts</li> </ul>	30 minutes
7.6.4 Appropriate inputs and their recommended application rates for optimum production of Sweetpotato	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Group exercise (trainees enlist inputs and application rates for different counties)</li> <li>• Plenary discussions (share group work results)</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> <li>• Participants' handouts</li> </ul>	1 hour
7.6.5 Module review and discussion	<ul style="list-style-type: none"> <li>• Discussion/conclusion and way forward</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	30 minutes
<b>Total</b>			<b>3 hours 30 minutes</b>

## 7.7 Guidelines for Facilitators

Module 7: Climate smart agronomic practices for Sweetpotato	
7.7.1. Introductions and climate setting (30 minutes)	Session guide
<p><b>Preliminaries</b></p> <p><i>(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations).</i></p> <p><b>Expectations (15 minutes)</b></p> <p>The trainees form groups (e.g., county based) and list expectations from the module</p> <p><i>The facilitator presents the module objectives.</i></p> <p><b>Objectives (15 minutes)</b></p> <p>By the end of the training module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Explain and describe agronomic practices for Sweetpotato production.</li> <li>• Describe appropriate inputs and their correct application rates for Sweetpotato production.</li> <li>• Outline region specific Sweetpotato production agronomic practices.</li> <li>• Specify the correct timing for all operations including application of inputs in Sweetpotato production..</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize the trainees expectations</li> <li>• PowerPoint presentations</li> <li>• Group exercise</li> <li>• Expectations lists kept for later reviewing compliancy</li> </ul>
7.7.2. Agronomic practices for Sweetpotato production (1 hour)	Session guide
<p><b>Plenary presentation (20 minutes)</b></p> <p>The facilitator presents critical factors on:</p> <ul style="list-style-type: none"> <li>• Factors to consider in selecting Sweetpotato production as an enterprise</li> <li>• Climate smart land preparation practices</li> <li>• Climate smart planting (vine rates and plant density)</li> <li>• Thinning</li> <li>• Weed control</li> <li>• Pests and disease control</li> <li>• Cropping systems</li> <li>• Spacing (inter-and intra-row spacing)</li> <li>• Conservation agriculture principles/benefits</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> <li>• Distribute participants' handouts/training materials</li> <li>• Practical exercise</li> </ul>

<p><b>Practical exercise (30 minutes)</b></p> <p>Guided groups tours to model farms to observe various sowing and management techniques</p> <p><b>Plenary discussion (10 minutes)</b></p> <p>Questions/answers and comments</p>	
<p><b>7.7.3. Appropriate inputs for the optimal production of Sweetpotato and their correct/recommended application rates (30 minutes)</b></p>	<p><b>Session guide</b></p>
<p><b>Group exercise (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• The facilitator guides trainees to list or/and present the required inputs for use in Sweetpotato production</li> <li>• The trainees get into county groups to provide lists of Sweetpotato inputs and their application rates as practiced by farmers.</li> <li>• The groups present their results in the plenary - opening up for questions, answers and discussion.</li> </ul> <p><b>Plenary presentation and plenary discussion (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• The recommended Sweetpotato production inputs (vines, fertilizers, manures, among others), their application rates and appropriate time of application for optimal yields</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants' handouts</li> <li>• Groups exercise</li> <li>• Plenary discussion</li> </ul>
<p><b>7.7.3. Appropriate inputs for the optimal production of Sweetpotato and their correct/recommended application rates (1 hour)</b></p>	<p><b>Session guide</b></p>
<p><b>Group exercise (40 minutes)</b></p> <ul style="list-style-type: none"> <li>• The facilitator guides trainees to list or/and present the required inputs for use in Sweetpotato production</li> <li>• The trainees get into county groups to provide lists of Sweetpotato inputs and their application rates as practiced by farmers.</li> <li>• The groups present their results in the plenary - opening up for questions, answers and discussion.</li> </ul> <p><b>Plenary presentation and plenary discussion (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• The recommended Sweetpotato inputs (vines, fertilizers, manures, among others.), their rates and their time of application for optimal yields</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint Presentation</li> <li>• Distribute participants' handouts</li> <li>• Groups exercise</li> <li>• Plenary discussion</li> </ul>

7.7.4. Module review (30 minutes)	Session guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summary of the main points from the training</p> <ul style="list-style-type: none"> <li>• Objectives and expectations (review done on the basis of the objectives and expectations listed earlier)</li> <li>• Trainees to randomly indicate new sets of skills and knowledge learnt from the module. The results are recorded per county presented</li> <li>• Randomly (average of 10 cases) trainees identify key issues for the way forward issues.</li> </ul>	<ul style="list-style-type: none"> <li>• Participants' handouts</li> <li>• Summarize the main points of the module on a flip chart and display</li> </ul>

## 7.8. Reference Materials

### 7.8.1 Handouts for Participants

- Sweetpotato production guides.
- Sweetpotato leaflets and brochures
- Sweetpotato Factsheets

# MODULE 8: INTEGRATED SOIL AND WATER MANAGEMENT PRACTICES FOR SWEETPOTATO PRODUCTION

## 8.1 Introduction

Poor soil conditions and unreliable availability of moisture in most smallholder farming systems have been the main causes of low crop 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 Onion production systems.

Integrated Soil Fertility Management (ISFM) through conservation agriculture offers the best options for improving soil fertility in the advent of climate change adaptation. Drought management technologies to mitigate drought effects in sweetpotato production are available. However, farmers have not realized the 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 sweetpotato 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 explained.
4. Water harvesting technologies, soil and water management discussed and explained
5. Temporary or permanent decline in land productivity 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 Sweetpotato 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) and the trained trainers. 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

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

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

## 8.7 Facilitator's Guidelines

<b>Module 8: Integrated soil and water management practices for Sweetpotato production</b>	
<b>8.7.1. Introduction, objectives and expectations (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations)</i></p> <p><b>Module objectives (30 minutes)</b></p> <p><i>(The facilitator presents modules objectives)</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Appreciate soil composition and what constitutes healthy soil, including soil classification.</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees' "expectations" and display.</li> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> </ul>

<ul style="list-style-type: none"> <li>• Describe soil and plant tissue sampling for laboratory analysis, interpretation and utilization of results from accredited laboratories in Kenya.</li> <li>• Explain soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping systems.</li> <li>• Explain water harvesting technologies, soil and water management.</li> <li>• Identify temporary or permanent decline of land productive capacity and provide various solutions to soil degradation.</li> <li>• Identify and describe problematic soils and their management.</li> </ul>	
<b>8.7.2. Soil composition, properties and health (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator presents on soil composition, properties and health)</i></p> <p><b>Plenary presentation (20 minutes)</b></p> <p>Soil composition, properties and health</p> <ul style="list-style-type: none"> <li>• Description of soil composition</li> <li>• Description of soil properties</li> <li>• Describe what soil health is all about</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<b>8.7.3. Soil and plant tissue sampling and analysis (1 hour)</b>	<b>Session guide</b>
<p><b>Plenary Presentation (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Overview of the soil sampling methods</li> <li>• Soil analysis results and interpretation</li> <li>• Overview of soil analysis results using available examples</li> <li>• Soil sampling guidelines</li> </ul> <p><b>Practical exercise on soil sampling (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• soil sampling methods</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Practical exercise and demonstration</li> </ul>

8.7.4. Soil fertility and plant nutrition (30 minutes)	Session guide
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Potential role of different soil management techniques in addressing soil fertility challenges in Sweetpotato smallholder farming systems</li> <li>• Integrated Soil Fertility Management techniques</li> <li>• Soil management guidelines</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> <li>• Participants' handouts</li> </ul>
8.7.5 Soil health and (ISFM) for climate resilient cropping systems (30 minutes)	Session guide
<p><b>Plenary Presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Soil health</li> <li>• Introduce integrated soil fertility management (ISFM)</li> <li>• Soil health and ISFM for a climate resilient cropping system</li> <li>• Manure management, mulching, organic amendments and composting for increased use of organic manure for improving agricultural production</li> <li>• Conservation agriculture as a climate smart agriculture practice</li> <li>• Sweetpotato intercropping and crop rotation as climate resilient cropping systems</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> </ul>

8.7.6 Soil and water management and water harvesting technologies (30 minutes)	Session guide
<p><b>Plenary Presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Principles of soil management for increased Sweetpotato productivity</li> <li>• Methods of tillage systems that conserve water for Sweetpotato use.</li> <li>• Principles of soil fertility management for increased Sweetpotato productivity</li> <li>• Methods of soil fertility management for increased Sweetpotato productivity</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
8.7.7 Soil degradation and reclamation (30 minutes)	Session guide
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Overview of soil degradation and reclamation.</li> <li>• Reclamation measures of degraded soil</li> <li>• Identification of the causes of soil degradation</li> <li>• Identification of reclamation measures of degraded soil</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
8.7.8 Problematic soils and their management (30 minutes)	Session guide
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Problematic soils and their management</li> <li>• Soils with unsuitable biological properties</li> <li>• Soils with unsuitable chemical properties</li> <li>• Soils with unsuitable physical properties</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise.</p>	<ul style="list-style-type: none"> <li>• Powerpoint presentation</li> <li>• Participants' handouts</li> </ul>

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

## 8.8. Reference materials

### 8.8.1 Participants' Handouts

1. Soil Management Extension Manual [
2. Soil Management Leaflets
3. Pamphlets and Leaflets

### 8.8.2 Further Reading

- OFRA Technical Training Manual

# MODULE 9: SWEETPOTATO CROP HEALTH

## 9.1 Introduction

Sweetpotato production is often constrained by damage caused by a range of insects, diseases, nematodes and weeds. Further, an acute shortage of knowledge among sweetpotato 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 weevils, aphids, erinose mites, whiteflies, sucking bugs and nematodes feed on the various parts of plants by chewing, sucking and tunnelling. These create wounds for the entry of bacterial, fungal and viral phytopathogen, thus causing death leading to lowering crop yields. Bacterial diseases affecting sweetpotato include crown gall, bacterial wilt, bacter disease, little leaf phytoplasma and hairy roots. Fungal diseases of sweetpotato include alternaria leafspot, Alternaria storage rot, blue mold rot, cercospora leaf spot, charcoal rot Fusarium root rot, grey mold and rhizoctonia stem canker. Viral diseases of sweetpotato include cassava mosaic virus, sweetpotato chlorotic stunt virus, sweetpotato feathery mottle virus, sweetpotato latent virus and sweetpotato mild mottle virus. 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 Sweetpotato crop i.e. moisture, nutrients, light and space. This has significantly reduced productivity and profitability of Sweetpotato over time since.

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 Sweetpotato 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 Sweetpotato described and explained.
3. Knowledge on major pests and diseases, their development, economic losses and their control.
4. Integrated Disease Management approaches and scouting for threshold determination.
5. Integrated weed management strategies for Sweetpotato.
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) and the trained trainers. 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

<b>Module 8: Crop Health</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Time</b>
9.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> <li>• Self-introductions</li> <li>• Group exercise</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Marker pens</li> <li>• Laptop</li> <li>• Projector</li> </ul>	30 minutes
9.6.2 Major Sweetpotato pests that cause economic losses and their control methods;	<ul style="list-style-type: none"> <li>• Group work</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Practical exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> </ul>	1 hour
9.6.3 Sustainable Integrated Pests Management (IPM) practices and scouting for threshold determination in Sweetpotato	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> </ul>	30 minutes
9.6.4 Major Sweetpotato diseases that cause economic losses and their control	<ul style="list-style-type: none"> <li>• Group work</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Practical session</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> </ul>	1 hour

9.6.5 Sustainable Integrated Management of Sweetpotato diseases and scouting for threshold determination	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Plenary discussion</li> <li>• Field demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> </ul>	1 hour
9.6.6 Integrated weed management (Major weeds of Sweetpotato)	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Field demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> </ul>	1 hour
9.6.7 Safe use of agro-chemicals and update source for registered agro-chemicals (PCPB registered products)	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Practical exercise</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Participants' handouts</li> </ul>	30 minutes
9.6.8 Module Review	<ul style="list-style-type: none"> <li>• Discussion/ Recap of the module</li> <li>• Take away messages</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Participants' handouts</li> </ul>	30 minutes
<b>Total</b>			<b>6 hours</b>

## 9.7 Facilitator's Guidelines

<b>Module 9: Sweetpotato crop health</b>	
<b>9.7.1. Introduction and levelling of expectations and objectives (30 minutes)</b>	<b>Session guide</b>
<p><b>Introduction (15 minutes)</b></p> <p><i>(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations)</i></p> <p><b>Module objectives (15 minutes)</b></p> <p><i>(The facilitator presents modules objectives)</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Identify major pests, diseases and weeds.</li> <li>• Describe and explain integrated pest, disease and weed management in Sweetpotato.</li> <li>• Explain safe use of agro-chemicals (pesticides, fungicides and herbicides).</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees' "expectations"</li> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> </ul>

<b>9.7.2. Major Sweetpotato pests that cause economic losses and their control (1 hour)</b>	<b>Session guide</b>
<p><i>(The facilitator makes a presentation on the common Sweetpotato pests that are of economic importance)</i></p> <p><b>Group work (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Trainees to share Sweetpotato pest information from their respective counties</li> </ul> <p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Names of pests and their descriptions</li> <li>• Symptoms of their infestation/type of damage</li> <li>• Data on economic significance of the common Sweetpotato pests</li> </ul> <p><b>Practical exercise (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Identification of Sweetpotato pests from provided specimens</li> </ul> <p><b>Discussion (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Let the trainees recall what they learned and discuss any issue that may arise</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Group exercise</li> <li>• Practical exercise</li> <li>• Participants' handouts</li> </ul>
<b>9.7.3. Sustainable Integrated Pest Management (IPM) practices in Sweetpotato and scouting for threshold determination (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• IPM principles; how to implement them with a focus on cultural, physical, biological and chemical pest management options.</li> <li>• Critical considerations for proper scouting</li> <li>• Threshold determination and when to implement control measures</li> <li>• An overview on the safe use of agro-chemicals (demonstration on how to select most suitable pesticides, for the management of pests in Sweetpotato).</li> </ul> <p><b>Discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and seek clarification on the principles of sustainable IPM options</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> </ul>

<b>9.7.4. Major Sweetpotato diseases that cause economic losses, conditions that favour their development and their control methods (1 hour)</b>	<b>Session guide</b>
<p><b>Group work (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Determination of Sweetpotato diseases in specific Counties</li> </ul> <p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Presentations on Sweetpotato diseases and conditions that favor their development</li> </ul> <p><b>Practical exercise (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Identification of major disease species causing economic damage based on samples presented</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Disease identification guidelines</li> <li>• Practical exercise</li> </ul>
<b>9.7.5. Sustainable Integrated Diseases Management (IDM); scouting and threshold determination (1 hour)</b>	<b>Session guide</b>
<p><b>Plenary presentation (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Critical considerations for scouting and when to implement Sweetpotato disease control measures</li> <li>• Presentation on Integrated Disease Management (IDM) in Sweetpotato</li> <li>• An overview on the safe use of recommended agro-chemicals (demonstration on how to select most suitable fungicides for the management of major Sweetpotato diseases).</li> </ul> <p><b>Field visit (30 minutes)</b></p> <p>Visit to a nearby Sweetpotato field for collection and identification of diseased Sweetpotato samples</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Disease management guidelines</li> <li>• Field demonstration</li> </ul>
<b>9.7.6 Integrated Weed Management (major weeds of Sweetpotato) (1 hour)</b>	<b>Session guide</b>
<p><b>Plenary presentation (45 minutes)</b></p> <ul style="list-style-type: none"> <li>• Identification of weeds</li> <li>• Major types of weed in the Sweetpotato field</li> <li>• Integrated Weed control measured</li> </ul> <p><b>Plenary discussion (15 minutes)</b></p> <p>Integrated Weed Management (IWM)</p>	<ul style="list-style-type: none"> <li>• Powerpoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>

<b>9.7.7. Safe Use of agro-chemicals and sources of registered chemicals (PCPB registered products) (30 minutes)</b>	<b>Session guide</b>
<p><b>Practical (20 minutes)</b></p> <p>Trainees go into their groups and discuss:</p> <ul style="list-style-type: none"> <li>• Ways used by farmers in mixing of pesticides/ ITK products; and their consideration on safe use of pesticides</li> <li>• Representative group leaders give presentation on findings of the discussion</li> </ul> <p><b>Plenary presentation (10 minutes)</b></p> <p>Facilitator makes presentation on:</p> <ul style="list-style-type: none"> <li>• Safe use of pesticides</li> <li>• Let the trainees ask questions on any of the covered topical issues and critical areas to share with farmers on safe use of pesticides</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Demonstration</li> <li>• Participants hand-outs</li> </ul>
<p><b>9.7.7. Module review (30 minutes)</b></p> <p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summarize the main points of the training: The facilitator should review the following main points about climatic conditions suitable for Sweetpotato production:</p> <ul style="list-style-type: none"> <li>• Major pests of Sweetpotato and their economic impacts on Sweetpotato production.</li> <li>• Integrated Pest Management (IPM) options for Sweetpotato</li> <li>• Major diseases of Sweetpotato and their economic impact on Sweetpotato production.</li> <li>• Integrated Disease Management (IDM) options for Sweetpotato</li> <li>• Major weeds of Sweetpotato and their economic impacts on Sweetpotato production.</li> <li>• Integrated Weed Management (IWM) options for Sweetpotato</li> </ul> <p><i>(Discuss with trainees about new things learnt from this Module and what are some of the issues that need clarification)?</i></p>	<p><b>Session guide</b></p> <ul style="list-style-type: none"> <li>• The last participants' handouts</li> <li>• Summarize the main points from the module on a flip chart and display</li> </ul>

## **9.8. Reference Materials**

### **9.8.1 Participants' handouts**

- Fact sheets on Sweetpotato pest identification and control
- Factsheets on Sweetpotato disease identification and their control
- Factsheets on Sweetpotato weeds identification and their management

### **9.8.2 Further reading**

Mwangi, H.W. Weed Management manual. KALRO-Kabete

# MODULE 10: SWEETPOTATO HARVESTING AND Postharvest MANAGEMENT

## 10.1 Introduction to the Module

Inappropriate harvesting, and postharvest handling methods are major challenges in Sweetpotato. The postharvest losses are estimated upwards at between 45-69%. Fresh Sweetpotato tubers are highly perishable due to their high moisture, sugar content and soft skin. Postharvest losses of Sweetpotato roots are mainly caused by several factors, that include mechanical damage such as cuts, skinning and bruises incurred during harvesting and transportation. Cracking is often caused by nematode damage and moisture stress while chilling is as a result of cold wet soils or subsequent exposure to temperatures below 13°C which result in tissue breakdown and souring of the tuber flavour. Respiration contributes to weight loss of the tubers and altered appearance, wounding can increase the respiration rate and weight loss.

Varieties with high dry matter content have therefore less weight loss following harvest. Respiration rate is higher at higher temperatures. Tubers that are stored at high temperature and humidity sprout. Sweetpotato weevil (*Cylas* spp) causes unsightly holes in the tubers, a bitter taste and unpleasant smell in the roots. Fungal and bacterial rots (often gaining access through wound sites on tubers due to harvesting or weevil damage or through infected planting materials) result in soft and sunken areas developing on the tubers, and may cause bitter taste. 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 Sweetpotato postharvest Value Chain, constraints and opportunities in postharvest value chain and climate smart and gender friendly postharvest TIMPs for minimizing the losses and enhancing the quality of Sweetpotato.

## 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 Sweetpotato explained.
2. Constraints and opportunities in Sweetpotato postharvest value chain explained.
3. Climate smart and gender-friendly postharvest practices for minimizing the losses and enhancing quality of Sweetpotato explained and demonstrated.

## 10.3 Module Target Group

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

## 10.4 Module Users

This module is intended for use by Master Trainers who are members of the CTT and the trained trainers. The trainers using this module should thoroughly familiarize themselves with the participant’s handouts.

## 10.5 Module Duration

The Module is estimated to take 3 hours.

## 10.6 Module Summary

<b>Module 19: Sweetpotato Harvesting and Postharvest Management</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Time</b>
10.1 Introductions, expectations and objectives	<ul style="list-style-type: none"> <li>• Personal introduction</li> <li>• Group work</li> <li>• Plenary presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> </ul>	20 minutes
10.2. Constraints and opportunities in postharvest management of Sweetpotato	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Plenary presentations</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Participants’ handouts,</li> <li>• Videos</li> </ul>	40 minutes
10.3. Sweetpotato postharvest TIMPs <ul style="list-style-type: none"> <li>• Maturity indices</li> <li>• Harvesting</li> <li>• Field assembly and packaging</li> <li>• Curing</li> <li>• Control of postharvest rots and decay</li> <li>• Sorting, grading and packaging</li> <li>• Storage (clamp and pit stores)</li> <li>• Cooling (Zero Energy Coolers, charcoal coolers)</li> </ul>	<ul style="list-style-type: none"> <li>• Group work</li> <li>• Brainstorming sessions</li> <li>• Plenary presentation</li> <li>• Practical demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Participants’ handouts</li> <li>• Materials for demos (Sweetpotatos, refractometer, bags, crates, etc.)</li> </ul>	1 hours 30 minutes

10.4. Module review	<ul style="list-style-type: none"> <li>• Facilitator’s summary</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Projector</li> <li>• Laptop</li> <li>• Module evaluation forms</li> </ul>	30 minutes
<b>Total</b>			<b>3 hours</b>

## 10.7 Facilitators Guidelines

<b>Module 10. Harvesting and Postharvest Management</b>	
<b>10.7.1 Introduction and levelling of expectations and objectives (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator welcomes trainees to the module and invites trainees to introduce themselves and state their expectations)</i></p> <p><b>Introduction and module objectives (10 minutes)</b>  <i>(The facilitator presents module’s objectives)</i></p> <p>By the end of the module trainees should be able to:</p> <ul style="list-style-type: none"> <li>• Explain the correct maturity indices and harvesting practices for Sweetpotato</li> <li>• Explain the whole range of postharvest practices for Sweetpotato</li> <li>• Explain the constraints and opportunities in Sweetpotato postharvest value chain</li> <li>• Explain climate smart and gender-friendly postharvest TIMPs for minimizing the losses and enhancing quality of Sweetpotato</li> </ul> <p><b>Expectations (10 minutes)</b>  <i>Assist the trainees to state their expectations based on the objectives</i></p>	<ul style="list-style-type: none"> <li>• Participants’ handouts</li> <li>• Training program</li> <li>• PowerPoint presentation</li> <li>• Summarize trainees’ “expectations” and display on flip chart/board.</li> </ul>
<b>10.7.2 Constraints and opportunities in postharvest handling of Sweetpotato (40 minutes)</b>	<b>Session guide</b>
<p><i>(Highlight the Sweetpotato postharvest value chain harvesting, field assembly and packaging, sorting, grading and packaging, storage, cooling, control of postharvest rots and decay)</i></p> <p><b>Group work (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Trainees discuss constraints in the postharvest handling of Sweetpotato, and suggest solutions</li> </ul> <p><b>Group presentation (10 minutes)</b>            Trainees present results of group work in plenary</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants’ handouts</li> </ul>

<b>10.7.3 Sweetpotato postharvest value chain TIMPs (1 hour 30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (1 hour)</b></p> <ul style="list-style-type: none"> <li>• Maturity indices and harvesting of Sweetpotato (importance of harvesting at the right maturity index, advantages and disadvantages of harvesting too early or too late)</li> <li>• Preparations farmers need to make prior to harvesting</li> <li>• Sweetpotato harvesting methods</li> <li>• Sweetpotato curing methods</li> <li>• Field assembly and packaging</li> <li>• Sorting, grading and packaging</li> <li>• Storage (Clamp and pit stores)</li> <li>• Cooling (Zero Energy Coolers, Charcoal coolers)</li> </ul> <p><b>Practical demonstrations (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Harvesting of Sweetpotato at the field</li> <li>• Sorting and grading (Sweetpotato purchased from the market and grading into various grades with reference to existing standards)</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants handouts</li> <li>• Materials for demos (Sweetpotato, refractometer, bags, crates, etc.)</li> </ul>
<b>10.4 Module review (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p><b>Plenary presentation (10 min)</b></p> <p>Together with the trainees, summarize the main points of the training.</p> <p><b>Group exercise (20 min)</b></p> <ul style="list-style-type: none"> <li>• Together with the trainees review the main points on the manual</li> <li>• Sweetpotato harvesting and postharvest handling</li> <li>• Discuss with trainees that may need clarification.</li> </ul>	<p>Summary of the main points from the module</p>

## **10.8. Reference Materials**

### **10.8.1. Participant's Handouts**

- Sweetpotato factsheet
- Sweetpotato leaflets

# MODULE 11: SWEETPOTATO VALUE ADDITION

## 11.1. Introduction

Value addition of sweetpotato is the process of increasing the economic value and consumer appeal or changing of the physical state or form of sweetpotato. This can be achieved through various technologies such as processing and preservation techniques, dehydration and drying technology, freezing technology, packing and labelling. Farmers in most of the sweetpotato producing areas, are yet to optimize on the economic benefits, partly due to inadequate knowledge of appropriate value-adding technologies, coupled with poor infrastructure facilities and the absence of coherent policies to support such an undertaking. This module exposes farmer trainers to the importance of Sweetpotato in addressing food and nutrition security at the household, community and industrial levels. It covers the various sweetpotato value added products, constraints in value addition and their suggested solutions. It is expected that the processing and value addition methods provided 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 sweetpotato as a food and nutrition security crop explained and appreciated.
2. Nutritional composition of sweetpotato, health benefits, food security and income described.
3. Constraints in value addition and consumption of sweetpotato, and suggest solutions identified
4. Sweetpotato-based value added products identified and explained.

## 11.3 Module Target Group

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

## 11.4 Module Users

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

## 11.5. Module Duration

The Module is estimated to take 6 hours 30 minutes.

## 11.6. Module Summary

Module 11. Sweetpotato value addition			
Sessions	Training methods	Training materials	Time
11.6.1. Introduction, objectives expectations	<ul style="list-style-type: none"> <li>• Personal introduction</li> <li>• Group work</li> <li>• Plenary presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Projector</li> <li>• Laptop</li> </ul>	30 minutes
11.6.2 Role of sweetpotato as a food and nutrition security crop	<ul style="list-style-type: none"> <li>• Powerpoint</li> <li>• Group exercise</li> <li>• Plenary presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> </ul>	30 minutes
11.6.3. Nutritional composition of sweetpotato and its role in human health	<ul style="list-style-type: none"> <li>• Power point</li> <li>• Plenary presentation</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Powerpoint presentation</li> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Participant's handouts</li> </ul>	45 minutes
11.6.4. Constraints in value addition and consumption of sweetpotato	<ul style="list-style-type: none"> <li>• Group exercise</li> <li>• Plenary presentation</li> </ul>	<ul style="list-style-type: none"> <li>• List of value added products</li> <li>• Checklist for prioritization</li> <li>• Pair wise ranking tool</li> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Participants' handouts</li> <li>• Projector</li> <li>• Laptop</li> </ul>	45 minutes
11.6.5 Sweetpotato based value added products:	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Practical demonstration</li> <li>• Sensory evaluation of value added sweetpotato products</li> <li>• Field visit to processing firms / groups</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Participant handouts</li> <li>• Assorted value addition equipment and ingredients (sweetpotato, sweetpotato flours, among others.)</li> <li>• Sensory evaluation forms</li> </ul>	3 hours 30 min

11.6.6. Module review	<ul style="list-style-type: none"> <li>• Plenary discussion</li> <li>• Presentations</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• PowerPoint presentation</li> <li>• Module evaluation forms</li> </ul>	30 minutes
<b>Total</b>			<b>6 hours 30 minutes</b>

## 11.7. Facilitator's Guidelines

<b>Module 11. Sweetpotato value addition</b>	
<b>11.7.1 Introduction, expectations and objectives (30 minutes)</b>	<b>Session guide</b>
<p><b>Introduction and expectations (15 minutes)</b></p> <p><i>(The facilitator welcomes trainees to the module on value addition of sweetpotato. They are then invited to introduce themselves and state their expectations)</i></p> <p><b>Module objectives (15 minutes)</b></p> <p><i>(The facilitator presents modules objectives.)</i></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Appreciate the role of sweetpotato as a food and nutrition security crop.</li> <li>• Describe nutritional composition of sweetpotato, health benefits, food security and income.</li> <li>• Identify constraints in value addition and consumption of sweetpotato, and suggest solutions.</li> <li>• Explain how to make sweetpotato-based value added products.</li> <li>• Explain the use of sweetpotato vines as a nutritive livestock feed (peels).</li> </ul>	<ul style="list-style-type: none"> <li>• Participants' handouts</li> <li>• PowerPoint Presentation</li> <li>• Summarize trainees' expectations and display on flip chart/board.</li> </ul>

<b>11.7.2 Role of Sweetpotato as a food and nutrition security crop 30 minutes)</b>	<b>S Session guide</b>
<p><i>(The facilitator presents on malnutrition cases in Kenya and the importance of Sweetpotato in addressing food security and malnutrition challenges)</i></p> <p><b>Plenary presentation (15 minutes)</b></p> <p>Powerpoint presentation highlighting the critical elements:</p> <ul style="list-style-type: none"> <li>• Micronutrient malnutrition cases in Kenya</li> <li>• Dietary nutrient requirements (focusing on VMGs)</li> </ul> <p><b>Group exercises (15 minutes)</b></p> <p>Trainees discuss in groups, the main malnutrition challenges in their respective counties/regions</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Recipe books</li> <li>• Sample sweetpotato and other processing ingredients</li> <li>• Group exercise</li> </ul>
<b>11.7.3 Nutritional composition of sweetpotato and its role in human health (45 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (45 minutes)</b></p> <ul style="list-style-type: none"> <li>• Overview of the documented sweetpotato nutritional composition and their role in human health and nutrition</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> </ul>
<b>11.7.4. Constraints in value addition and consumption of Sweetpotato (45 minutes)</b>	<b>Session guide</b>
<p><b>Group exercise (30 min)</b></p> <p>Groups discuss the constraints in sweetpotato value addition and consumption</p> <p><b>Plenary presentation (15 min)</b></p> <p>Overview of constraints in value addition and consumption of sweetpotato.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Group Exercise</li> </ul>
<b>11.7.5 Sweetpotato based value added products ( 3 hours 30 min)</b>	<b>Session Guide</b>
<p><b>Plenary presentation (30 min)</b></p> <ul style="list-style-type: none"> <li>• Overview of sweetpotato based value added products</li> <li>• Meaning of value addition</li> <li>• Requirements for value addition of sweetpotato</li> <li>• Sweetpotato based value added products; sensory evaluation of the products</li> </ul>	<ul style="list-style-type: none"> <li>• Participants handouts</li> <li>• Powerpoint presentation</li> <li>• Recipes</li> <li>• Sensory evaluation forms</li> </ul>

<p><b>Practical exercise (3 hours)</b></p> <ul style="list-style-type: none"> <li>• Demonstration on formulation of sweetpotato based products</li> <li>• Practical on sensory evaluation of value added Sweetpotato products</li> </ul>	<ul style="list-style-type: none"> <li>• Assorted value addition equipment and ingredients</li> </ul>
<p><b>11.7.6 Training review (30 minutes)</b></p>	<p><b>Session guide</b></p>
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Review the main points about sweetpotato value addition together with the trainees.</p> <ul style="list-style-type: none"> <li>• What new things did you learn from this Module?</li> <li>• What are some of the problems and issues that you have become more aware of in sweetpotato value addition?</li> <li>• What questions do you still have about sweetpotato value addition?</li> </ul>	<p>Summary of the main points from the module.</p>

## 11.8. Reference Materials

### 11.8.1. Participants' Handouts

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

# MODULE 12: MECHANIZATION OF SWEETPOTATO PRODUCTION ACTIVITIES

## 12.1 Introduction

Agricultural mechanization supports sweetpotato production through enhancing production, productivity and profitability in agriculture, by achieving timeliness of farm operations. It comes along with precision in metering and placement of inputs, reducing susceptibility to input losses, increasing utilization efficiency of costly inputs (seed, chemical, fertilizer, irrigation, water etc.), reducing unit cost of production, enhancing profitability and competitiveness in the cost of operation. It also benefits 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 sweetpotatoes farming in Kenya especially when applied to planting, weeding, pest control, harvesting and postharvest activities.

## 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. Tractor mounted mould plough described and explained.
3. Tractor mounted harrow described and explained.
4. Tractor mounted ridger described and explained.
5. Tractor mounted sweetpotato vine planter described and explained.
6. Use of pest control implements and tools demonstrated.
7. Harvest equipment identified and demonstrated.

## 12.3 Module Target Group and Categories

This module is intended for public and private service providers, county public extension agents and Lead Farmers.

## 12.4 Module Users

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

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

## 12. 6 Module Summary

<b>Module 12 Mechanization of sweetpotato production activities</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Duration</b>
12.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> <li>• Personal introduction</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> </ul>	20 minutes
12.6.2 Climate smart tillage options	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip chart</li> <li>• Felt pens</li> <li>• Participants' handouts</li> </ul>	30 minutes
12.6.3 Seed-bed preparation	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip chart</li> <li>• Felt pens</li> <li>• Participants' handouts</li> </ul>	20 minutes
12.7.4 Laying out of irrigation structures	<ul style="list-style-type: none"> <li>• Plenary presentations</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> <li>• Practical session</li> </ul>	30 minutes
12.7.5 Calibration of vine seed rate for planting and soil firming	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip chart</li> <li>• Felt pens</li> <li>• Participants' handouts</li> </ul>	30 minutes
12.7.6 Planting demonstration	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip chart</li> <li>• Felt pens</li> <li>• Participants' handouts</li> </ul>	30 minutes

12.7.7 Pest control equipment and tools usage	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Practical session</li> </ul>	1 hour
12.7.8 Harvesting and transportation	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip chart</li> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Practical session</li> </ul>	1 hour
12.7.8 Module review	<ul style="list-style-type: none"> <li>• Presentations</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> </ul>	20 minutes
<b>Total</b>			<b>5 hours</b>

## 12.7 Facilitator's Guidelines

12.7.1 Introduction, objectives and expectations (20 minutes)	Session guide
<p><i>(The facilitator welcomes trainees to the module and thereafter invites them to introduce themselves and state their expectations).</i></p> <p><i>The facilitator presents module objectives</i></p> <p><b>Module objectives</b></p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Identify and explain climate smart tillage options.</li> <li>• Demonstrate seedbed preparation for raised beds and direct sowing</li> <li>• Demonstrate and explain layout of irrigation structures</li> <li>• Demonstrate calibration of vine planters, seed rate determination and soil firming</li> <li>• Demonstrate use of pest control implements and tools.</li> <li>• Explain how to harvest and transport sweet potato with minimum injury</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees' "expectations"</li> <li>• and display.</li> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> </ul>

<p><b>12.7.2. Climate smart tillage options (30 minutes)</b></p> <p><i>(The facilitator presents climate smart tillage options)</i></p> <p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Overview of the sweetpotato mechanization activities</li> <li>• Climate smart tillage options for sweetpotato production</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise</p>	<p><b>Session guide</b></p> <ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<p><b>12.7.3. Seed-bed preparations using raised beds and ridges (20 minutes)</b></p> <p><b>Plenary presentation (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Techniques and methods of raised bed design</li> <li>• Techniques and methods of ridging</li> </ul> <p><b>Discussion (10 minutes)</b></p> <p>Let the trainees recall what they have learnt and discuss any issue that may arise.</p>	<p><b>Session guide</b></p> <ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<p><b>12.7.4. Irrigation layout and tools (30 minutes)</b></p> <p><b>Plenary presentation (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Techniques and methods of irrigation design</li> </ul> <p><b>Discussion (20 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise.</p>	<p><b>Session guide</b></p> <ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<p><b>12.7.5. Calibration of vine planters, seed rate determination and soil firming (30 minutes)</b></p> <p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Techniques and methods of planter vine seed, rate determination and soil firming</li> </ul> <p><b>Discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise.</p>	<p><b>Session guide</b></p> <ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>

<b>12.7.6. Planting demonstration (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>Techniques and methods of vine seed placement</li> </ul> <p><b>Discussion (5 minutes)</b></p> <p>Let the trainees recall what they have learnt and discuss any issue that may arise.</p>	<ul style="list-style-type: none"> <li>PowerPoint presentation</li> <li>Participants' handouts</li> <li>Plenary discussion</li> </ul>
<b>12.7.7. Pest control equipment and tools usage (1 hour)</b>	<b>Session guide</b>
<p><b>Plenary presentation (30 minutes)</b></p> <ul style="list-style-type: none"> <li>Techniques and methods of using pest control equipment; knap sack and boom sprayer</li> </ul> <p><b>Plenary discussion (30 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise</p>	<ul style="list-style-type: none"> <li>PowerPoint presentation</li> <li>Participants' handouts</li> <li>Plenary discussion</li> </ul>
<b>12.7.8 Harvesting and transportation (1 hour)</b>	<b>Session guide</b>
<p><b>Plenary presentation (30 minutes)</b></p> <ul style="list-style-type: none"> <li>Techniques and methods of using knives to harvest sweetpotato</li> </ul> <p><b>Plenary discussion (30 minutes)</b></p> <p>Let the trainees recall what they learnt and discuss any issues that may arise</p>	<ul style="list-style-type: none"> <li>PowerPoint presentation</li> <li>Participants' handouts</li> <li>Plenary discussion</li> </ul>
<b>12.7.9 Module review (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summarize the main points of the training and together with the participants review the main points:</p> <ul style="list-style-type: none"> <li>Various climate smart tillage operations</li> <li>Seedbed preparation</li> <li>Layout irrigation structures</li> <li>Calibration of vine planters, seed rate determination and soil firming</li> <li>Planting</li> <li>Chemical application implements and tool operations</li> <li>Harvest and transport with minimum injury</li> </ul> <p><i>(Discuss with trainees about new things learnt from the module and any issues that may arise)</i></p>	<ul style="list-style-type: none"> <li>The last participants' handouts</li> <li>Summarize the main points from the module on a flip chart and display</li> </ul>

## **12.8 Reference Materials**

### **12.8.1 Participants' handouts**

- Sweetpotato mechanization factsheets.
- Sweetpotato mechanization pamphlets and leaflets.

# MODULE 13: SWEETPOTATO BUSINESS AND MARKETING

## 13.1 Introduction

Sweetpotato is mainly produced in Nyanza, Western, Coastal and Central Regions with Lake Region (Nyanza and Western) leading in production. An acre of land under sweetpotato has a yielding potential of 14-18 tons in four to six months under good management. This can yield up to 0.9 million in revenue at farm gate price of KES 70 per kilogram. Distribution and marketing of potatoes are hampered by poor infrastructure, notably bad roads. Most roads in the sweetpotato-growing areas are earth roads that become impassable during the rainy season. This raises transaction costs and lowers profit margins. The county governments are however trying to ensure that the roads remain passable during the rainy season.

Markets and marketing of sweetpotato is a major issue of concern to small scale farmers and other actors in the value chain in Kenya, particularly inconsistency in supplying sufficient volumes required for trade, seasonal supply and price fluctuations. The low production/volumes, high perishability and bulkiness of the produce also limit farmers to the local markets, where demand is low and hence prices. To strengthen the sweetpotato value chain, it is important to equip farmer facilitators with the skills and knowledge on sweetpotato farming business and marketing strategies. This module is designed to expose Master Trainers to sweetpotato 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. Various marketing approaches of sweetpotato identified.

## 13.3 Module Target Group

This module targets agricultural extension, service providers and Lead Farmers.

## 13.4 Module Users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT) and the trained trainers. The facilitator 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

<b>Module 13. Sweetpotato Business and Marketing</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Time</b>
13.6.1. Models for market-oriented production of sweetpotato (levelling of participants' expectations about the module and objectives)	<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Masking tapes/flip chart holders</li> </ul>	20 minutes
13.6.2. Developing a business plan for sweetpotato farm business  i. Business concept and emerging and farming business models  ii) Planning a farm business: SWOT analysis, farm budgeting and business plan	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Masking tapes/flip chart holders</li> </ul>	1 hour
13.6.3. Marketing as a group - collective marketing	<ul style="list-style-type: none"> <li>• Presentation</li> <li>• Plenary discussions</li> <li>• Role play exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Masking tapes/flip chart holders</li> </ul>	30 minutes
13.6.4 Profitability analysis - reviewing performance of sweetpotato agro	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Masking tapes/flip chart holders</li> </ul>	20 minutes

13.6.5 Scaling up plan of sweetpotato agro-enterprise development approach	<ul style="list-style-type: none"> <li>• Group work</li> <li>• Plenary discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Masking tapes/flip chart holders</li> </ul>	30 minutes
13.6.6 Marketing approaches (contracted sweetpotato production model, sweetpotato marketing entrepreneurship model and Internet/online/mobile marketing)	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary Discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Laptop</li> <li>• Flip charts</li> <li>• Marker pens</li> <li>• Masking tapes/flip chart holders</li> </ul>	20 minutes
13.6.7. Module review	<ul style="list-style-type: none"> <li>• Facilitator's summary</li> <li>• Plenary presentation</li> <li>• Plenary Discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Module review</li> <li>• Participants handouts</li> </ul>	20 minutes
<b>Total</b>			<b>3 hours 20 minutes</b>

### 13.7 Facilitators Guidelines

<b>Module 13. Sweetpotato Business and Marketing</b>	
<b>13.7.1 Levelling participants' expectations about the module (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator welcomes trainees to the module and thereafter invites them to state their expectations)</i></p> <p>The facilitator presents module objectives.</p> <p>By the end of this module, the trainee is expected to:</p> <ul style="list-style-type: none"> <li>• Appreciate business concept and appreciate emerging and inclusive farmer-market linking models.</li> <li>• Describe how to plan a farm business using SWOT Analysis, farm budgeting and business plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees' "expectations" and display on flip chart/board.</li> <li>• Participants handouts</li> <li>• PowerPoint presentation</li> </ul>

<ul style="list-style-type: none"> <li>• Describe and explain the tools for implementing a farm business: cost of production, record keeping, break-even, gross margin and entrepreneurship.</li> <li>• Identify the marketing approaches of Sweetpotato.</li> </ul>	
<b>13.7.2 Developing a business plan for Sweetpotato farm business (1 hour)</b>	<b>Session guide</b>
<p><i>(The facilitator to highlight elements of business concept and emerging farming business models)</i></p> <p><b>Plenary presentation (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Business concept and emerging farming business models</li> </ul> <p><b>Group exercise (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Discuss areas of adjustments in the models</li> </ul> <p><b>Planning a farm business using SWOT analysis, farm budgeting and business plan (20 minutes)</b></p> <p><i>The facilitator highlights the components of SWOT matrix and their interactions to generate opportunities based on the other components)</i></p> <p><b>Plenary presentation (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• SWOT analysis</li> <li>• Budgeting</li> <li>• Business planning</li> </ul> <p><b>Group exercise (10 minutes)</b></p> <p>List the strengths, weaknesses, opportunities and threats in sweetpotato farming as a business and marketing</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Group exercise</li> </ul>
<b>13.7.3 Marketing as a group - collective marketing (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator highlights the importance and benefits of collective and group marketing).</i></p> <p><b>Presentation and discussions (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Collective marketing</li> </ul> <p><b>Role play exercise (20 minutes)</b></p> <p>In groups of two, the trainees will do a role play, where they sell individually and where sell as a group.</p>	<ul style="list-style-type: none"> <li>• Participants 'handouts</li> <li>• Group exercise</li> </ul>

<b>13.7.4 Profitability analysis - reviewing performance of sweetpotato agro enterprise (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator highlights the importance of managing sweetpotato production as a farm business)</i></p> <p><b>Plenary presentation (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• The farmer as an entrepreneur</li> <li>• Record keeping</li> <li>• Profitability assessment (cost of production, break-even and gross margin)</li> </ul> <p><b>Plenary discussion (10minutes)</b></p> <ul style="list-style-type: none"> <li>• Profitability analysis</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<b>13.7.5 Scaling up plan of sweetpotato agro-enterprise development approach (30 minutes)</b>	<b>Session guide</b>
<p><b>Group and plenary discussions (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• In groups three groups the participants discuss how to scale up sweetpotato agro-enterprise</li> </ul> <p>The group leaders in each group present back to the whole plenary and discuss the outcomes.</p>	<ul style="list-style-type: none"> <li>• Plenary discussion</li> <li>• Group exercise</li> </ul>
<b>13.7.6 Marketing strategies (20 minutes)</b>	<b>Session guide</b>
<p><b>Plenary Presentation (10 minutes)</b></p> <p><i>(The facilitator highlights the marketing strategies for the Sweetpotato farm business)</i></p> <ul style="list-style-type: none"> <li>• Market research</li> <li>• Producer organizations</li> <li>• Contract farming</li> <li>• Online/internet marketing</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p>	<ul style="list-style-type: none"> <li>• Powerpoint presentation</li> <li>• Participants' handouts</li> </ul>
<b>13.7.7 Training review (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator leads the trainees in reviewing the module.</i></p> <p><b>Plenary presentation (10 minutes)</b></p> <p>Summarize the main points of the training</p>	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Summary of the main points from the module.</li> </ul>

## **13.8. Reference Material**

### **13.8.1. Participants' handouts**

- Sweetpotato Business and Marketing Factsheets
- Sweetpotato Production Manual

### **13.8.2. Further reading**

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 Sweetpotato Production in Ekiti State, Nigeria.
3. Tawedzegwa, M. (2012). Farming as a family business. Training manual. Zimbabwe agricultural competitiveness program.

# **MODULE 14. SWEETPOTATO CROSS-CUTTING ISSUES (AGRICULTURAL INNOVATION PLATFORMS, POLICY, GENDER MAINSTREAMING AND SOCIAL INCLUSION)**

## **14.1. Introduction**

This module on cross-cutting issues comprises of issues that influence the uptake and upscaling of TIMPs within the Sweetpotato Value Chain. The issues are namely Agricultural Innovation Platforms (AIPs), Gender mainstreaming and Agricultural policy.

The Agricultural Innovation Platform sub module addresses how to facilitate the coming together of relevant value chain stakeholders for interaction and development of innovations to address value chain challenges and opportunities. The gender mainstreaming sub module exposes participants on how to apply a gender lens within the Value Chain to ensure a level operational ground for all gender categories. Agricultural policy formulation creates awareness on policy formulation and the various rules and regulations that facilitate Value Chain development. The methodology of delivery for each of these sub modules are presented here below.

## **Sub-module 14.1. Agricultural Innovation Platforms**

### **14.1.1. Introduction**

This sub module exposes the participants to an agricultural innovation systems based configuration or organization of stakeholders called the Agricultural Innovation Platform (AIP). It is an organizational model for stimulating innovation and development and brings stakeholders 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. Adaptation into AIP process requires systems that foster partnerships and reflexive institutions which allow for learning and innovation. The stakeholders within agricultural innovation platforms include individuals, private companies and public sector organizations, policy makers and other Value Chain stakeholders. These actors are brought together to seek technical, institutional or organizational solutions to critical challenges hindering agricultural productivity within a Value Chain. AIP facilitates actors to interact, innovate, learn and change as they seek a solution to the common challenge. In an innovation platform every actor's contribution is valued and benefits accrue to all in a win-win situation. The AIP is a useful methodology for developing, testing and scaling of innovations in the Sweetpotato Value Chain.

### **14.1.2. Sub-Module Learning Outcomes**

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

1. The definition of agricultural innovation systems and innovations clearly described and 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 Core Team of Trainers (CTT) and the trained trainers. The facilitator 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

### 14.1.6 Module Summary

Sub-Module 14.1 Agricultural Innovation Platforms (AIP)			
Sessions	Training methods	Training materials	Time
14.1.6.1 Introduction, objectives and expectations	<ul style="list-style-type: none"> <li>• Personal introduction</li> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> </ul>	20 minutes
14.1.6.2 Definition of Agricultural innovation systems and different types of innovations (technical, institutional and organizational)	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> </ul>	30 minutes
14.1.6.3 Characteristics of an Agricultural Innovation Platform	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants' handouts</li> </ul>	30 minutes

14.1.6.4 Phases of an innovation platform (initiation, establishment, management and sustainability)	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Group exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Participants' handouts</li> <li>• Laptop</li> </ul>	45 minutes
14.1.6. 5 Case studies of successful Agricultural Innovation Platforms	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Role plays</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• PPT presentation</li> <li>• Participants' handouts</li> </ul>	15 minutes
14.1.6. 6 Benefits and challenges of Agricultural Innovation Platforms	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> <li>• Role plays</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• PPT presentation</li> <li>• Participants' handouts</li> </ul>	10 minutes
14.1.6.7 Module review	<ul style="list-style-type: none"> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> <li>• Fact sheets</li> </ul>	30 minutes
<b>Total</b>			<b>3 hours</b>

### 14.1.7 Facilitator's Guidelines

<b>Sub Module 14.1 Agricultural Innovation Platform (AIP)</b>	
<b>14.1.6.1. Introduction, levelling of expectations and objectives (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator welcomes trainees to the and thereafter invites them to introduce themselves and state their expectations)</i></p> <p><b>Module Objectives</b></p> <p>(The facilitator presents modules objectives and levels out expectations)</p> <p>By the end of the module, the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Define agricultural innovation systems, innovation process and innovations</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees' "expectations" and display.</li> <li>• PowerPoint Presentation</li> </ul>

<ul style="list-style-type: none"> <li>• Describe characteristics of an innovation platform</li> <li>• Explain how to initiate, establish, manage and sustain an agricultural Innovation Platform</li> <li>• Explain the benefits and challenges of AIP</li> </ul>	
<b>14.1.6.2 A definition of Agricultural innovation systems and different types of innovations (technical, institutional and organizational) (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation and discussion (30 minutes)</b></p> <ul style="list-style-type: none"> <li>• Past progression of research and extension models and their shortcomings</li> <li>• Agricultural innovation systems model and actualization through Agricultural Innovation Platforms</li> <li>• Definition of innovation process</li> <li>• Types of innovations (products of innovation process)</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint Presentation</li> <li>• Plenary discussion</li> </ul>
<b>14.1.6.3. Characteristics of an Agricultural Innovation Platform (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator should present an overview of innovation platforms and their main characteristics)</i></p> <p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Characteristics of Agricultural Innovation Platforms</li> <li>• Why Agricultural Innovation Platforms are used</li> <li>• Where to form Agricultural Innovation Platforms</li> <li>• Establishment of linkages between value chain actors in agricultural innovation platforms</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>
<b>14.1.6.4 Phases of an innovation platform initiation, establishment, management and Sustenance (45 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (30 minutes)</b></p> <p><b>Initiation phase</b></p> <ul style="list-style-type: none"> <li>• Mobilization of stakeholders in the sweetpotato value chain for challenge identification</li> <li>• General description of the value chain within a specific area</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Participants' handouts</li> <li>• Plenary discussion</li> </ul>

<p><b>Establishment phase</b></p> <ul style="list-style-type: none"> <li>• Clear prioritization of the key value chain challenge or compelling agenda in the (weakness in the chain)</li> <li>• Vision of the AIP formulated with clear goals</li> <li>• Development of a business plan with clear milestones to guide operations of the AIP</li> <li>• Formation of a main committee to coordinate platform activities.</li> <li>• Formation of diverse sub-committees with clear roles</li> </ul> <p><b>Management phase</b></p> <ul style="list-style-type: none"> <li>• Keeping stakeholders focused on the business plan to ensure an inclusive and transparent process.</li> <li>• Neutral facilitation to ensure joint strategy building and action and the coordination of support activities.</li> <li>• Managing emerging experts taking up leading roles and issues as champions.</li> </ul> <p><b>Sustainability and scaling phase</b></p> <ul style="list-style-type: none"> <li>• Changing roles of initiator, local stakeholders and Private sector</li> <li>• Local stakeholders lead and own AIP while initiator backstops and private sector supports and seize opportunity</li> <li>• Embarking on fresh issues or challenges</li> <li>• Maintaining capacity acquired to address new issues or challenges in subsequent cycles.</li> </ul> <p><b>Plenary discussion (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Let the trainees recall what they learned and discuss any issue that may arise.</li> </ul>	
<p><b>14.1.7.5 Case studies of successful AIPS (15 minutes)</b></p>	<p><b>Session guide</b></p>
<p><b>Plenary presentation and discussion</b></p> <ul style="list-style-type: none"> <li>• successful innovation platforms and their achievements</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> </ul>

<b>14.1.7.6 Benefits and challenges of AIPS (10 minutes)</b>	<b>Session guide</b>
<b>Plenary presentation</b> <ul style="list-style-type: none"> <li>• Benefits of Agricultural Innovation Platforms</li> <li>• Challenges of Agricultural Innovation Platforms</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> </ul>
<b>14.1.6.7. Module review (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <p>Summarize the main points of the training and together with the trainees and review the main points on:</p> <ul style="list-style-type: none"> <li>• Agricultural innovation systems, innovation process and different innovations</li> <li>• AIP characteristics, why and where to form them</li> <li>• The four Phases of innovation platforms</li> <li>• The benefits and challenges of innovation platforms</li> </ul> <p><i>(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?)</i></p>	<ul style="list-style-type: none"> <li>• Participants' handouts</li> <li>• Summarize the main points from the module on a flip chart and display</li> </ul>

## 14.8 Reference Material

### 14.8.1. Participants' Handouts

- Agricultural Innovation Platform Factsheet.
- Agricultural Innovation Platform Guides.

### 14.8.2. Further Reading

1. 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 Vol.2(6)
2. Makini F. W., Mose L.O., Kamau G. K, Salasya B., Mulinge W.W., Ongala J., Makelo M. N. and Fatunbi A. O. (2017). Innovation opportunities in Sweetpotato Production in Kenya. Forum for Agricultural Research in Africa (FARA).
3. Makini, F.W., Kamau, G., Makelo, M., Mose L.O., Salasya B., Mulinge, W. and Ongala J (2016) Status of Agricultural Innovation Platforms and Innovations Investment. ( 2015). *PARI Project country Report. Republic of Kenya*. Forum for Agricultural Research in Africa (FARA) Accra, Ghana
4. Makini F., Kamau G., Makelo M., Adekunle A., Mburathi G., (2013). Operational field guide for developing and managing local agricultural innovation platforms. KARI - ACIAR - AusAID, Nairobi, Kenya

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

### **14.2.1 Introduction.**

Sweetpotato production 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 huge women's contribution, 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 women, youth and VMGs access to 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. Sweetpotato 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 sweetpotato TIMPs is enhanced by field agricultural practitioners and extension officers as an effort geared towards achieving Climate Smart Agriculture "triple win" in target counties

### **14.2.2 Sub-Module learning outcomes**

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

1. The concept of gender mainstreaming and social inclusion in sweetpotato value chain understood and appreciated.
2. Youth empowerment in sweetpotato value chain explained and understood.
3. Women empowerment in sweetpotato value chain explained and understood.
4. Strategies for inclusion of vulnerable and marginalized groups in sweetpotato 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 Core Team of Trainers (CTT) and the trained trainers. 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

<b>Sub-Module 14.2 Gender mainstreaming and social inclusion in the Sweetpotato value chain</b>			
<b>Sessions</b>	<b>Training methods</b>	<b>Training materials</b>	<b>Duration</b>
14.2.6.1 Introduction, expectations and objectives	<ul style="list-style-type: none"><li>• Personal introductions</li><li>• Plenary presentation</li><li>• Plenary discussion</li></ul>	<ul style="list-style-type: none"><li>• Flips charts</li><li>• Felt pens</li><li>• Projector</li><li>• Laptop</li><li>• Participants' handouts</li></ul>	30 minutes
14.2.6.2 Gender mainstreaming in Sweetpotato value chain	<ul style="list-style-type: none"><li>• Plenary presentation</li><li>• Group exercise</li><li>• Plenary discussion</li></ul>	<ul style="list-style-type: none"><li>• Flips charts</li><li>• Felt pens</li><li>• Projector</li><li>• Laptop</li><li>• Participants handouts</li></ul>	30 minutes
14.2.6.3 Youth empowerment in Sweetpotato value chain	<ul style="list-style-type: none"><li>• Plenary presentation</li><li>• Group exercise</li><li>• Plenary discussion</li></ul>	<ul style="list-style-type: none"><li>• Flips charts</li><li>• Felt pens</li><li>• Projector</li><li>• Laptop</li><li>• Participants handouts</li></ul>	30 minutes

14.2.6.4 Women empowerment in Sweetpotato value chain	<ul style="list-style-type: none"> <li>• Plenary presentation s</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	30 minutes
14.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	30 minutes
14.2.6.6 Environmental and social management framework	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	30 minutes
14.2.6.7 Module review	<ul style="list-style-type: none"> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> </ul>	30 minutes
<b>Total</b>			<b>3 hours 30 minutes</b>

### 14.2.7 Facilitator’s Guidelines

<b>Sub Module 14.2: Gender mainstreaming and social inclusion in Sweetpotato value</b>	
<b>14.2.7.1 Introduction, objectives and expectations (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator welcomes trainees to the module and thereafter invites them to state their expectations)</i></p> <p><b>Module objectives (30 minutes)</b></p> <p><i>The facilitator presents modules objectives</i></p> <p>By the end of the module training, the trainee must be to: -</p> <ul style="list-style-type: none"> <li>• Understand gender mainstreaming and social inclusion, in the Sweetpotato value chain</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize trainees “expectations” and display.</li> <li>• PowerPoint presentation</li> <li>• Group exercise</li> </ul>

<ul style="list-style-type: none"> <li>• Understand youth empowerment in the Sweetpotato value chain</li> <li>• Appreciate women empowerment in the Sweetpotato value chain</li> <li>• Recognize strategies for inclusion of vulnerable and marginalized groups in the Sweetpotato value chain</li> <li>• Understand the environmental and social management framework (ESMF) tool</li> </ul>	
<b>14.2.7.2 Gender mainstreaming and social inclusion in Sweetpotato value chain (30 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator should present and explain what is gender mainstreaming, who does what activity, who has access to what resources among others. and why)..</i></p> <p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Definition of gender</li> <li>• What is gender mainstreaming and why it is important?</li> <li>• Who does what? (gender division of roles in Sweetpotato value chain)</li> <li>• Who owns what? (access and control of resources and benefits)</li> <li>• Who makes which decisions?</li> <li>• Existing policies in support of gender mainstreaming</li> </ul> <p><b>Group exercise and discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Group exercise</li> <li>• Plenary discussion</li> <li>• Participants' handouts</li> <li>• Group exercise</li> <li>• Plenary discussion</li> </ul>
<b>14.2.7.3 Youth empowerment in Sweetpotato value chains (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary Presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Why agriculture is not attractive to youth</li> <li>• Youth's role in the value chain</li> <li>• Strategies to empower youth in Sweetpotato value chain</li> </ul> <p><b>Group exercise and discussion (10 minute)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise.</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Group exercise</li> <li>• Plenary discussion</li> <li>• Participants' handouts</li> </ul>

<b>14.2.7.4 Women empowerment in Sweetpotato value chain (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Women’s role in the value chain</li> <li>• Challenges facing women in the value chain</li> <li>• Strategies for empowering women in the value chain</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants’ handouts</li> <li>• Plenary discussion</li> <li>• Participants’ handouts</li> </ul>
<b>14.2.7.5. Strategies for inclusion of vulnerable and marginalized groups in Sweetpotato value chain (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Who are vulnerable and marginalized groups (VMGs)</li> <li>• Why gender inequality exists</li> <li>• Social inclusion and why</li> <li>• Strategies of inclusion of VMG</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> <li>• Participants’ handouts</li> </ul>
<b>14.2.7.6. Environmental and social management framework (ESMF) (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Objective of ESMF in the Sweetpotato value chain</li> <li>• Environmental and social safeguards of Sweetpotato</li> <li>• Safeguard policies triggered by the project</li> </ul> <p><b>Plenary discussion (10 minutes)</b></p> <p>Let the trainees recall what they learned and discuss any issue that may arise</p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Plenary discussion</li> </ul>
<b>14.2.7.7. Module review (30 minutes)</b>	<b>Session guide</b>
<p><i>The facilitator leads the participants in reviewing the module)</i></p> <p>Summarize the main points of the training and together with the trainees review the main points:</p> <ul style="list-style-type: none"> <li>• What is gender mainstreaming and why it is important?</li> </ul>	<ul style="list-style-type: none"> <li>• Summarise the main points of the module on a flip chart and display</li> <li>• Plenary discussion</li> </ul>

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Youth empowerment in Sweetpotato value chain</li><li>• Women empowerment in Sweetpotato value chain</li><li>• Strategies for inclusion of vulnerable and marginalized groups in Sweetpotato value chain</li><li>• Environmental and Social Management Framework of Sweetpotato value chain activities</li></ul> |  |
|---|--|

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

## 14.2.8 Reference Materials

### 14.2.8.1. Participants' handouts

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

### 14.2.8.2. Further Reading

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**

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. However little has been done to formulate policies that support the sweetpotato. This offers an opportunity for policy formulation that support sweetpotato value chain.

This module exposes trainees 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 appreciated and explained.
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 understood and described.
5. Financing and investments for Climate-smart Agriculture understood and explained.
6. The need for a technology policy understood and outlined.

### **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) and trained trainers. 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	<ul style="list-style-type: none"> <li>• Personal introductions</li> <li>• Group discussion</li> <li>• Plenary discussions</li> <li>• Plenary presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> </ul>	20 minutes
14.3.6.2 Agricultural policy frameworks in Kenya	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Practical exercise</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> </ul>	30 minutes
14.3.6.3 Climate-smart agriculture practices, policy options and approaches	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Practical exercises</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	30 minutes
14.3.6.4 Climate-smart-sensitive policy cycle	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	30 minutes
14.3.6.5 Implementation of the climate-smart-sensitive policy at the county level	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Practical exercise</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	20 minutes

14.3.6.6 Financing and Investments for Climate-smart Agriculture	<ul style="list-style-type: none"> <li>• Presentations</li> <li>• Practical exercise</li> <li>• Plenary discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• Projector</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	30 minutes
14.3.6.7 Technology policy	<ul style="list-style-type: none"> <li>• Plenary presentation</li> <li>• Plenary discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Flips charts</li> <li>• Felt pens</li> <li>• PowerPoint</li> <li>• Laptop</li> <li>• Participants handouts</li> </ul>	20 minutes
14.3.6.8 Module review	Plenary discussion	<ul style="list-style-type: none"> <li>• Flip charts</li> <li>• Felt pens</li> </ul>	20 minutes
<b>Total</b>			<b>3 hours 20 minutes</b>

### 14.3.7 Facilitator’s Guidelines

<b>Sub-Module 14.3: Climate-Smart Agricultural policy options</b>	
<b>14.3.7.1 Introduction, expectations and outcomes (20 minutes)</b>	<b>Session guide</b>
<p><i>(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations).</i></p> <p><b>Trainees expectations (10 minutes)</b></p> <p><i>(The facilitator requests the participants to form groups and list their expectations)</i></p> <p><b>Module objectives (10 minutes)</b></p> <p><i>(The facilitator presents module learning objectives)</i></p> <p>By the end of this module the trainee should be able to:</p> <ul style="list-style-type: none"> <li>• Explain the role of agricultural policy frameworks in Kenya</li> <li>• Identify climate-smart agriculture practices, options and approaches</li> <li>• Recount the stages in climate-smart-sensitive policy cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Summarize participants’ expectations”</li> <li>• PowerPoint presentation</li> <li>• Distribute participants handouts</li> </ul>

<ul style="list-style-type: none"> <li>• Describe the phases in the implementation of the climate-smart-sensitive policy at the county level</li> <li>• Evaluate and select financing and investments options for Climate-smart Agriculture</li> <li>• Explain the need for technology policy</li> <li>• Describe the phases in the implementation of the climate-smart-sensitive policy at the county level</li> <li>• Evaluate and select financing and investments options for Climate-smart Agriculture</li> <li>• Explain the need for technology policy</li> </ul>	
<b>14.3.7.2 Agricultural policy frameworks in Kenya (30 minutes)</b>	
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• The role of agricultural policy frameworks in Kenya</li> </ul> <p><b>Practical exercise (10 minutes)</b></p> <p><i>(The facilitator requests the trainees to form groups and identify the gaps between agricultural policy frameworks and the existing agricultural policies).</i></p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants' handouts</li> <li>• Group exercise</li> </ul>
<b>14.3.7.3 Climate-smart agriculture practices, policy options and approaches (30 minutes)</b>	
<p><b>Plenary Presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Considerations for climate-smart production systems</li> <li>• Existing systems, practices and methods suitable for climate smart agriculture</li> <li>• Institutional and policy options</li> <li>• Ensuring farmer organizations for market access</li> <li>• Gendered approach</li> </ul> <p><b>Practical exercise and plenary discussions (15 minutes)</b></p> <p><i>(The facilitator requests the trainees to form groups and identify the existing climate-smart agriculture practices and the relevant policy options for implementation).</i></p>	<p><b>Session guide</b></p> <ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants' handouts</li> <li>• Group exercise</li> </ul>

<b>14.3.7.4 Climate-smart-sensitive policy cycle (30 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Stages in the climate-smart-sensitive policy cycle</li> </ul> <p><b>Plenary Discussions (15 minutes)</b></p> <ul style="list-style-type: none"> <li>• Climate-smart-sensitive policy cycle</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants' handouts</li> <li>• Plenary discussion</li> </ul>
<b>14.3.7.5 Implementation of the climate-smart-sensitive policy at the county level (20 minutes)</b>	<b>Session guide</b>
<p><b>Plenary presentation (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Phases in the implementation of the climate-smart-sensitive policy at the county level</li> </ul> <p><b>Practical exercise (10 minutes)</b></p> <p><i>(The facilitator requests the trainees to form groups and develop a programme showing steps, activities and stakeholders for the implementation of climate-smart policies).</i></p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants' handouts</li> <li>• Practical exercise</li> </ul>
<b>14.3.7.6 Policy financing and investments for Climate-smart Agriculture (30 minutes)</b>	<b>Session Guide</b>
<p><b>Plenary presentation (20 minutes)</b></p> <ul style="list-style-type: none"> <li>• Why financing is needed</li> <li>• Financing gaps</li> <li>• Sources of financing</li> <li>• Financing mechanisms</li> <li>• Connecting action to financing</li> <li>• Types of subsidies to farmers</li> </ul> <p><b>Group exercises (10 minutes)</b></p> <p><i>(The facilitator requests the trainees to form groups and identify potential sources of financing, financing mechanisms and connecting action to financing).</i></p>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants' handouts</li> <li>• Practical exercise</li> </ul>

14.3.7.7 Need of technology policy (20 minutes)	Session guide
<p><b>Plenary presentation (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• What is a technology policy?</li> <li>• Why do we need technology policy?</li> <li>• Is technology policy inconsistent with a market oriented economy?</li> <li>• Technology policy in Kenya</li> </ul> <p><b>Plenary discussions (10 minutes)</b></p> <ul style="list-style-type: none"> <li>• Technology policy</li> </ul>	<ul style="list-style-type: none"> <li>• PowerPoint presentation</li> <li>• Distribute participants' handouts</li> </ul>
14.3.7.8 Module review (20 minutes)	Session guide
<p><i>(The facilitator leads the trainees in reviewing the module)</i></p> <ul style="list-style-type: none"> <li>• Summarize the main points of the training and together with the trainees review the main points.</li> <li>• Trainees lists the main points leant during the training</li> <li>• Discuss with trainees new things learnt from this module</li> <li>• Ask the trainees what are some of the problems and issues that they have become more aware of in the module</li> </ul>	<ul style="list-style-type: none"> <li>• Q&amp; A session</li> <li>• Recap the main points</li> <li>• Test understanding</li> <li>• Participatory evaluation of the session</li> </ul>

### 14.3.8. Reference Material

#### 14.3.8.1. Participants' handouts

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

#### 14.3.8.2. Further reading

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 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.



### NATIONAL AGRICULTURAL AND RURAL INCLUSIVE GROWTH PROJECT SWEETPOTATO VALUE CHAIN TRAINING OF TRAINERS WORKSHOP

TRAINING VENUE:

DATE:

Time	Activity	Duration	Responsible
Day 0: Sunday	Travel to and arrival at the training venue	Whole day	
<b>Day 1: Monday</b>	<b>Chair:</b> <b>Rapporteur:</b>		
8.00 a.m-8.30 a.m	Registration	30 minutes	
	Opening prayer and introductions		
8.30 a.m-10.00a.m	<b>Official opening of the Sweetpotato Value Chain ToT workshop</b>	1 hour 30 minutes	
	Sweetpotato ToT Workshop objectives		
	Remarks from Director Crops Systems and welcoming Deputy Director General – crops		
	Remarks from Deputy Director General - crops and official opening		
	GROUP PHOTO		
10.00 a.m-10.30 a.m	Climate setting and class organization	30 minutes	
<b>10.30 a.m-11.00 a.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
11.00 a.m– 12.00 noon.	Farmer Field and Business School (FFBS) approach in Sweetpotato production	1 hour	
12.00 noon –1.00 p.m	Climate Change and Climate Smart Agriculture in Sweetpotato value chain	3 hours	

<b>Time</b>	<b>Activity</b>	<b>Duration</b>	<b>Responsible</b>
<b>1.00 p.m- 2 .00 p.m</b>	<b>LUNCH BREAK</b>	<b>1hour</b>	
2.00 p.m – 4. p.m	Sweetpotato variety selection	2 hours	
<b>4.00 p.m – 4.30 p.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
<i>Close of Day 1</i>			
<b>Day 2: Tuesday</b>	<b>Chair:</b>	<b>Period</b>	
	<b>Rapporteur:</b>		
8.00 a.m – 8.30 a.m	Prayer and registration Recap of day1 activities	30 minutes	
8.30 a.m – 10.30 a.m	Sweetpotato production niches and Climatic requirements	2 hours	
<b>10.30 a.m-11.00 a.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
11.00 a.m–1.00 p.m	Sweetpotato climate smart agromonic practices	2 hours	
<b>1.00 p.m-2.00 p.m</b>	<b>LUNCH BREAK</b>	<b>1hour</b>	
2.00 p.m– 4.00 p.m	Sweetpotato seed systems	2 hours	
<b>4.00 p.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
<i>Close of day 2</i>			
<b>Day 3 Wednesday</b>	<b>Chair:</b>	<b>Period</b>	
	<b>Rapporteur:</b>		
8.00 a.m – 8.30 a.m	Registration, prayer and recap of day 2 activities	30 minutes	
8.30 a.m–10.30 a.m	Sweetpotato crop health (pests, diseases and weeds).	2 hours	
<b>10.30 a.m-11.00 a.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
11.00 a.m–12.00 noon	Integrated soil and water management practices for Sweetpotato production (part I)	2 hours	
<b>1.00 p.m-2.00 p.m</b>	<b>LUNCH BREAK</b>	<b>1 hour</b>	
2.00 p.m–4.00 p.m	Integrated soil and water management practices for Sweetpotato production (part II)	2 hours	
<b>4.00 p.m – 4.30 p.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
<i>Close of day 3</i>			
<b>Day 4 Thursday</b>	<b>Chair:</b>	<b>Period</b>	
	<b>Rapporteur:</b>		
8.00 a.m – 8.30 a.m	Registration, prayer and recap of day 3 activities	30 minutes	
8.30 a.m – 10.30 a.m	Mechanization of Sweetpotato production	2 hours	
<b>10.30 a.m-11.00 a.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	

<b>Time</b>	<b>Activity</b>	<b>Duration</b>	<b>Responsible</b>
11.00 a.m – 1.00 p.m	Sweetpotato harvesting and post-harvest management	2 hours	
<b>1.00 p.m-2.00 p.m</b>	<b>LUNCH BREAK</b>	1 hour	
2.00 p.m–4.00 p.m		2 hours	
<b>4.00 p.m – 4.30 pm</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
<i>Close of day 4</i>			
<b>Day 5: Friday</b>	<b>Chair:</b>	<b>Period</b>	
	<b>Rapporteur:</b>		
8.00 a.m– 11.00 a.m	Registration, prayer and travel to a Sweetpotato farm	3 hours	
<b>11.00 a.m-11.30 a.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
11.30 a.m–1.30 p.m	Field excursion: in a Sweetpotato farm	2 hours	
<b>1.00 p.m-2.00 p.m</b>	<b>LUNCH BREAK</b>	1 hour	
2.00 p.m-5.00 p.m	Travel back to training venue	3 hours	
<b>5.00 p.m – 5.30 pm</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
<i>Close of day 5</i>			
<b>Day 6 Saturday</b>	<b>Chair:</b>	<b>Period</b>	
	<b>Rapporteur:</b>		
8.00 a.m – 8.30 a.m	Registration, prayer and recap of day 4 &5 activities	30 minutes	
8.30 a.m–10.30 a.m	Food Safety Management System (HACCP) and Good Agricultural Practices (GAP) in Sweetpotato value chain.	2 hours	
<b>10.30 a.m-11.00 a.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
11.30 a.m – 1.30 p.m	Sweetpotato value addition part I: (Theory on the importance of value addition, value added products and their nutritional benefits)	2 hours	
<b>1.30 p.m-2.15 p.m</b>	<b>LUNCH BREAK</b>	1 hour	
2.15 p.m – 4.15 p.m	Sweetpotato value addition part II: (demonstration of recipes for various value-added products of Sweetpotato).	2 hours	
<b>4.15 pm – 4.45 p.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
<i>Close of day 6</i>			
<b>Day 7: Sunday</b>	<b>Chair:</b>	<b>Period</b>	
	<b>Rapporteur:</b>		
8.00 a.m – 8.30 a.m	Registration, prayer and recap of day 6 activities	30 minutes	
8.30 a.m - 10.30 a.m	Sweetpotato business and marketing	2 hours	
<b>10.30 a.m-11.00 a.m</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	

<b>Time</b>	<b>Activity</b>	<b>Duration</b>	<b>Responsible</b>
11.00 a.m– 1.00 p.m	Agricultural Innovation Platforms (AIPs)	2 hours	
<b>1.00 p.m-2.00 p.m</b>	<b>LUNCH BREAK</b>		
2.00 p.m-4.00 p.m	Agricultural policy	2 hours	
<b>4.00 p.m – 4.30 pm</b>	<b>HEALTH BREAK</b>	<b>30 minutes</b>	
<i>Close of Day 7</i>			
	<b>Chair:</b>	<b>Period</b>	
<b>Day 8: Monday</b>	<b>Rapporteur:</b>		
8.00 a.m – 8.30 a.m	Registration, prayer and recap of day 7 activities	30 minutes	
8.30 a.m-9.30 a.m	Agricultural policy	1 hour	
9.30 a.m– 11.00 a.m	<ul style="list-style-type: none"> <li>Gender mainstreaming and social inclusion in Sweetpotato value chain</li> </ul>	1 hour 30 minutes	
<b>11.00 a.m -11.30 a.m</b>	<b>HEALTH BREAK</b>		
11.30 a.m– 1.30 p.m	<ul style="list-style-type: none"> <li>Gender mainstreaming and social inclusion in Sweetpotato value chain</li> </ul>	2 hours	
<b>1.30 pm – 2.30 pm</b>	<b>LUNCH BREAK</b>	1 hour	
2.30 p.m– 3.00 p.m	<ul style="list-style-type: none"> <li>Course evaluation</li> </ul>	30 minutes	
3.00 p.m – 3.30 p.m	Presentations of county action plans	30 minutes	
3.30 p.m-4.00 p.m	<ul style="list-style-type: none"> <li>Way forward</li> </ul>	30 minutes	
4.00 p.m-5.00 p.m	<p><b>Official Closing of ToT Workshop</b></p> <ul style="list-style-type: none"> <li>Remarks by the group leader (Governor)</li> <li>Remarks by the CPC</li> <li>Remarks by KCSAP crops coordinator- Ms. Violet Kirigua</li> <li>Remarks by KCSAP NPCU -Dr. Charles Lungaho</li> <li>Issuance of certificates –Dr. Lusike Wasilwa</li> <li>Official closing address by the Director crops- Dr. Lusike Wasilwa</li> <li>Closing prayer</li> </ul>	1 hour	<b>Chair:</b>

<b>Time</b>	<b>Activity</b>	<b>Duration</b>	<b>Responsible</b>
<b>Day 9 Tuesday</b>	Departure		
<b>8.00 a.m</b>	Registration, prayer and departure		

## ANNEX 2: GENERAL REFERENCE MATERIALS

	<b>Category / Modules</b>	<b>Publication title</b>	<b>Reference types</b>	<b>No of pages</b>	<b>Farmer category</b>  A= new entrant/ Sweetpotato elite farmer  B= elite Sweetpotato farmer
1	Climate change and climate smart agriculture	Sweetpotato factsheets			<b>AB</b>
2	Farmer Field Business School (FFBS) approach	Khisa Godrick: (2004) Farmer Field School Methodology: Training of Trainers Manual.	Field booklet	42	<b>AB</b>
		Sustainet East Africa; (2010) Farmer Field School: A Technical Manual	Field booklet	41	<b>AB</b>
3	Good Agricultural Practices (GAP) and Food Safety Management System (FSMS) - Hazard Analysis Critical Control Points (HACCP) Plan	Hazard Analysis Critical Control Point Principles and Application Guidelines”, Adopted August 14, 1997.  Criteria for Foods).	Book	120	<b>AB</b>
4	Sweetpotato production niche and climatic requirements	Factsheets on Sweetpotato Production niche and climatic requirements	Factsheet		<b>AB</b>
5	Sweetpotato variety selection	Sweetpotato variety factsheets	Factsheets		<b>AB</b>
6	Sweetpotato seed systems	Sweetpotato seed system fact sheets	Factsheets		<b>AB</b>

7	Sweetpotato climate smart agronomic practices	Root and Tubers handbook (A guide for farmers and extension officer)	Manual		<b>AB</b>	
8	Integrated soil and water management practices for Sweetpotato production	Isaya V. Sijali, 2001. Drip Irrigation: Options for smallholder farmers in eastern and southern Africa. Technical Handbook No. 24. Published by SIDA's Regional Land Management Unit, Nairobi. FAO, 2014.	Manual	35	<b>AB</b>	
		Irrigation Techniques for Small-scale Farmers: Key Practices for DRR Implementers. Rome: Food and Agriculture Organization of the United Nations  United Nations (FAO). <a href="http://www.fao.org/3/a-i3765e.pdf">http://www.fao.org/3/a-i3765e.pdf</a>	Manual		<b>AB</b>	
9	Sweetpotato crop health	Satyagopal, K., S.N. Sushil, P. Jeyakumar, G. Shankar, O.P. Sharma, S.K. Sain, D.R. Boina, D. Chattopadhyay, B.S. Sunanda, Ram Asre, K.S. Kapoor, Sanjay Arya, Subhash Kumar, C.S. Patni, Dhanapal, A.N. Sabalpara, S.K. Beura, R.K. Mesta, Biju, B.G. Naik, J. Halder, S. Saha. 2014. AESA based IPM package for Sweetpotato. pp 40.	Manual	56	<b>AB</b>	
		A PRACTICAL GUIDE TO IDENTIFICATION AND CONTROL SWEETPOTATO DISEASES (2014). TROPICA SEEDS PVT LTD   No 54, South End Road, 1st Floor, Nama Aurore Building, Basavangudi, Bangalore 560004 INDIA.				
		Weed management manual (KALRO Kabete)	Manual		43	<b>AB</b>
		Weed identification manual (KALRO Kabete)				
		K.S. Kapoor, Sanjay Arya, Subhash Kumar, C.S. Patni, Dhanapal, A.N. Sabalpara, S.K. Beura, R.K. Mesta, Biju, B.G. Naik, J. Halder, S. Saha. 2014. AESA based IPM package for Sweetpotato. pp 40.		10	<b>AB</b>	
				10	<b>AB</b>	

10	Sweetpotato harvesting and post- harvest management	Sweetpotato harvest and postharvest factsheets	Factsheets		<b>AB</b>
11	Sweetpotato value addition	Sweetpotato value addition factsheets			<b>AB</b>
12	Mechanization of Sweetpotato production activities	Sweetpotato mechanization factsheets	Factsheets		<b>AB</b>
13	Sweetpotato business and marketing	Sweetpotato business and marketing factsheets	Factsheets		<b>AB</b>
14	<b>Sweetpotato cross cutting issues</b>				
	(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. Kamau et al. 2017. Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya.	Research paper	17 page article	<b>B</b>
	(ii) Gender mainstreaming and social inclusion	Gender mainstreaming in agriculture and rural development: a reference manual for governments and other stakeholders 2001 pp.46 pp. ref.36	Book	46	<b>AB</b>
	(iii) Policy	Republic of Kenya (2007). Kenya Vision 2030 Republic of Kenya (2017). Kenya climate smart agriculture strategy 2017 – 2026 Republic of Kenya (2017). Agricultural sector transformation and growth strategy 2019 – 2029 Republic of Kenya (2004). Strategy for revitalizing agriculture	Policy document	25 pages	<b>AB</b>

## ANNEX 3: FFBS LEARNING MATERIALS

### PARTICIPATORY TECHNOLOGY DEVELOPMENT (PTD) AND CURRICULUM ON SWEETPOTATO CROP SPACING MANAGEMENT:

<b>Value Chain</b>	Sweetpotato
<b>Learning enterprise</b>	Sweetpotato
<b>Funded enterprise</b>	Sweetpotato VC at production level
<b>Background problem</b>	Low Sweetpotato production due to poor spacing
<b>Objective</b>	To increase production through improved spacing management strategies

#### Factors to consider:

- Land topography
- Runs (blocks should face East to West)
- Certified seeds of preferred Sweetpotato variety

#### Setting the P.T.D blocks:

- Plots to be laid (10 x10) M, arranged three in a row with a footpath of 1M apart.
- Improved Sweetpotato varieties
- The blocks must be right angled.
- The recommended spacing and farmers' practice
- 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 crop
- Leaf girth and length
- Crop height
- No of Sweetpotato fruits per square metre
- Yield /unit area

## Setting of blocks

Plot 1 Spacing at 100 cm x 60 c		Plot 2 Farmer practice		Plot 3 Spacing 100 cm x 30cm
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## AGRO ECOSYSTEMS ANALYSIS (AESA) ON SWEETPOTATO

AESA NO .....

### General information

Variety .....

Fertilizer .....

Planting date.....

Weather: .....

Time of observation: .....

Diagram of pests and natural enemies observed:.....

Number of leaves/plant.....

Leaves per/plant .....

### Agronomic data

Average leaf length.....

Average plant height.....

Average leaf girth.....

Yield in kg per plot.....

Natural enemies	Insects observed
1	1.
2.	2
3.	3
4.	4.
Observations	Recommendations
Weeds	Weeding after 2 weeks
Holes on leaves	Pest and disease scouting
Yellow leaves	Pest/disease control
	Foliar feed application

## AGRO ECOSYSTEMS ANALYSIS (AESA) ON SWEETPOTATO.

AESA NO .....

### General information

Variety .....

Fertilizer .....

Planting date.....

### Agronomic data

Average leaf length.....

Average vine length.....

Average leaf width.....

Number of leaves/plant.....

Weight of tubers per plant.....

Yield in kg per plot.....

Weather: .....

Time of observation: .....

Diagram of crop of enemies and insects observed

### Natural Enemies

1.

2.

3.

### Insects observed

1.

2.

3.

### Observation

1. Weeds

2. Holes on the leaves

3. Yellow leaves

### Recommendation

Weeding after 2 weeks

Keep monitoring and control pests

Add foliar feeds or control disease





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