Climate Smart Agricultural Technologies, Innovations and Management Practices for Indigenous Vegetables Value Chain

TRAINING OF TRAINERS' MANUAL

Compiled by: Ndinya C., Omari F., Wayua F., Odendo M., Ngaire S., Muriuki J.N.S., Wandera W., Okoko N, Ndubi J. Nyaga A., Nasirembe W. and Ndung'u J.

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Compiling Authors: Ndinya C., Omari F., Wayua F., Odendo M., Ngaire S., Muriuki J.N.S., Wandera W., Okoko N, Ndubi J. Nyaga A., Nasirembe W. and Ndung'u J.

Editors: Ouda J. O., Mukundi K., Nyabundi K.W., Maina P., Ayemba J., Odendo M., Odhiambo H. and Gatambia E.

Design and layout: Nyaola E. and Mnene N.

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

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LIST OF ABBREVIATIONS

AEZ	Agro-Ecological Zone
AIP	Agricultural Innovation Platform
AIV	African Indigenous Vegetables Technologies
ASALs	Arid and Semi-Arid Lands
B	Boron
CA	Conservation Agriculture
Ca	Calcium
CAN	Calcium Ammonium Nitrate
CCP	Critical Control Points
CCT	County Coordinating Teams
CIG	Common Interest Groups
Cl	Chlorine
COPMAS	Community Production and Marketing System
CTT	Core Team of Trainers
CSA	Climate Smart Agriculture
Cu	Copper
DAP	Di Ammonium Nitrate
EMSF	Environmental Social Management Framework
ET	Evapotranspiration
Fe	Iron
FSMS	food safety management system
GAP	Good Agronomic Practices
GoK	Government of Kenya
HACCP	hazard analysis critical control points
INRM	integrated natural resource management
IDM	Integrated Disease Management
IPM	Integrated Pest Management
IWM	Integrated Weed Management
ISFM	integrated soil fertility management
K	Potassium
KALRO	Kenya Agricultural and Livestock Research Organization
KARI	Kenya Agricultural Research Institute
KCSAP	Kenya Climate Smart Agriculture Project
KEPHIS	Kenya Plant Health Inspectorate Services
KES	Kenya Shilling
Kg	Kilogram
LF	Lead Farmers
Mg	Magnesium
Mo	Molybdenum
N	Nitrogen
NARS	national agricultural research systems
NPK	Nitrogen Phosphorus Potassium
P	Phosphorus
PTD	Participatory Technology Development

S	Sulphur
TIMPs	Technology Innovation and Management Practices
TOTs	Training of Trainers
VMG	vulnerable and marginalized group
Zn	Zinc
4R	Right nutrient, Right source, Right placement, and Right timing.

FOREWORD

Kenya Climate-Smart Agriculture Project (KCSAP) tasked the Kenya Agricultural and Livestock Research Organization (KALRO) with the implementation of the project's Component 2 on 'Strengthening Climate-Smart Agricultural Research and Seed Systems'. The component activities are geared towards the development, validation, adoption and delivery of context specific climate smart agriculture (CSA) technologies, innovation and management practices (TIMPS). The other responsibility is development of sustainable seed production and distribution systems for priority value chains to enhance availability and access to improved seeds, animal breeds and fingerlings by target beneficiaries. This will be supported under Component 1 namely 'Up scaling Climate-Smart Agricultural Practices'. Against this background, KALRO and her NARS partners have developed, validated and availed CSA TIMPS for dissemination and adoption. The TIMPS have further been unpacked during the development of Training of Trainers (ToT) Manuals for use in training public and private extension service providers and lead farmers. The ToT Manuals are instructional guides to be used for teaching and learning step-by-step procedures of implementing CSA innovations for each of the 13 value chains being addressed. The training content is drawn from the CSA TIMPS that support respective value chains. The contents 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 teased out of the value chains and the project objectives. The ToT Manuals training design takes into consideration the delivery system, the partners and their roles, the duration of training and logical flow of the sessions. Similar content requiring similar delivery systems are grouped together while the roles of the partners are tapped in the training and planning of the training sessions. The Manual is divided into modules, which have a uniform outline that ensures every aspect of the TIMPs are fully covered in way that the trainees can absorb and relate to. Various delivery methods are deployed and where possible demonstrations and practical work are incorporated to enable the trainees learn by participating in the actual field activities. Furthermore, to ensure that the training across various groups is standardized, trainers' guidelines, detailed descriptions of the trainees, program, training methods and a training evaluation have been provided in the manual. Adhering to these guidelines, therefore, enables possibility to replicate the training in several locations without loss of details regardless of whether conducted by different trainers. It is highly advised that the ToT Manuals should be used in conjunction with the respective value chains' TIMPs documents and facts sheets in order to provide valuable resource for both public and private extension service providers. The use of this Manual is expected to enable achievement of the envisaged 'Triple Wins' of increased productivity, enhanced resilience and reduction of greenhouse gases emissions.

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

Eliud K Kireger, PhD, OGW

Director General, KALRO

PREFACE

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

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

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

KALRO having the mandate of implementing the activities under Component 2 has been instrumental in using its information resources and those of partners and collaborators to come up with the inventories of TIMPs and corresponding ToT Manuals. The use of these information resources coupled with the accompanying training and the contribution of the

other project components, will go a long way in enabling the KCSAP to meet its development objective.

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

Francis Muthami
National Project Coordinator
Kenya Climate-Smart Agriculture Project

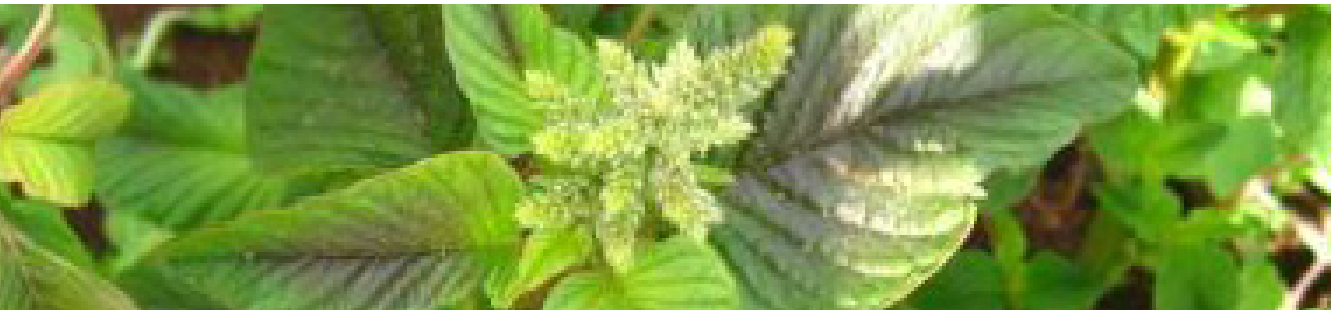
INTRODUCTION

About this manual

This training of Trainers' Manual consists of two parts; namely Part I and Part II. Part I comprises notes for the facilitators while Part II is made up of the training modules in the value chain.

PART I

This part consists of four sections including the Background of the African Indigenous Vegetables (AIVs) value chains, Content of the Training, Training Design and Facilitators Guidelines.



SECTION 1: BACKGROUND

1.1 The Role of AIVs Value Chain in the Kenyan Economy

African Indigenous Vegetables (AIVs) are increasingly recognized as essential for household food security by adding variety to cereal-based staple diets. They also provide a promising economic opportunity for reducing rural poverty in Kenya and in many other countries in sub-Saharan Africa, especially for women. The AIVs are those vegetables whose natural habitat originated in Africa and have been integrated into cultures through natural or selective processes. Leaves, fruit, roots, stem, bark, and seed from AIVs have been utilized for nutrition and medicinal purposes in Africa.

The priority species include African nightshades *(Solanum scabrum)*, leafy amaranth *(Amaranthus* spp.*)*, spider plant *(Cleome gynandra),* cowpeas *(Vigna unguiculata)*, Ethiopian kale (*Brassica carinata*), *mitoo (Crotalaria ochroleuca* and *C. brevidens)*, *kahuhura (Cucurbita ficifolia),* jute plant *(Corchorus olitorius)* and pumpkin leaves (*Cucurbita maxima and C. moschata)*. Despite their advantages, indigenous fruits and vegetables have not been fully exploited in Africa. The introduction of exotic fruits and vegetables on the continent had a negative impact on the consumption, domestication and cultivation of indigenous fruits and vegetables. For a long time, agricultural policies in many countries advocated the use of exotic species at the expense of indigenous ones. Recently, indigenous fruits and vegetables have won some recognition through crop research at international, regional and national institutions. Thus, AIVs have increasingly become important commercially in Kenya where they have increasingly featured in both formal and informal markets in Nairobi and its neighbouring areas and other urban areas. Since the year 2005, AIVs have become a common occurrence in most supermarkets, where they are sold in increasing quantities.

1.2 The Role of AIVs in Food and Nutrition Security

Climate change is expected to have a significant impact on food security in Kenya. While tropical vegetables require very specific water and temperature ranges, there is still little evidence of climate change having an impact on indigenous vegetable production. Besides, their diversity in household diets ensures that essential micronutrients are acquired, in addition to curing and shielding humans against chronic diseases, especially heart diseases, cancers, and diabetes and supply of needed micronutrients, especially calcium, iron, iodine, vitamin A and "hidden hunger". The concept of hidden hunger has become the "buzz word" in the development arena. Hidden hunger is the lack of the appropriate balance of macro- (calories) and micronutrients (vitamins and minerals such as vitamin A, iron, zinc, and iodine).

To lessen the burden of hidden hunger, overweight and obesity, nutrition security has become embedded in food security agendas and the importance of dietary diversity for good health has moved to the forefront of nutritional interventions. Recognizing the important nutritional benefits of fruits and vegetables, the World Health Organization (WHO) recommends a minimum intake of 400 grams per capita per day. However, consumers are believed to be missing this target. Thus filling this dietary gap could be derived from the nutritive power of vegetables. Increased production and consumption of AIVs could directly contribute to

achievement of Kenya government's development agenda, the "Big 4" (2018-2022) on food and nutrition security, which is one of the four pillars of the agenda.

1.3 AIVs as a Climate Smart Innovation

African indigenous vegetables have the potential to improve food security in the face of climate change, for several reasons. They are mainly produced by resource-poor smallholders, are nutrient-denser than exotic vegetables, have various health benefits, contribute to identity and authenticity, and offer a range of agronomic advantages.

Many AIV species tolerate a wide spectrum of climate variability, are well-adapted to harsh climatic conditions and disease infestation and are easier to grow than to their exotic counterparts. This is particularly true for the rainy season, while in the dry season, some AIVs are more affected by the consequences of climate variability, as some AIVs are more prone to pests and diseases and water stress, particularly the marketable nightshade and spiderplant species. Generally, AIVs have a short growth period, with most being ready for harvesting within 3-4 weeks. Furthermore, because most of them have not been intensively selected, they have a wide genetic base.

1.4 Objectives of the Training

The purpose of this training is to enhance the capacity of farmer trainers to provide and promote knowledge and skills to farmers for increased productivity of AIVs through adoption of appropriate climate smart agricultural practices. Specifically, the objectives of this training are:

a) Provision of new and relevant knowledge, technologies and skills for AIVs production.
b) Refreshing knowledge and skills on good agricultural practices (GAP) for AIVs production including climate adaptations, variety selection, soil nutrient management, soil water conservation techniques, control of diseases and pests, post-harvest handling, value addition, mechanization, agribusiness, marketing and cross cutting issues (gender mainstreaming and social inclusion, innovation platforms, and policy).
c) Imparting knowledge and skills in participatory techniques for effective facilitation of adult learning processes and developing inclusive stakeholder partnership for sustainable up scaling of AIVs technologies.

After the training, the Trainer of Trainers (ToTs) as facilitators will train farmers in relevant aspects of AIVs value chains. This training will involve providing the ToTs with techniques in participatory preparation, mobilization, planning, implementation, monitoring and evaluation of training sessions.

The ToTs shall thereafter up-scale the adoption of GAP through farmer groups in their villages and those in the neighbourhood.

SECTION 2: TRAINING CONTENT

2.1 Orientation of the Modules

The training content is organized into 14 modules that are targeted and orientated to ensure the technology and innovation management practices (TIMPS) are adopted to improve productivity through improved AIVs value chains competitiveness in a market driven production. The purpose of these modules is to enhance the knowledge and capacities of trainers in understanding and disseminating the climate-smart AIVs practices to the intended beneficiaries, who are primarily the farmers.

2.2 Modules Outline

Each of the 14 modules consist of the following 8 parts:

- Introduction to the module – context and background to training needs as well as knowledge and skills gaps being addressed.
- Module learning outcomes – what trainees are expected to learn
- Module target group - trainee categories.
- Module users - facilitators, master trainers
- Module duration - minimum number of hours of training and exposure to materials
- Module summary - sequence of sessions, training methods, materials and duration
- Facilitators' guidelines - detailed sessions, training methods, materials and session guides
- Participants' handouts - detailed notes and reference materials for trainees.

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

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

No.	Module Name	Need addressed	Expected training outcomes	Time
1.	Climate change and climate smart agriculture	Improve resilience of AIV small scale farmers to climate change Adoption of climate smart technologies for AIVs value chain	The potential impact of climate change on AIVs production understood Climate smart techniques for AIVs demonstrated	4 hours
2	Farmer Field Business School approach	Improve farmer knowledge and skills in production for business and product marketing	Business and marketing skills understood	4 hours
3	GAPS and food safety	Meet food safety standards requirements	Knowledge and skills in food safety standards and requirements acquired	4 hours

4.	AIV production niche and climate requirements	Optimise crop productivity of AIVs	Suitable AIV growing environments identified.	4 hours
5.	AIV variety selection	Optimise AIVs productivity potential	Production potential of AIV varieties appreciated	4 hours
6.	AIVs seed systems	Timely availability of appropriate planting material	Formal and informal seed supply systems identified	4 hours
7.	AIV climate smart agronomic practices	Enhanced adoption of climate smart agronomic practices	Knowledge and skills on climate smart agronomic practices enhanced	5 hours
8.	Integrated soil fertility and water management practices for AIV	Enhanced adoption of soil fertility and water management practices	Knowledge and skills on soil fertility and water management practices enhanced	5 hours
9.	AIV crop health	Good crop health management practices	Good crop health management practices demonstrated	3 hours
10	AIV harvesting and post-harvest management	Reduce harvest and post-harvest losses	Causes of harvest and post-harvest losses articulated.	6 hours 30 minutes
11	AIV value addition	Improved value of AIV products	Value creation and AIV value added products identified Opportunities identified and prioritized	4 hours
12.	Mechanization of AIV activities	Improved production efficiency	Mechanization options of for improved production efficiency identified	4 hours
13.	AIV business and marketing assessment	Improved knowledge and skills in AIV business and marketing	Knowledge and skills in AIV business and marketing enhanced	12 hours
14	AIV cross cutting issues Innovation platforms Gender mainstreaming and social inclusion, Policy	Improve understanding of environment and stakeholder concerns	Gender and VMG awareness in AIV production improved Opportunities for gender and VMGs identified	6 hours
Total duration				**74 hours 30 minutes**

SECTION 3: TRAINING DESIGN

3.1 Delivery System

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

1. Establishment of a team of facilitators
   a) A Core Team of Trainers (CTT) trains trainers (service providers, public and private extension agents and lead farmers) as trainers of a ToT course. This is done using this manual and modules contained therein.
   b) Each of the Master trainers will facilitate farmers to acquire knowledge and skills in facilitating Farmer-led Field and Business Schools through practical demonstrations.
2. Up-scaling

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

3.2 Partners and their roles

The partners envisioned in this training plan are:

1. **Core Team of Trainers** – Master Trainers drawn from KALRO and State Department of Agriculture to facilitate initial training of Farmers Trainers in a ToTs course. They are also to provide mentorship to master trainers during the first year of their farmer trainings. They should also be available in the evaluations and trainings.
2. **County Government Department of Agriculture** –Master trainers and their supervisors referred to as County Coordination Teams (CCT) who will take the role of trainers, mentors and coordinators at sub county level. They will assist FFBS's form partnership with stakeholders for sustainability. They should also participate in formation of information platforms and support lead farmers (LFs) form their network.
3. **Private Sector Service Providers** – inputs suppliers, financial and business development service providers, market players and processors to partner and support promotion of AIVs.

3.3. Training duration

The TOT course for Master Trainers for the 14 modules in the AIVs value chain shall take a total of six days of training period. Programs and timetables will be developed and will cater for this.

3.4 Logic Design and flow of sessions

The logic of design and flow of each module is that the facilitator, paying attention to the proposed methods and sessions guidelines, shall: (1) Introduce the module; (2) Draw out the participants' expectations; (3) Relate participants' expectations with module objectives or learning outcomes; (4) 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; (5) Review the module at the end using participatory approaches where one participant reads one summary message and its application and (6) 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. In addition:

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

4.2. Preparation of training venues and sites

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

1. **Training Room** – should have adequate space for 30 participants.
2. **Demonstration Site** – ideally should be a 5-minute walking distance with at least 5 distinct plots for demonstration.

4.3. The Trainees

The trainees are agriculture extension officers with elaborate training background in agriculture and extension. The facilitator should not lecture but draw out and build on their knowledge, skills and experience that they shall bring in. As a golden rule, do not lecture them but facilitate, listen and let them feel like equals to each other and the CTT team members.

4.4. Training Program

The facilitator will require a program that 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 present a list of available training methods.

Table 2: Description of Training Methods

Training Method	Description of Method
Plenary presentations	Use of power point or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Group exercises, buzz groups, visits and demonstrations	To be considered where skills are an issue requiring sharing and trying
Case studies	To be used where there is need to view a problem objectively and allow free exchange of ideas
Role plays and problem-solving exercises	Plenary discussions have been considered as training methods where attitude is an issue
On-farm practical demonstration	To be considered where hands-on practical skills are acquired through sharing and demonstration

4.6 Planning Schedules and Guidelines for ToT Preparation

While planning for this training, the CTT leader should ensure that the activities in Table 3 are done before the training.

Table 3: Duration of activities to be done before Training

Duration to training	Activities to be done
Three months	At least 8 AIVs demonstration plots planted (staggered).
Six weeks	Recruit Master Trainers, compose CTT.
Four weeks	Send out invitation letters to participants and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members
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
Four days	Confirm training sites preparedness, prepare sitting arrangements and stationery, and brief assistants
One day	Arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at residence proposed
On first day	Arrange for reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes: • Registration • Welcoming to venue by host • Elaborate introduction of CTT and participants • Introduction to the project and training course • Ground rules • Groups formation

4.7. Evaluation of the Training

Half day has been allocated for planning for way forward and evaluation of the TOT on the last day of the training. This is as presented in the program in Section 4.4 (Annex 1).The evaluation strategy should take two directions with the first being the individual trainees filling evaluation forms (table 4) without conferring or referring to each other. The evaluation forms are then collected and analysed by the CTT members.

Table 4: Individual Sample Evaluation Form

	Aspect / Module	**Rating**		
		Very useful (3 marks)	**Useful (2 marks)**	**Of limited use (1 mark)**
1	Climate change and climate smart agriculture			
2	Farmer Field Business school (FFBS) approach			
3	Good Agricultural Practices (GAP) and Food Safety Management System (FSMS)			
4	AIVs production niche and climate requirements			
5	AIVs variety selection			
6	AIVs seed systems			
7	AIVs climate smart agronomic practices			
8	Integrated soil and water management practices for AIVs			
9	AIVs Crop Health			
10	AIVs harvesting and Post- harvest management			
11	AIVs value addition			
12	Mechanization of AIVs production activities			
13	AIVs business and Market assessment			
14	AIVs Cross cutting issues (i) Innovation Platforms (ii) Gender mainstreaming and social inclusion (iii)Policy			

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 and as they present, the CTT members should only give points

of clarification, 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. This one does not need a guided template but the trainees should be allowed to use their own way to present their evaluation points**.**

4.8 Participants' Reference Materials

4.8.1 List of Publications

AIVs reference material will consist of the following:

a) AIVs production manuals/ guides
b) Pamphlets/brochures
c) Factsheets on specific TIMPs

The detailed list of all publications is summarized in **Annex 2**

4.8.2 Guide on the use of the reference information

The trainers will be advised to issue to participants' handouts after each module. This will help them recap on what they learned even after they have left the training.

The list of all individual publications will be stored and made 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 – so that trainees can easily access and if necessary print any of them at their convenience.

All modules will be divided into the following sections

1. Introduction to the module
2. Module learning outcome
3. Module target group
4. Module duration.
5. Module summary.
6. Trainer's guidelines.
7. Participants' handouts.

PART II

African Indigenous Vegetable Training Modules

This part consists of 14 modules of training namely: Climate change and climate smart agriculture, Farmer Field Business school (FFBS) approach, Good Agricultural Practices and Food safety, AIVs production niche and climate requirements, AIV variety selection, AIVs seed systems, AIVs climate smart agronomics practices, Integrated soil and water management practices for AIVs, AIVs crop health, AIVs harvesting and post-harvest management, AIVs value addition, Mechanization of AIVs production activities, AIVs agri-business and Market assessment, and cross cutting issues (innovation platforms, policy, gender main streaming and social inclusion)

Each of the modules will be divided into the following:

1. Introduction to the module
2. Module learning outcomes
3. Module target group
4. Module users
5. Module duration
6. Module summary
7. Trainers guidelines
8. Participants' handouts

MODULE 1

CLIMATE CHANGE AND CLIMATE SMART AGRICULTURE

1.1 Introduction

The impacts of climate change (CC) and variability in agriculture, food systems and food security is a serious concern. Kenya's agricultural production systems are highly impacted by the effects of CC 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

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

1.3 Module Target Group

These module targets agricultural extension service dealing directly with farmer groups at community level or community facilitators and lead farmers

1.4 Module Users

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

1.5 Module Duration

The module is estimated to take 4 hours.

1.6. Module Summary

Module 1. Climate Change and Climate Smart Agriculture in AIVs Value Chain			
Sessions	**Training Methods**	**Training Materials**	**Duration**
1.6.1. Introduction to climate change and variability	• Plenary Presentation • Case study videos • Plenary discussions	• Projector • Laptop • Videos • Flip charts • Handouts	1 hour
1.6.2. Impacts of climate change and variability on agriculture and food security	• Plenary Presentation • Case study videos • Plenary discussions	• Projector • Laptop • Videos • Flip charts • Handouts	1 hour
1.6.3. Concept of Climate smart agriculture (CSA) in AIVs	• Plenary Presentation • Case study videos • Plenary discussions	• Projector • Laptop • Videos • Flip charts • Handouts	1 hour
1.6.4. Projected future climate scenarios affecting AIVs and how to manage	• Presentation • Case study videos • Plenary discussions	• Projector • Laptop • Flip charts • Handouts	40 minutes
1.6.5. Module review	• Participants' questions and comments • Facilitator' summary	Module review	20 minutes
TOTAL			**4 hours**

1.7 Facilitators' Guidelines

1.7.1. Introduction and Levelling Expectations (1 hour)	**Session Guide**
(The trainer introduces the trainees to this module and its important linkages in the achievement of KCSAP project objectives). **Trainees' expectation (30 minutes)** *The facilitator organises the trainees into groups to state and list their expectations.* **Module Objectives (30 minutes)** *(The trainer presents module's objectives on power point).* By the end of the module training the trainee should be able to:	PowerPoint presentation Distribute Participants' Handouts on Module Objectives and expectations.

• Explain climate change and adaptations. • Define 'climate smart agriculture'. • Describe and explain available climate smart crop management practices in AIVs production. • Explain the benefits of selected climate smart crop management practices in AIVs production.	
1.7.2 Introduction to Climate Change and Climate Variability (1 hour)	**Session guide**
(*The trainer proceeds to introduce the module basics).* **Plenary Presentation** • Basic terminologies used in the module (weather, climate, variability, adaptation, coping). • Explain climate change and climate variability. • The causes of climate change. • Climate risks impacting agriculture. • Proposed adaptation measures (captured in TIMPS).	• PowerPoint presentation • Flip chart sketches • Discussion on the session; Field experiences, coping and adaptation mechanisms adopted by farmers
1.7.3 Concept of Calimate Smart Agriculture (CSA) (1 hour)	**Session Guide**
(The trainer presents to the trainees the principles underpinning CSA and the link to deliverable of project objectives). **Plenary Presentation** • Definition of the CSA approach and their characteristics • The three pillars of CSA (productivity, Adaptation and Mitigation • Why CSA is needed	• Power Point presentation • Handouts • Plenary discussion.
1.7.4 Projected Future Scenarios that will Impact Productivity (40 minutes)	**Session Guide**
(The trainer leads the trainees in discussing future climatic projections focusing on rainfall and temperature which directly impacts on crop yields). **Plenary Presentation and discussion** • What are the long-term rainfall and temperature projections as impacted by climate change? • Projected impacts on food production and needed adaptation measures especially for AIVs.	• PowerPoint Presentation • Video presentation • Plenary Discussion

Video presentation (20 Minutes) • Short Video on showing projections of rainfall and temperature.	
1.7.5 Module Review (20 minutes)	**Session Guide**
(The trainer leads the trainees in summarizing the key points discussed in the module)	• Plenary discussion

1.8 Participants' Reference Materials

- **Participant's Handouts**
- Fact sheet on climate change

References

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

MODULE 2

FARMER FIELD AND BUSINESS SCHOOL APPROACH IN AFRICAN INDIGENOUS VEGETABLES PRODUCTION

2.1. Introduction

This module is designed for training and exposing trainees of Farmer Field and Business Schools (FFBS) to the FFBS approach and concepts. Practitioners of FFBS need to have knowledge of this methodology in order to mainstream various Technologies, Innovations and management Practice (TIMPs) in the AIV value chain. The trainees will thereafter facilitate farmers in the Common Interest Groups (CIGs) to enable them share and learn by doing, try available TIMPS as they implement them on their farms. The FFBS also empowers the learners with various skills such as 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 AIVs productive, profitable and sustainable.

2.2. Module Learning Outcomes

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

- Farmer Field and Business School approach and the difference between teaching and facilitating, clearly understood.
- Practical skills required for the roles and ability to facilitate a participatory learning session acquired and enhanced
- Knowledge and analytical skills to design simple experiments to test and select the best solution to their challenges acquired and enhanced.
- Shifting from the traditional focus to improving productivity towards farming business proposition appreciated and accepted.

2.3. Module Target Group

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

2.4. Module Users

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

2.5. Module Duration

The Module is estimated to take a minimum of 4 hours 30 minutes

2.6 Module Summary

Module 2: Farmer Field and Business School Approach			
Sessions	**Training Methods**	**Training Materials**	**Time**
2.6.1 Introduction, objectives and levelling of expectations	• Groups to bring out expectations • Presentation	• Module objectives • Marker pens, flip chats • Power point	1 hour
2.6.2 Overview of FFBS key activities	• Brainstorming • Plenary presentation	• Flip charts • Power point • Pictorials	30 minutes
2.6.3 Designing an FFBS program	• Presentation • Plenary discussion	• Power point • Participants' handouts	1 hour
2.6.4 Communication and facilitation skills	• Presentation • Plenary sessions • Group discussions	• Power point • Flip charts	30 minutes
2.6.5 Facilitation skills	• Plenary presentation	• Flip charts • Power point • Plenary discussions and presentations	30 minutes
2.6.6 Organization, management and leadership in FFBS	• Presentation • Plenary sessions • Group discussions	• Power point • Flip charts • Handouts	30 minutes
2.5.7 Module review	• Participants' questions and comments • Facilitator' summary	• Participants' handouts • Module review	30 minutes
TOTAL			**4 hours 30 minutes**

2.7 Facilitator's Guidelines

2.7.1 Introduction and Levelling Expectations (1 hour)	Session Guide
(The facilitator welcomes trainees to the module and invites the trainees to state their expectations). The facilitator then leads the trainees in brainstorming on their respective county group **Module Objectives (30 minutes)** The facilitator presents modules objective in power point By the end of the module the trainee should be able to: • Describe the concepts, characteristics, principles and plans of Farmer Field and Business School (FFBS) as a 'learning by doing 'approach • Identify climate change, risks, hazards, impacts and mitigation measures in AIV value chain. • Mainstream gender issues in climate-smart AIV value chain.	• Summarize trainees' "Expectations" on a flipchart and make displays. • PowerPoint presentation
2.7.2 Overview of FFBS key activities (30 minutes)	**Session Guide**
(The facilitator should be able to introduce FFBS by defining it and sharing its benefits with the trainees). Power points **Plenary Presentation** Overview of FFBS • Principles of FFBS, Characteristics of FFBS • AIV curriculum matrix	• List the responses on flip chart • PowerPoint presentation • Participants handouts
2.7.3 Designing an FFBS program (1 hour)	**Session Guide**
(Facilitator should guide discussions on the steps of preparation and establishment of FFBS). **Plenary Presentation** **The classical steps** • Ground working • Training of facilitators • Establishing PTDs at the FFBS • Season long FFBS sessions • Evaluation of PTDs • Field days • Graduation • Establishment of Lead FFBS • Follow ups **Group Exercise** Steps in establishing FFBS in the community. Within the groups follow facilitator instructions. **Plenary presentation**	• Distribute participants' handouts • Procedure of ground working- distribute handout • PowerPoint presentation • Group Exercise .

2.7.4 Communication skills (30 minutes)	Session Guide
Plenary presentation *(The facilitator introduces the topic on communication and why effective communication).* **Group exercise** • What is effective communication? • Purpose of communication • Barriers to effective communication • Maintaining communication within the FFBS group	• Group dynamics on communication-exercise • Distribute flip charts and felt pens to participants • Group Exercise
2.7.5 Facilitation skills (30 minutes)	**Session Guide**
(The facilitator introduces the topic on Facilitating adult learners). **Plenary presentation** **Facilitating AIV CIGs** • Definition of Facilitation, facilitator and effective facilitator • Qualities of a good facilitator • Golden rules of facilitator • Roles and responsibilities of FFBS Facilitators • Adult Non-formal learning techniques	• Distribute flip charts and felt pens to participants • Participants' Handout on adult learning techniques
2.7.6 Organization, management and Leadership of FFBS (30 minutes)	**Session Guide**
(The facilitator introduces the topic by asking the trainees how their groups are organized, managed and leadership structures). **Plenary Presentation** • What is leadership • Leadership continuum-subjects, environment and leader • Existing leadership structure • Roles and responsibilities of leaders • Leadership and sustainability in groups	• Flip charts • PowerPoint • Plenary discussions and presentations
2.7.7.Module Review (30minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module). *Review together the main points about FFBS module.* • Definition of Facilitation, facilitator and effective facilitator • What new things did you learn from this Module? • What are some of the problems and issues that you have become more aware of? • In FFBS, problems are seen as challenges • How would we identify the priority problem in the community? - And how would we address it? - Why farming business proposition? - Any other question?	• Flip charts, felt pens

2.8 Participants' Reference Materials

Participants' Handouts

- Factsheet on FFBS
- Factsheet on AESA

References

1. FAO (2004) Farmer Field School Methodology: a TOT Manual
2. Khisa, G. (2004) Farmer Field School Methodology: Training of Trainers Manual.
3. SUSTAINET EA (2010). Technical Manual for farmers and Field Extension Service Providers: Farmer Field School Approach. Sustainable Agriculture Information Initiative, Nairobi.

MODULE 3

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

3.1. Introduction

This module is designed for training and exposing trainees to good agricultural practices (GAPs) and food safety management system along the AIV value chain. The GAPs are based on the principals of risk analysis and prevention for sustainable agriculture. On the other hand, food is faced with the challenges of declining safety, reduced quality, requirements for sustainable farming practices and negative environmental impact from agricultural activities. Worker safety, health issues and traceability requirements have also become a common feature in the market place where the consumers require assurance. Observing GAPs is important in protecting consumer health and safety right from the beginning of a food chain. It is imperative to operate not only from the table but also upstream to include suppliers (e.g. fertilizers, propagation materials, plant protection) and all value chain players including providers of logistics and farm equipment. Therefore, GAPs should constitute a certification system for agriculture, specifying procedures that must be implemented to create food for consumers that is safe and wholesome, using sustainable methods.

Food safety, an essential condition for food quality, is based on the absence or occurrence of hazards that may create risks for human and animal health, within acceptable limits. Hazards are a common occurrence along food value chains that lack effective control measures. Hazards may be inherent in the seed or introduced from other sources as food moves along the supply chain from the farm to fork continuum. Consequently, food safety risks such as food-borne diseases occur frequently.

Today, there is an increasing public concern on the negative environmental and health impacts of chemicals (pesticides, growth regulators and mineral fertilisers) used in agricultural production as well as microbial pathogens and their toxins. It has therefore become necessary to control the occurrence of the hazards through the implementation of an effective Food Safety Management Systems (FSMS) through Hazard Analysis Critical Control Points (HACCP). The HACCP is a seven step management system which provides the framework for monitoring the total food chain to reduce the risk of foodborne illness and consequently death. The system is designed to identify and control potential problems before they occur.

3.2. Module Learning Outcomes

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

- Optimisation of the utilisation of resources (water, soil, manure, fertilizers, and other inputs) and environmental protection and conservation explained.
- GAP's on matters of food safety and quality clearly explained and understood
- Enhancement of worker safety and health within the production system understood and appreciated.
- Mapping in traceability in food safety and quality explained
- Need for legal safe food production as a moral market requirement explained.

- Risks /hazards of food safety within agricultural production chain identified.
- Critical control point (CCPs) at different levels of agricultural production mapped and determined.
- Preventive and corrective measures for the control of hazards defined.

3.8. Participants' Hand-outs

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

3.3. Module Target Group

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

3.4. Module Users

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

3.5. Module Duration

The Module is estimated to take 7 hours 30 minutes

3.6 Module Summary

Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			
Sessions	**Training Methods**	**Training Materials**	**Time**
3.6.1 Introduction, objectives and levelling of expectations	• Groups to bring out expectations • Plenary Presentation	• Module objectives • Marker pens, flip chats • Power point, laptop, projector	30 minutes
3.6.2 Understanding what is GAP and its application in the crop value chains	• Plenary Presentations • Group work • Plenary	• Flip charts • Power point • laptop, projector • Pictorials	30 Minutes
3.6.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk assessment	• Group Work • Farm visit within training site • Group presentations	• Flip charts • Power point • laptop, projector • Pictorials • Data sheets	1 hour

3.6.4 Review of GAP requirements for audit and types of protocols possible	• Group work • Plenary Presentations • Mock Audit	• Data forms • Flip charts • Power point • Laptop, projector • Pictorials • Data sheets	1 hour
3.6.5 GAP Check list and Audit	• Plenary presentation • Group exercise	• Flip charts • Power point projector • Laptop, • Pictorials	45 minutes
3.6.6 Safe use of Pesticides and calibration of sprayers and nozzles	• Group work on nozzles and rate of discharge • Safety guidelines	• Pictorials • Knapsacks • Measuring Cylinders • Tape measure • Nozzles • Empty clean Pesticide containers	1 hour
3.6.7 Understanding of food safety management system in crop value chains	• Brain storming • Plenary presentation • Group discussions	• Flip charts • Power point • Laptop, projector • Pictorials • handouts	45 minutes
3.6.8 Determination of food safety risks/ hazards	• Brain storming • Plenary presentation • Group discussions	• Flip charts • Power point • Laptop, projector • Pictorials handouts	30 minutes
3.6.9 Determination of critical control points (CCP) in a crop value chain	• Plenary Presentation • Group discussions	• Power point • laptop, projector • Flip charts	30 minutes
3.6.10 Prevention and corrective measures for CCP in crop value chains	• Plenary Presentation • Group discussions	• Flip charts • Power point • Plenary discussions	30 minutes
TOTAL			**7 hours 30 minutes**

3.7 Facilitator's Guidelines

Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)	
3.7.1 Introduction and Levelling Expectations (30 hour)	**Session Guide**
(The facilitator welcomes trainees to the module and introduces him/herself stating profile and experience of working with farmers). **Trainees' introduction and expectations** The facilitator invites the trainees to state their expectations after brain storming in their respective county groups **Module Objectives** The facilitator presents modules objective in Power Point By the end of the module the trainee should be able to: • Understand and appreciate optimization of inputs and resources (water, soil, manure, fertilizers, and other inputs) and environmental protection and conservation. • Appreciate GAPs on matters of food safety and quality. • Explain worker safety and health within the production system. • Map and implement traceability in food safety and quality. • Explain need for legal safe food production as a moral market requirement. • Identify risks /hazards of food safety within crop production chain. • Map and determine Critical control point (CCPs) at different levels of crop production. • Define preventive and corrective measures for the control of hazards.	• Summarize trainees' "Expectations" on a flipchart and make displays • Power Point presentation
3.7.2 Understanding what is GAP and its application in the crop value chains (30 minutes)	**Session Guide**
(Facilitator to lead discussions on understanding of GAPs and its relevance to various actors in the value chain). **Plenary Presentation** • Understanding GAPs in the context of AIV production • Explain the role of GAPs in safe and sustainable food production system for growers and consumers. • Understanding GAPs as the key to high commodity market destinations	• Power Point presentation • Participants hand-outs • Group exercises

3.7.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk assessment (1 hour)	Session Guide
(Facilitator should guide discussions on the key determinants of site suitability for agricultural activities). **Plenary discussion** • 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) • The Need for documentation in a farm assurance system • Types of Mandatory farm records • General guidelines to Conservation Agriculture	• Power Point presentation • Participants handouts
3.7.4 Review of GAP requirements for audit and types of protocols possible (1 Hour`)	**Session Guide**
(The facilitator leads the trainees in summarizing the key points discussed in the module). **Plenary presentation** • Methods and procedures required at on-farm level to obtain GAPs certification in AIVs production. • Good soil management practices (appropriate crop rotations, manure application) • Careful management of water resources and efficient use of water for rain-fed crop production via irrigation. • Selection of crop types and varieties to meet local consumer needs. • Adoption of IPM practices to minimize the potential impact of pest control actions on workers, food, and environmental and health safety. • Minimizing contamination at Harvest, On-farm Processing and Storage.	• Group work and presentation by groups • PowerPoint presentation • Participants hand-outs
3.7.5 GAP checklists and Audit (45 minutes)	**Session Guide**
(Facilitator guides the trainees on self-assessment (Internal audit and corrective measures for non-compliance). Plenary Presentation • Need for mandatory records in GAPs • Internal Audit procedures • Practical on Mock Audits • Interpretation of audit reports • Compliance and Corrective action	• PowerPoint presentation • Global GAP Checklists • Participants hand outs • Group Exercise

Group Exercise • Groups Audit a farm or a process within the training site • Present Audit results and verdict and Corrective action	
3.7.6 Safe use of Pesticides and calibration of sprayers and nozzles (1 hour)	**Session Guide**
(The facilitator organizes the groups to identify level of knowledge on pesticide use and safety knowledge. Determination of pesticide quantities to use and PHI). **Plenary presentation** • Formation of groups and for practical activities • Guided Knapsack calibration • Different types of nozzles and their use • Pesticide safety **Group Exercise** • Practical session on calibration of pesticides, different types of pesticides and their handling	• PowerPoint presentation • Pesticide containers • Knapsack sprayers • Nozzles • Participants hand-outs • Group Exercise
3.7.7 Understanding Food Safety (45 minutes)	**Session Guide**
(The facilitator should be able to introduce food safety system by defining it and sharing its benefits with the trainees). Power points). **Plenary Presentation** • Overview of Food safety management systems • Why food safety is important in crops production systems • Risks to human/animal health due to chemical, biological and physical hazards exposure • Legal and market requirements for food safety practice • Food safety practices that reduce risks/hazards • Use of HACCP tool/system for monitoring crop production	• List the responses on flip chart • PowerPoint presentation • Participants hand-outs
3.7.8 Determination of food safety risks/hazards (30 minutes)	**Session Guide**
(Facilitator should guide discussions on the steps of identification of food safety hazards FSMS). **Plenary Presentation** • Explain the concept of risk identification (Hazard analysis) • Listing the types of hazards that cause illness or death	• PowerPoint presentation • Participants hand outs

• Determine factors influencing likely occurrence/ severity of hazards identified • List hazards alongside the possible control measures • Explain the concept in a flow diagram **Group Exercise** • Groups to identify major risk/hazards at points of crop production for bean, garden peas and African Leafy Vegetables • Produce flow diagrams for each crop	Group exercise .
3.7.9 Determination of critical control points (CCP) in crop value chains (1 hour)	**Session Guide**
(The facilitator introduces the topic on determination of critical control points (CCP) **Plenary presentation** • Why is important to determine CCP in production chain (preventing, eliminating or reducing risks) • How to monitor and measure the CCP (point, step or procedure) • How to document the CCP • How to establish critical limits (from standards/ guideline) for each CCP **Group Exercise** • Groups to identify and establish critical control points and critical limits for AIVs.	• PowerPoint presentation • Participants handouts • Group exercise
3.7.10 Prevention and corrective measures for CCP in crop value chains (1 hour)	**Session Guide**
(The facilitator introduces the topic on prevention and control of possible hazards). **Plenary presentation** • Establishment of corrective actions against CCP • Establish verification procedures for CCP • Establish record-keeping and documentation procedures • How to develop HACCP plan and Food safety kit **Group Exercise** • Groups to identify and establish corrective actions and verification procedures for AIVs.	• Power Point presentation • Participants hand-outs • Group exercises

3.7.11 Module Review (30 minutes)	Session Guide
(The facilitator leads the trainees in summarizing the key points discussed in the module)	Plenary discussion

3.8 Participants' Reference Materials

3.8.1 Participants' Handouts

- Global GAP cartoon Manual
- Global GAP Version

3.8.2 References

- National Advisory Committee on Hazards Criteria for Foods. (2018). Hazard Analysis Critical

MODULE 4

AFRICAN INDIGENOUS VEGETABLE PRODUCTION NICHES AND CLIMATIC REQUIREMENTS

4.1 Introduction

This module exposes service providers, lead farmers and facilitators to the different types of production ecological (altitudes, soils, AEZs and climatic conditions) suitable for African Indigenous Vegetable (AIV) production in the selected Counties. African Indigenous Vegetable is adapted to a wide range of ecological conditions such as the dry low lands at sea level, dry and wet cold high lands and semi humid and humid areas. Most of these vegetables grow well at temperature 20-30ºC. Due to the changing climate conditions and the increased demand of AIVs for rural and urban market consumers, farmers in wide range of ecological areas are demanding AIV varieties. There is therefore need for the knowledge on the production niches and climatic conditions for the production of the crop in the various target counties to match with the available varieties.

4.2 Module Learning outcomes

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

1. Importance of AIVs in Kenya's economy explained and appreciated
2. Altitudes and soil types/characteristics for AIV production identified
3. Climatic conditions (temperature, rainfall and humidity) required for AIV production described
4. County agro-ecological zones for AIV production described

4.3 Module Target Group and Categories

This module targets service providers, public and private extension agents and lead farmers in the AIVs value chain.

4.4 Module users

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

4.5. Module Duration

The Module is estimated to take a minimum of **4 hours**

4.6 Module Summary

Module 3: AIV production niches and climatic requirements			
Sessions	**Training methods**	**Training materials**	**Time**
4.6.1 Introductions and climate setting Participants expectations Objectives	• Presenter introductions • Self-introduction of trainees • Plenary discussions to share expectations • Presentations of objectives	• Flips charts • Felt pens • Laptop for PowerPoint Presentation	1 hour
4.6.2 Importance of AIV in Kenya's economy	• Plenary Presentations • Plenary discussions	• Flips charts • Felt pens • Projector • Hand-outs	1 hour
4.6.3 AIV production ecological/climatic requirements for optimal yields	• Plenary Presentations • Plenary discussions	• Flips charts • Felt pens • Laptop • Projector presentation • Participants Handouts	1 hour
4.6.4 AIV production Agro-ecological zones (AEZs)- average yields, and constraints in the target Counties	• Group work • Plenary Presentations • Plenary discussions • Field demonstration	• Flips charts • Felt pens • Laptop • Projector	1 hour
4.6.5 Module review	• Discussions/conclusion and way forward	• Flip charts • Laptop Projector	30 minutes
Total			**4 hours**

4.7 Facilitator's Guidelines

Module 3: AIV production and appropriate climatic requirements	
4.7.1. Introductions and climate setting (1 hour)	**Session Guide**
(The facilitator introduces himself/herself, welcomes trainees to the module and invites trainees to introduce themselves and state their expectations) **Module Objectives** **Introduction of Objectives (30 minutes)** By the end of this training module the trainee should be able to: • Define and explain the importance of AIV in Kenya's economy • Identify and describe altitudes and soil types/ characteristics for AIV production • Describe climatic conditions (temperatures, rainfall and humidity) required for AIV production • Describe specific county agro-ecological zones for AIV production **Expectations (30 minutes)** The trainees go into groups (e.g. county based) and list their expectations from the module	• Summarize the facilitator/trainees involvement in AIV value chains • PowerPoint presentations • Group exercise (listing and presenting expectations). • Expectations lists kept for later reviewing compliancy
4.7.2 Importance of AIV in Kenya's economy (1 hour)	**Session Guide**
Plenary Presentation (40 minutes) • Origin and place of AIV as crop • Why AIV in Kenyan households • Key counties producing AIVs in Kenya • General AIV production in Kenya **Facilitator's guided discussion (20 minutes)** Questions/answers/comments	• PowerPoint presentation • Distribute to participants • Handouts (training materials)
4.7.3 AIV production ecological/climatic requirements (1 hour)	**Session Guide**
Plenary Presentation (40 minutes): Presentation on AIV topics such as: • Importance of AIV in Kenya's economy • Altitude and Agro-ecological zones • Climatic conditions (Rainfall, Temperature and humidity) • Soils (soil types, pH, general fertility for AIVs) **Facilitator's guided discussion (20 minutes)** Questions/answers/comments	• PowerPoint Presentation • Distribute to participants Handouts (training materials)

4.7.4. AIV production AEZs (villages), average yields, and constraints in the target Counties (45 minutes)	Session Guide
Plenary Presentation (15 Minutes) **Group work (30 mins)** Facilitator guides in reviewing and discussing suitability map (County by County) Trainer to bring out specific County or sub-county AEZs, land size, yields and constraints to AIV production. Then, the trainees provide in the plenary: • Agro-ecological zones (AEZs) and % area suitable for AIVs • Average land/farm size under AIV • Average AIV yield per farm • Constraints to AIV production **Discussions/presentations from the groups (15 minutes)** Let the trainee groups share the exercise outcomes	• PowerPoint presentations • Group work • Open but facilitator's guided discussions
4.7.5. Module review (15 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Together discuss and summarize the main points from the training with specific reference to: • Objectives and expectations (review done on basis of the earlier listed objectives and expectations) • AIV production ecological/climatic requirements AIV production AEZs (villages) average yields, and constraints in the target Counties • Randomly (average of 10 cases), *trainees indicate new thing(s) learnt from the module. The results are recorded per county presented* • Randomly (average of 10 cases) trainees pin-point the way forward issues.	• The last Participants' Handouts/training materials • Summarize the main points of the module on a flip chart and display

4.8 Participants' Reference Materials

4.8.1 Participants' Handouts

- AIV production Guides manual 2012,
- AIV leaflets [2005]

4.8.2 References

Okoko, N., Karanja, D., Kidula, N., Kiptarus, E., Wasilwa, L., Okong'o, P., Musebe, R., Kimani, M. and Kimenye, L. (2012). Promotion of African indigenous vegetables through farmer-led seed enterprises in Western Kenya. Paper presented in the 13th KARI Scientific conference, October 2012, KARI Headquarters, Nairobi

Okoko, N., Karanja, D., Kidula, N., Kiptarus, E., Wasilwa, L., Okong'o, P., Musebe, R., Kimani, M. and Kimenye, L. (2012). Production of quality seed of African Indigenous Vegetable. Training manual

MODULE 5
AFRICAN INDIGENOUS VEGETABLE VARIETY SELECTION

5.1 Introduction
This module exposes trainees to the improved AIV varieties, their uses and target area of production. Breeding of AIV is in its early stages and therefore the various AIV varieties released are new to the consumers. They grow in a wide range of ecological areas and are used primarily for leaves. These varieties are grouped according to plant physical characteristics, yield, harvesting period and taste. Due to the climate changing towards drier conditions and the increased demand for AIV for their nutritive properties, more farmers are demanding AIV varieties. However, since many of these varieties are new, farmers are not able to identify their characteristics and special attributes. Therefore, farmers in the AIV target areas need to be trained.

5.2 Learning Outcomes
By the end of the module the following outcomes should be achieved:

1) The AIV crop described and appreciated
2) Knowledge on the various improved AIV varieties, and their attributes acquired and applied
3) Appropriate varieties for specific regions identified

5.3 Module Target Group
This module targets service providers, public and private extension agents and lead AIV farmers.

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

5.5 Module Duration
The Module is estimated to take 4 hours.

5.6 Module Summary

Module 5: AIV Variety Selection			
Sessions	**Training Methods**	**Training Materials**	**Time**
5.6.1 Introduction and Objectives Expectations	Plenary presentation Group discussions and presentation of expectations	• Flip charts • Projector • Laptop	1 hour

5.6.2 Introduction to various improved AIV varieties, their ecological areas of cultivation and their attributes and uses.	Group Exercises to identify local AIVs Plenary Presentations On-farm practical demonstration	• Projector • Flip charts • Manila papers • Marker pens	1 hour 30 minutes
5.6.3 Appropriate variety for specific regions	Plenary Presentation Group Exercises	• Projector	1hour
5.6.4.Module review	Group Exercises Facilitator's summary	• Participants' handouts • Module review • AIV manual	30 minutes
TOTAL			**4 hours**

5.7. Facilitators Guidelines

AIV Variety Selection	
5.7.1 Introduction and levelling of expectations and objectives (1 hour)	**Session Guide**
Introduction (30 minutes) (*The facilitator welcomes trainees to the module, introduces himself/herself and invites them to introduce themselves and state their expectations.* **Module Objectives (30 minutes)** *(The facilitator presents modules objectives)* By the end of the module the trainee should be able to: 1. Describe the AIV crop and its climatic and ecological requirements. 2. Identify the various improved AIV varieties their ecological areas of cultivation and their uses. 3. Identify the varieties suited to the counties of interest.	• Summarize trainees' "expectations" and display. • Distribute participants' handouts • Module Objectives, Program

5.7.2 Introduction to AIV and the various improved AIV varieties and their uses (30 minutes)	Session Guide
(The facilitator should describe the AIV crop and guide the trainees in identifying the various AIV improved varieties and their uses). **Group work (10 minutes)** Ask trainees to highlight and describe some of the AIV varieties they know. **Plenary Presentation (20 minutes)** • What is AIV? • Improved AIV varieties. • Categories of AIV varieties for malting and consumption, forage, sweet AIV varieties Present to the trainees pictures of each variety giving the full description and its uses.	• Plenary Presentation • Distribute Participants' handouts • AIV brochures, leaflets and manual
5.7.3 Recommended AIV varieties for the target counties (2 hours)	**Session Guide**
Plenary Presentation **Varieties for the target counties (30 minutes)** • AIV growing regions and the new regions which are being targeted for AIV cultivation in Kenya. • AIV varieties suited for each county • County climate conditions for target county (semi-arid, hot dry low land, cold dry highlands, high potential, sub humid and humid) **Group Exercises (30 minutes)** Trainees discuss and list AIV varieties in their respective counties **Group Exercises (1 hour)** *(Ensure there is an established plot of all the varieties or AIV plant samples).* • Visit the AIV plot with the trainees and assist them identify and study the various varieties. • After the field visit facilitate them to recall what they learned and discuss on any issue that may arise. (can also use AIV plant samples for the various varieties).	• Plenary presentation • Distribute participants' handouts. • AIV manual • Brochures • Leaflets

5.7.4 .Module review (30 minutes)	Session Guide
(The facilitator should be able to lead the trainees in reviewing the module). **Group Exercise** Summarize the main points of the training Together with the trainees review the main points about improved AIV varieties ◦ What new things did you learn from this Module? ◦ What are some of the problems and issues that you have become more aware of in AIV varieties? ◦ What questions do you still have about identification of AIV varieties?	• The last Participants' Handouts • Summary of the main points from the module.

5.8 Participants' Reference Materials

5.8.1 Participant's Handouts

- AIV production Guides [2017]
- AIV leaflets [2017]

MODULE 6
AFRICAN INDIGENOUS VEGETABLE SEED SYSTEMS

6.1. Introduction

AIV farmers mostly recycle their own seed or source seed from their local markets. A very small percentage purchase certified seed. Continued use of own saved seed over many years makes production of improved varieties (especially self-pollinated crops) uneconomical, thus undermining the incentives for private sector investment in commercial production and marketing of such seeds. This in turn has limited the dissemination of improved high-quality seed of AIVs. The mode of own-saved seed system is commonly practised for subsistence production but even at that level, yields frequently fluctuate. As rural life becomes more commercialized and global markets become more competitive, farmers need to shift from subsistence agriculture to commercial production. This module exposes service providers, lead farmers and facilitators to the various seed systems in AIV production. The module also covers the importance of quality seed and how to improve AIV seed provision. It also covers community seed production and gives direction on how to interface formal and informal seed production to enable farmers venture into commercial production.

6.2 Module Learning outcomes

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

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

6.3. Module Target Group and Categories

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

6.4. Module Users

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

6.5 Module Duration

The module is estimated to take a minimum duration of 4 hours 30 minutes.

6.6. Module Summary

Module 6. AIV Seed Systems			
Sessions	**Training methods**	**Training materials**	**Time**
6.6.1 Introduction, objectives and expectations	Self introduction Presentations Plenary discussions	• Flips charts • Felt pens • Projector • Laptop	1 hour
6.6.2 Definition of seed and seed system in Kenya	Group work Presentations	• Flips charts • Felt pens • Projector • Laptop	1 hour
6.6.3 Formal seed system in Kenya	Presentations Discussions	• Projector • Laptop • Flips charts • Felt pens	1 hour
6.6.4 Informal seed system in Kenya	Presentations Discussions	• Projector • Laptop • Flips charts • Felt pens	1 hour
6.6.5 Module review and discussions	Group work Discussions presentation	• Flips charts • Felt pens	30 minutes
Total			**4 hours 30 minutes**

6.7 Facilitator's Guidelines

AIV Seed Systems	
6.7.1. Introduction and levelling of expectations and objectives (1 hour)	**Session Guide**
Introduction (30 minutes) *(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations)* **Module Objectives (30 minutes)** *(The facilitator presents modules objectives)* *By the end of the training module the trainee should be able to:* • Describe the main AIV seed systems in Kenya • Explain and discuss the importance of formal seed system in AIV production • Outline the importance of informal seed systems, community seed bulking and its interface with formal seed production for enhanced production of quality grain	• Summarize trainees' "Expectations" and display. • PowerPoint presentation • Distribute participants' handouts on Module • Objectives and Training Programme

6.7.2. Definition of seed and seed system in Kenya (1 hour)	Session Guide
Group work and presentations: (30 Minutes) • What is quality seed? **Plenary Presentation (30 Minutes)** • What is a seed system and characteristics of main seed systems (formal and informal seed systems)? • Commodity corridors	• Group work • PowerPoint presentation • Distribute participants' hand-outs • Brochures, Leaflets,
6.7.3 Formal seed system in Kenya (1 hour)	**Session Guide**
Plenary presentations highlighting: • Legal requirements for seed certification • Seed certification process • Post certification activities for enforcing the Seed Act cap 326 • Post control activities for seed quality assurance • Seed importation and exportation requirements	• PowerPoint presentation • Distribute participants' handouts • Brochures, Leaflets
6.7.4 Informal seed system in Kenya (1 hour)	**Session Guide**
Plenary presentations: (30 Minutes) • Seed multiplication • AIV seed standards and commercial production • Informal seed system • Community seed bulking and how is it implemented • Synergies for formal and informal seed system **Group work and discussions (30 Minutes)** Calculate seed system requirements for the county/ward/farmer group) and present	• Group work • PowerPoint presentation • Distribute participants' hand-outs • Brochures, Leaflets,
6.7.5 Module review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training and together with the trainees review the main points on: • AIV seed systems and their characteristics • Importance of using certified seed • Informal seed *(Discuss the new sets of skills and knowledge learnt from this module together with the trainees. What are the observations made by the trainees from this module?)*	• The last participants' handouts • Summarize the main points from the module on a flip chart and display

6.8 Participants' Reference Materials

6.8.1 Participants' Handouts

- AIV production Guides [2017]
- AIV leaflets [2017]

6.8.2 References

Oluoch, M.O. & Pichop, Germain & Silue, Drissa & Abukutsa-Onyango, Mary & M, Diouf & Shackleton, Charlie. (2009). Production and harvesting systems for African indigenous vegetables.

Kebede SW, Bokelmann W (2017) African Indigenous Vegetables and their Production Practices: Evidence from the HORTINLEA Survey in Kenya. Agrotechnology 6: 170. doi: 10.4172/2168-9881.1000170

Winifred Chepkoech, Nancy W. Mungai, Hillary K. Bett, Silke Stöber, and Hermann Lotze-Campen (2020) Toward Climate-Resilient African Indigenous Vegetable Production in Kenya

MODULE 7

CLIMATE SMART AGRONOMIC PRACTICES FOR AFRICAN INDIGENOUS VEGETABLES

7.1 Introduction

In order to optimise productivity of the African Indigenous Vegetable varieties, farmers need to adopt certain specific agronomic packages, without which the yield potential of improved AIV varieties cannot be achieved. In addition, with the vagaries in weather due to climate change effects, it is necessary to incorporate adaptation or mitigation measures in order to be able to realise a crop. In this respect, climate smart agronomic practices come to the fore. There is therefore need for farmer facilitators in the AIV target counties to be facilitated to guide farmers on the climate smart AIV agronomic practices, seed selection techniques, and disease and pest management strategies.

7.2 Module Learning outcomes

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

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

7.3 Module Target Group and Categories

This module targets service providers, public and private extension agents and lead farmers in the AIVs value chain target counties

7.4 Module users

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

7.5. Module Duration

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

7.6 Module Summary

AIV climate smart agronomic practices			
Sessions	**Training methods**	**Training materials**	**Time**
7.6.1 Introductions and climate setting	• Presenter introductions • Self-introduction of trainees (incl. individual involvement in AIV value chain • Plenary discussions • Presentations	• Flips charts • Felt pens • Laptop • Projector	30 minutes

7.6.2 Objectives and expectations	• Presentations (guide on group work) • Group work (trainees enlist expectations) Plenary discussions to share expectations	• Flips charts • Felt pens • Laptop • Projector	30 minutes
7.6.3 Agronomic practices for AIV production	• Presentations • Practical work (groups tour nearby farm for possible farm layout) • Plenary discussions resulting from the farm visit	• Flips charts • Felt pens • Laptop • Projector	1 hour 30 minutes
7.6.4 Appropriate inputs and their correct/ recommended application rates in AIV optimal production	• Presentations • Group work (trainees enlist inputs and dosage in different counties) • Plenary discussions to share group work results	• Flips charts • Laptop • Projector • Participants' handouts	1 hour
7.6.5 Module review and discussion	• Discussions/conclusion and way forward	• Flip charts • Laptop • Projector	30 minutes
Total			**3 hours, 30 minutes**

7.7 Facilitator's Guidelines

Module 6: Climate smart agronomic practices for AIV	
7.7.1. Introductions, climate setting (30 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module introduces him/ herself and then invites them to introduce themselves and state their expectations).	• Summarize the facilitator/trainees involvement in AIVs value chains
7.7.2 Module Objectives (30 minutes)	
Facilitator guides on getting: **Objectives (15 minutes)** The facilitator presents the module objectives. By the end of the training module, the trainee should be able to: 1. Explain and describe agronomic practices for AIV production	• PowerPoint presentations • Group exercise (listing and presenting expectations).

2. Describe appropriate inputs and their correct rates of application for AIV production 3. Outline region specific AIV production agronomic practices 4. Specify the right timing for operations or inputs application in AIV production **Expectations (15 minutes)** The trainees from groups (e.g. county based) and enlist expectations from the module	• Expectations lists kept for later reviewing compliancy
7.7.3. Agronomic practices for AIV production (1 hour)	
Plenary Presentation (1 hour 15 minutes) The facilitator presents critical factors on: • Factors for selecting AIV production as an enterprise • Climate smart land preparation • Climate smart planting (seed rates, plant density) • Thinning, • Weed control • Pests and disease control • Rogueing • Cropping systems • Spacing (inter-and intra-row spacing) • Conservation agriculture principles/benefits **Discussions (15 minutes)** Questions/answers and comments	• PowerPoint Presentation • Groups discussions • Distribute participants' handouts/training materials
7.7.4. Appropriate inputs for AIV optimal production and their correct/recommended application rates (1 hour)	**Session Guide**
Group work (30 minutes) • The facilitator guides trainees to list or/and present the required inputs for use in AIV production • The trainees get into county groups to provide lists of AIV inputs and their application rates as practiced by farmers. • The groups present their results in the plenary - opening up for questions, answers and discussions. **Plenary presentation (30minutes)** The facilitator present PowerPoint presentation on the recommended AIV inputs (seeds, fertilizers, manures, etc.) and their rates, and their time of application for optimal yields of AIV.	• PowerPoint Presentation • Distribute participants • Groups discussions handouts/training materials

7.7.5. Module review (30 minutes)	Session Guide
(The facilitator leads the trainees in reviewing the module) Summary of the main points from the training • Objectives and expectations (review done on basis of the objectives and expectations listed earlier) • *Trainees to randomly indicate new sets of skills and knowledge learnt from the module. The results are recorded per county presented* • Randomly (average of 10 cases) trainees pin-point the way forward issues.	• The last Participants' Handouts/training materials • Summarize the main points of the module on a flip chart and display

7.8 Participants' Reference Materials

7.8.1 Participants' Handouts

1. AIV production Guides [2017]
2. AIV leaflets
3. Brochures 2017

7.8.2 References

1. Nasambu Okoko, Daniel Karanja, Nelson Kidula, Edwin Kiptarus, Lusike Wasilwa, Paul Okong'o, Richard Musebe, Martin Kimani and Lydia Kimenye. 2012. Promotion of African indigenous vegetables through farmer-led seed enterprises in Western Kenya. Paper presented in the 13th KARI Scientific conference, October 2012, KARI Headquarters, Nairobi
2. Nasambu Okoko, Daniel Karanja, Nelson Kidula, Edwin Kiptarus, Lusike Wasilwa, Paul Okong'o, Richard Musebe, Martin Kimani and Lydia Kimenye. 2012. Production of quality seed of African Indigenous Vegetable. Training manual

MODULE 8

INTEGRATED SOIL AND WATER MANAGEMENT PRACTICES FOR AFRICAN INDIGENOUS VEGETABLE PRODUCTION

8.1 Introduction

The performance of the agriculture sector in Kenya has continued to decline over the years due to increased soil acidity, mining of nutrients not supplied in the applied fertilizers and lowering of the soil organic matter content caused by lack of use of organic resources. 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 supply to crop production systems. Integrated Soil Fertility Management (ISFM), which includes conservation agriculture, offers the best options for improving soil fertility while allowing for climate change adaptation.

AIVs are mostly cultivated by smallholder farmers who not only apply minimal inputs, but also apply them inappropriately Drought management technologies to mitigate drought effects in the AIV 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 AIV production systems. This module introduces service providers, lead farmers and facilitators to the importance of integrated soil and water management practices.

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
2. Soil and plant tissue sampling for laboratory analysis, interpretation and utilization of results from accredited laboratories in Kenya demonstrated
3. Soil fertility and plant nutrition for increased crop productivity (4R Stewardship that includes Right nutrient source, Right application rates, Right timing and Right placement) understood
4. Soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping outlined
5. Water harvesting technologies, soil and water management for AIVs described
6. Identification of temporary or permanent decline of land productive capacity and the possible various solutions to soil degradation imparted identified and outlined
7. Problematic soils and their management options described

8.3 Module Target Group and Categories

This module is intended for service providers and county public extension agents in the AIV producing areas.

8.4 Module Users

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

8.5 Module Duration

The Module is estimated to take a duration of 5 hours

8.6 Module Summary

Module 8: Integrated soil and water management practices for AIV production			
Sessions	**Training methods**	**Training materials**	**Duration**
8.6.1 Introduction, objectives and expectations	Self introduction Presentations Plenary discussions	Flip charts Projector Felt pens Laptop	30 minutes
8.6.2 Soil composition, properties and health,	Presentations Practical's on how to conduct soil sampling and analysis	Flip charts Projector Laptop Felt pens Participants' handouts	30 minutes
8.6.3 Soil and plant tissue sampling and analysis	Presentations Field demonstrations (Conduct soil and plant tissue sampling and analysis)	Flip charts Projector Laptop Participants' handouts	1 hour
8.6.4. Soil fertility and plant nutrition	Presentations Field demonstrations	Flip charts Felt pens Projector Laptop Participants' handouts	30 minutes
8.6.5 Soil health and (ISFM) for climate resilient cropping systems	Presentations Field demonstrations	Flip charts Felt pens Projector Laptop Participants' handouts	30 minutes
8.6.6 Soil and water management and water harvesting technologies	Presentations Field demonstrations	Flip charts Felt pens Projector Laptop Participants' handouts	30 minutes

8.6.7 Soil degradation and reclamation	Presentations Field demonstrations	Flip charts Felt pens Projector Laptops Participants' handouts	30 minutes
8.6.8 Problematic soils and their management	Presentations Field demonstrations	Flip charts Felt pens Projector Laptops Participants' handouts	30 minutes
8.6.9 Module review and discussion	Discussions	Flip charts Felt pens	30minutes
Total			**5 hours**

8.7 Facilitator's Guidelines

Integrated soil and water management practices for AIV production	
8.7.1. Introduction, Objectives and Expectations (30 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module. They are then invited to introduce themselves and state their expectations) **Module Objectives (30 minutes)** *(The facilitator presents modules objectives)* By the end of the module the trainee should be able to: • Explain soil composition and what constitutes a healthy soil, including soil classification. • Appreciate and discuss soil and plant tissue sampling for laboratory analysis, interpretation and utilization of results from accredited laboratories in Kenya • Demonstrate the outlined soil fertility and plant nutrition protocol for increased crop productivity (4R Stewardship that includes Right nutrient source Right application rates, Right timing and Right placement) • Outline soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping systems • Describe water harvesting technologies together with soil and water management practices. • Identify temporary or permanent decline of land productive capacity and the possible solutions to soil degradation • Describe problematic soils and their management options.	• Summarize trainees' "expectations" and display. • PowerPoint presentation • Distribute participants' handouts on Module • Objectives and Training Program

8.7.2. Soil composition, properties and health (30 minutes)	Session Guide
(The facilitator presents on soil composition, properties and health) **Plenary Presentation (20 minutes)** Soil composition, properties and health • Description of soil composition • Description of soil properties • Explanation of what soil health is all about **Discussion (10Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise	• PowerPoint presentation • Distribute participants' Handouts • Brochures, leaflets and manual
8.7.3. Soil and plant tissue sampling and analysis (1 hours)	**Session Guide**
Plenary Presentation (30 minutes) • Overview of the soil sampling methods • Soil analysis results and interpretation • Overview of soil analysis results using available examples • Soil sampling guidelines **Practical exercise on soil sampling (30 minutes)** Demonstration on soil sampling methods	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manuals Demonstration
8.7.4. Soil fertility and plant nutrition (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Potential role of different soil managements techniques in addressing soil fertility challenges in AIV smallholder farming systems • Integrated Soil Fertility Management techniques • Soil fertility management guidelines **Discussion (10 Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual

8.7.5 Soil health and (ISFM) for climate resilient cropping systems (30 minutes)	Session Guide
Plenary Presentation (20 Minutes) • Soil health • Introduce Integrated Soil Fertility Management (ISFM) • Soil health and ISFM for a climate resilient cropping system • Manure management, mulching, organic amendments and composting for increased use of organic manure to improve AIV production • Conservation agriculture as a climate smart agriculture practice • Intercropping and crop rotation as a climate resilient cropping system **Discussion (10 Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
8.7.6 Soil and water management and water harvesting technologies (30 minutes)	**Session Guide**
Plenary Presentation (20 Minutes) • Principles of soil management for increased AIV productivity • Tillage systems that conserve water for AIV use. • Principles of soil fertility management for increased AIV productivity • Soil fertility management practices for increased AIV productivity **Discussion (10 Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise under the guidance of the facilitator.	• PowerPoint presentation • Distribute participants' Handouts • Brochures, leaflets and manual
8.7.7 Soil degradation and reclamation (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Overview of soil degradation and reclamation. • Reclamation measures for degraded soil • Identification of the causes of soil degradation • Identification of reclamation measures for degraded soil **Discussion (10 Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise under the guidance of the facilitator.	• Session Guide • PowerPoint presentation • Distribute participants handouts • Brochures, leaflets and manual

8.7.8 Problematic soils and their management (30 minutes)	Session Guide
Plenary Presentation (20 minutes) • Problematic soils and their management • Soils with unsuitable biological properties • Soils with unsuitable chemical properties • Soils with unsuitable physical properties **Discussion (10 Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' Handouts • Brochures, leaflets and manual
8.7.9. Module review (30 minutes)	**Session Guide**
The facilitator leads the trainees in reviewing the module) Summarize the main points of the training and together with the trainees review the main points. Discuss with trainees about new things learnt from this Module. Let them identify some of the problems and issues that they have become more aware of in the module.	• The last participants' handouts • Summary of the main points from the module on a flip chart and display

8.8 Participants' Reference Materials

8.8.1 Participants' Handouts

1. AIV Extension Manual [KCEP-CRAL Manual, 2019]
2. AIV Leaflets [KCEP-CRAL Manual, 2019]
3. Soil Management Extension Manual [KCEP-CRAL Manual2019]
4. Soil Management Leaflets [KCEP-CRAL PAMHPLETS2019}
5. OFRA Technical Training Manual

MODULE 9
CROP PROTECTION AND HEALTH MANAGEMENT FOR AIVs

9.1 Introduction
Varying number of pests and diseases are a major constrain to ALV production across the country. Losses attributable to both pests and diseases vary between 20% and 100%. For some ALVs, there is little or no information on the type and prevalence of pests and diseases while for others extrapolation from related cultivated crops gives a reasonably accurate estimation of the type, severity and importance of some pests and diseases. The African nightshade, for instance, has more less the same pest and disease complex as tomatoes while jute mallow which is in the malvaceae family share pests and diseases with cotton and okra. Control strategies for both pests and diseases will borrow heavily from related crop species as well as strategies developed on other host crops. Opportunities exist to develop sustainable IPM approaches on most pests and diseases of ALVs and thus ensure better production systems than in exotic vegetables.

This module is intended to train the extension service to enable them acquire the knowledge, skills and attitude to assist ALVs farmers to practice and reduce yield loss from pests and diseases

9.2 Module learning outcomes
By the end of the module, the following outcomes should be achieved:
1. Steps in identification of pests and diseases described
2. Integrated pest and disease management approaches identified and explained
3. Safe use of pesticides explained

9.3 Module target group
This module targets service providers, public and private extension agents 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 Lead Farmers in the AIV value chain target Counties. The facilitator using this module should with the participant's handouts (training materials).

9.5 Module duration
Module is estimated to take 6 hours.

9.6 Module summary

Module 9: Crop Protection and Health Management for AIVs			
Sessions	**Training methods**	**Training materials**	**Time**
9.6.1 Introduction, objectives and expectations	• Self introduction • Plenary discussions	• Flips charts • Felt pens • Projector • Laptop	15 minutes
9.6.2 Introduction to economic pests of Pumpkins and their management strategies	• Plenary discussion • Group work to list major pests of AIVs • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.3 Introduction to major diseases of pumpkins and their management strategies	• Plenary discussion • Group work to list the major diseases • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /photos	35 minutes
9.6.4 Introduction to economic pests of spider plant and their management strategies	• Plenary discussion • Group work to bring out major pests • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.5 Introduction to economic pests of cowpea and their management strategies	• Plenary discussion • Group work to bring out major pests • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	30 minutes
9.6.6 Introduction to major diseases of cowpea and their management strategies	• Plenary discussion • Group work to list the major diseases • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes

9.6.7 Introduction to economic pests of Amaranth and their management strategies	• Plenary discussion • Group work to list the major pests • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.8 Introduction to major diseases of Amaranth and their management Strategies	• Plenary discussion • Group work to list the major diseases • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.9 Introduction to economic pests of African nightshade and their management strategies	• Plenary discussion • Group work to list the major pests • Group reporting	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.10 Introduction to major diseases of African nightshade and their management strategies	• Plenary discussion • Group work to list major diseases	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /photos	25 minutes
9.6.11 Introduction to economic pests of Slenderleaf and their management strategies	• Plenary discussion • Group work to list the major pests	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.12 Introduction to major diseases of Slenderleaf and their management strategies	• Plenary discussion • Group work to list the major diseases	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.13 Introduction to economic pests of Jute mallow and their management strategies	• Plenary discussion • Group work to list the major pests	• Flip charts • Projector • Laptop • Preserved or live specimens /pictures	30 minutes

9.6.14 Introduction to major diseases of Jute mallow and their management strategies	• Plenary discussion • Group work to list the major diseases	• Flip charts • Felt pens • Projector • Laptop • Preserved or live specimens /pictures	25 minutes
9.6.15 Module Review	• Plenary Discussions	• Flip chart • Felt pens	30 minutes
Total			**7 hours**

9.7 Facilitator's Guidelines

9.7.1 Introduction and levelling of expectations and objectives-(15 minutes)	**Session Guide**
Introduction (10 minutes) *(The trainer welcomes trainees to the module and. They are then invited to introduce themselves and state their expectations through group work).* **Module Objectives (5 minutes)** *(The trainer presents modules objectives)* **By the end of the module the trainee should be able to:** • Identify major pests of ALVs that cause economic losses. • Explain and describe sustainable Integrated ALVs pest management (IPM) practices and scouting for threshold determination. • Identify the symptoms for specific diseases common in ALVs producing areas. • Outline Integrated Disease Management (IDM) of ALVs. • Explain safe use of pesticides.	• Summarize trainees' "Expectations" on cards or flipchart and display • PowerPoint presentation • Distribute participants' handouts on module objectives and training program • Group formation Flip charts • Felt pens • Projector • Laptop
9.7.2 Introduction to economic pests of Pumpkins and their management strategies-25 minutes	**Session Guide**
Presentation-5 minutes • Major pests of pumpkins **Group work to bring out major pests-10 minutes** • Pumpkin pests from their counties • Pest management options from their counties **Group presentations-5 minutes** • Each group makes a presentation	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on pests and management options

Wrap up discussion-5 minutes Trainer guides discussion on what the trainees have learnt	• Distribute participants' handouts (brochures, Leaflets and manuals) on pests of pumpkins
9.7.3 Introduction to major diseases of pumpkins and their management strategies (35 minutes)	**Session Guide**
Plenary discussion-5 minutes • Major pests of pumpkins and their management strategies- **Group work to bring out major diseases- 10 minutes** • Pumpkin pests from their counties • Trainees list pest management options from their counties **Group presentation- 5minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on pumpkin diseases	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on diseases and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on diseases of pumpkins
9.7.4 Introduction to economic pests of spider plant and their management strategies (25 minutes)	**Session Guide**
Plenary discussion-5 minutes • Trainer presents on major pests of spider plant and their management strategies **Group work to bring out major pests of spiderplant-10 minutes** • Spiderplant pests from their counties • Pest management options from their counties **Group presentations-5 minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on spider plant diseases	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on pests and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on pests of spiderplant
9.7.5 Introduction to economic pests of cowpea and their management strategies (30 minutes)	**Session Guide**

Presentation-10 minutes • Trainer presents on major pests of cowpea-20 minutes **Group work-10 minutes** • Trainees list cowpea pests from their counties • Trainees list pest management options from their counties **Group presentations-5 minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on pests of cowpea	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on pests and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on pests of cowpea
9.7.6 Introduction to major diseases of cowpea and their management strategies (25 minutes)	**Session Guide**
Plenary discussion-5 minutes • Trainer presents on major pests of cowpea and their management strategies- **Group work to bring out major diseases- 10 minutes** • Trainees list cowpea pests from their counties • Trainees list pest management options from their counties **Group presentation- 5minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on diseases of cowpea	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on pests and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on diseases of cowpea
9.7.7 Introduction to economic pests of Amaranth and their management strategies (25 minutes)	**Session Guide**
Presentation-5 minutes • Trainer presents on major pests of amaranth -20 minutes **Group work-10 minutes** • Trainees list amaranth pests from their counties • Trainees list pest management options from their counties **Group presentations-5 minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on pests of amaranth	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on pests and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on pests of amaranth

9.7.8 Introduction to major diseases of Amaranth and their management strategies (25 minutes)	Session Guide
Presentation-5 minutes • Trainer presents on major diseases of amaranth - **Group work-10 minutes** • Trainees list amaranth diseases from their counties • Trainees list pestdisease management options from their counties **Group presentations-5minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** • Trainer guides discussion on what the trainees have learnt on diseases of amaranth	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on diseases and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on diseases of amaranth
9.7.9 Introduction to economic pests of African nightshade and their management strategies (25 minutes)	**Session Guide**
Plenary discussion-5 minutes • Trainer presents on major pests of African nightshade and their management strategies- • **Group work to bring out major diseases- 10 minutes** • Trainees list African nightshade pests from their counties • Trainees list pest management options from their counties **Group presentation- 5 minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on pests of African nightshade	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on pests and management options • Distribute participants' handouts (brochures, Leaflets) on pests of African nightshade
9.7.10 Introduction to major diseases of African nightshade and their management strategies (25 minutes)	**Session Guide**
Presentation-5 minutes • Trainer presents on major diseases of African nightshade **Group work-10 minutes** • Trainees list African nightshade pests from their counties • Trainees list pest management options from their counties	• PowerPoint presentation by trainer • Groups work on specimens, photos

Group presentations-5minutes • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on diseases of African nightshade	• Group representatives report on diseases and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on diseases of nightshade
9.7.11 Introduction to economic pests of Slenderleaf and their management strategies (25 minutes)	**Session Guide**
Plenary discussion-5 minutes • Trainer presents on economic pests of slenderleaf and their management strategies **Group work to bring out major pests of spiderplant-10 minutes** • Trainees list slenderleaf pests from their counties • Trainees list pest management options from their counties **Group presentations-5 minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on spiderplant diseases	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report pests and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on diseases of nightshade
9.7.12 Introduction to major diseases of slenderleaf and their management strategies (25 minutes)	**Session Guide**
Plenary discussion-5 minutes • Trainer presents one major diseases of slenderleaf and their management strategies **Group work to bring out major pests of slenderleaf -10 minutes** • Trainees list slenderleaf diseases from their counties • Trainees list disease management options from their counties **Group presentations-5** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on slenderleaf diseases	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on diseases and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on diseases of slenderleaf

9.7.13 Introduction to economic pests of Jute mallow and their management strategies (45 minutes)	Session Guide
Plenary discussion-10 • Trainer presents on major pests of Jute mallow and their management strategies **Group work to bring out major pests of spiderplant-10 minutes** • Trainees list Jute mallow pests from their counties • Trainees list pest management options from their counties **Group presentations-5** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on jute mallow pests	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on pests and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on pests of jute mallow
9.7.14 Introduction to major diseases of Jute mallow and their management strategies (25 minutes)	**Session Guide**
Presentation-5 minutes • Trainer presents on major diseases of Jute mallow **Group work-10 minutes** • Trainees list jute mallow pests from their counties • Trainees list pest management options from their counties **Group presentations-5minutes** • Each group makes a presentation **Wrap up discussion-5 minutes** Trainer guides discussion on what the trainees have learnt on diseases of jute mallow	• PowerPoint presentation by trainer • Groups work on specimens, photos • Group representatives report on diseases and management options • Distribute participants' handouts (brochures, Leaflets and manuals) on diseases of jute mallow
9.7.15 Module Review and Discussion (30 minutes)	**Session Guide**
The facilitator leads the trainees in reviewing the module). Summarize the main points of the training and together with the trainees review the main points. Discuss with trainees new things learnt from this Module. Let them identify some of the problems and issues that they have become more aware of in the module.	• The last participants' handouts • Summary of the main points from the module on a flip chart and display

9.8 Participants' Reference Materials

9.8.1 Participants' Handouts

MODULE 10
HARVEST AND POST-HARVEST MANAGEMENT OF AIVs

10.1. Introduction

This module is designed for training facilitators in knowledge and skills proper harvesting, post-harvest handling and adding value to AIVs after harvesting. Most AIVs valued for their leaves as food attain harvesting maturity from 4 to 6 weeks after planting when their nutrient concentrations are at peak. The AIV fruits such as pumpkins attain physiological maturity at approximately 5 to 6 months from planting date. It is at this stage that they are commonly considered palatable and highly nutritious. The harvesting methods applicable to AIVs valued for their leaves include cutting the whole plant at the base (above the first four nodes), picking the tender stems and leaves only (leaving the flowers intact), cutting the tender stems, leaves and flowers, picking the leaves only (and leaving the stems and flowers intact) and uprooting the entire plant four to five weeks after sowing. The recommended time for harvesting AIVs is early in the morning so as to obtain high quality produce for fresh markets. When harvested and kept under low temperatures, the AIVs remain appealing to consumers. AIVs are highly perishable (easily deteriorate in quality) and if not handled properly after harvesting, losses of between 20-45 per cent can be incurred. If adequate plans have not been made for preservation, farmers dispose what they produce immediately after harvesting and this reduces income and affects future production plans. There are opportunities in earning more income through proper postharvest management practices (value addition). In AIV producing areas, farmers engage buyers in harvesting AIVs. The buyers then package and cart away the fresh produce to market destinations.

Farmers invest very little effort in postharvest management due to a number of reasons. Development agencies have supported value adding activities in AIVs in different production areas but marketing strategies are lacking.. The trained AIV farmer groups do not have the organizational structures for execution of any existing postharvest management strategies they have learnt. It is common to find the producer group's executive committee members marketing processed products during exhibitions, field days and shows instead of engaging workers on commission to market their produce.

Where processing facilities have been provided by projects or development agents, rarely are marketing plans and operations and maintenance procedures developed and in place. The groups therefore lack knowledge in organizational development of postharvest activities and face capacity and infrastructural constrains. This limits post-harvest enterprise development

10.2 Module Learning Outcomes

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

1. Explain the whole range of postharvest practices for AIVs.
2. Identify and prioritize value addition opportunities in AIVs value chain as a postharvest practice.
3. Demonstrate how to develop a value addition strategy for the priority opportunities emphasizing on suitability and growth.

10.3 Module Target Group
This module targets service providers, public and private extension agents and lead farmers

10.4 Module Users
This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT) and Lead Farmers in the AIV value chain target Counties. The facilitator using this module should be well conversant with the participant's Handouts (training materials).

10.5 Module Duration
The Module is estimated to take 3 hours and 10 minutes

10.6 Module Summary

Module 10. Post-harvest management of African Indigenous Vegetables			
Sessions	**Training Methods**	**Training Materials**	**Time**
10.6.1 Introduction, Expectations Objectives	Personal introduction Discussion on expectations Plenary presentation	• Flip charts • Felt pens • Projector • Laptop	30 minutes
10.6.2 Sorting and grading of AIVs	Plenary presentations Group Exercise	• Projector • Participants' handouts • AIV TIMPs manual	30 minutes
10.6.3 Cooling of AIVs Importance of cooling vegetables Cooling methods: • Zero Energy Cooler • CoolBotTM • WakatiTM technology	Plenary presentation On-farm practical demonstration	• Projector • Laptop • Participants' handouts • AIV TIMPs manual	30 minutes

10.6.4 Modified Atmosphere Packaging of AIVs Importance of Modified Atmosphere Packaging (MAP) Types of MAP: • Ziploc® bag • Xtend® bag packaging	Plenary presentation Practical demonstration Group exercise	• Projector • Laptop • Ziploc® and Xtend® bag packaging • Sample vegetables • Participants handouts • AIV TIMPs manual	1 hour
10.6.5 Module review	Facilitator's summary Group Exercise	• Module review • The module's handouts	30 minutes
TOTAL			**3 hours**

10.7 Facilitators guidelines

Module 10: Post-harvest management of AIVs	
9.7.1 Introduction and levelling of expectations and objectives (30 minutes).	**Session Guide**
Introduction and Module Objectives (15 minutes) *(The facilitator welcomes trainees to the module on Postharvest Management of AIVs and introduces him/herself by stating his/her profile and experience.)* The facilitator presents module's objectives By the end of the module trainee should be able to: • Explain the whole range of post-harvest practices for AIVs • Explain the importance of sorting and grading in AIVs value chain as postharvest practice • Explain the cooling methods of AIVs • Explain Modified Atmosphere Packaging (MAP) of AIVs **Expectations (15 minutes)** Assist the trainees to state their expectations based on the objections	Handouts • Program • Note books • pens Use PowerPoint Summarize trainees' "Expectations" and display on flip chart/ board.
10.7.2. Sorting and grading of AIVs (30 minutes)	**Session Guide**
(Discuss importance of sorting and grading of vegetables and the various grades obtainable) **Plenary presentation (20 minutes)** • Summarize the importance of sorrting in postharvest management of vegetables, and quality life of vegetables under • Describe the various grades methods	Use PowerPoint Handouts • AIV manual • Brochures • Leaflets • Factsheets

Group Exercises (10 minutes) Let the trainees recall what they learned, raise issues on vegetable grading and sorting and discuss	
10.7.2 Cooling of AIVs (30 minutes)	**Session Guide**
(Discuss importance of cooling of vegetables and the various cooling methods – Zero Energy Brick cooler, Evaporative Charcoal Cooler, CoolBot™, Wakati™ technology) **Plenary presentation (20 minutes)** • Summarize the importance of cooling in postharvest management of vegetables, and shelf-life of vegetables under different storage temperatures • Describe the various cooling methods **Group Exercises (10 minutes)** Let the trainees recall what they learned, raise issues on vegetable cooling and discuss	Use PowerPoint Handouts • AIV manual • Brochures • Leaflets • Factsheets
10.7.3 Modified Atmosphere Packaging of AIVs (1 Hour)	**Session Guide**
(Facilitator uses slides to train) **Plenary presentation (20 minutes)** The processes of Modified Atmosphere Packaging (MAP) of vegetables **Group Exercises (10 minutes)** Let the trainees recall what they learned, raise issues on MAP and discuss **On-farm practical demonstration (30 minutes)** Demonstrate to trainees: • The modified atmosphere packaging of vegetables • How AIVs are packed in Ziploc® and Xtend® bags, and Wakati™ technology	• Power point • Handouts • AIV manual • Brochures • Leaflets Requirements: • Ziploc® and Xtend® bag packaging Sample vegetables
10.7.5 Training review (30 minutes)	**Session Guide**
(The facilitator should be able to lead the trainees in reviewing the module) **Plenary presentation** Together with the trainees, summarize the main points of the training.	Summary of the main points from the Module.

Group Exercise Together with the trainees review the main points about AIV post-harvest handling • What new things did you learn from this Module? • What are some of the problems and issues that you have become more aware of in harvesting and post harvesting? • What questions do you still have about post-harvest handling?	

10.8 Participants' Reference Materials

10.8.1 Participant's Handouts

1. Factsheets
2. AIV TIMPs manual
3. AIV production Guides [2017]
4. AIV leaflets
5. Brochures 2017

10.8.2 References

Wayua, F.O., and Ndinya, C. (2018). Postharvest Handling of Indigenous Leafy Vegetables in Kenya: Manual for Extension Workers.KALRO-Kakamega. HortinLea Project Reports. Purdue Project Documents

MODULE 11

VALUE ADDITION OF AFRICAN INDIGENOUS VEGETABLES

11.1. Introduction

Consumption of African Indigenous Vegetables (AIVs) in Kenya has grown exponentially over the years due to increased consumer awareness on the vegetables' health benefits. In the last two decades, the AIVs have moved from the rural farms and markets to the urban markets including supermarkets. Although the some AIVs are now more accessible in urban grocery stores, their uptake and consumption is still low. Consequently, the dissemination of value addition strategies would spur increased production and maximize incomes for smallholder AIV farmers. AIVs utilization at household level is very low due to inadequate knowledge of the various opportunities and recipes for value addition and products diversification for home consumption and small scale businesses. Generally, AIVs traditional recipes are less appealing to youth and children. It is therefore envisaged that promotion of value-added products will greatly enhance adoption, production and home consumption. This module is designed for equipping the extension service with AIV value adding options and skills for training AIV farmers.

11.2 Module Learning Outcomes

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

1. Solar drying of AIVs explained
2. Recipes for AIV value added products described
3. Value addition opportunities in AIV value chain identified and prioritized
4. A value addition strategy for the priority opportunities emphasizing on suitability and growth demonstrated.

11.3 Module Target Group

This module targets public and private agricultural extension service providers, home economics and food utilization extension staff and private extension service providers.

11.4 Module Users

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

11.5. Module Duration

The Module is estimated to take **6 hours 30 minutes**

11.6. Module Summary

Module 11. AIV value addition			
Sessions	**Training Methods**	**Training Materials**	**Time**
11.6.1 Introduction, Objectives Expectations	Introduction Presentation Plenary Presentation	Flip charts Felt pens Projector Laptop	30 minutes
11.6.2 Solar drying of vegetables	Introduction Presentation Plenary Presentation	Flip charts Felt pens Projector Laptop	30 minutes
11.6.3 Introduction to recipes for AIV value added products	Plenary Presentation Group Exercise	Projector Recipe books, leaflets Manual	1 hour
11.6.3 Making of different AIV value added products	Practical demonstration Group Exercise	AIVs, pumpkin flour, AIV flours, and other ingredients	2 hours
11.6.4 Prioritizing opportunities in AIV value addition	Group exercise Plenary Presentations	List of value added products Checklist for prioritization Pair wise ranking tool Flip charts	1 hour
11.6.5 Value addition strategy development	Group exercise Plenary Presentations	Flip charts Felt pens Manilla paper	1 hour 30 minutes
11.6.5 Module review	Facilitator's summary Group Exercises	Module review Participants handout	30 minutes
TOTAL			**7 hours**

11.7. Facilitators Guidelines

AIV value addition	
11.7.1 Introduction and levelling of expectations and objectives (30 minutes)	**Session Guide**
Introduction and Module Objectives (15 minutes) *(The facilitator welcomes trainees to the module and invites them to state their expectations)* The facilitator presents modules objectives. **Module Objectives** By the end of the module the trainees should be able to: • Explain solar drying of AIVs • Describe recipes for AIV value added products • Identify and prioritize value addition opportunities in AIV value chain • Demonstrate value addition strategy for the priority opportunities emphasizing on suitability and growth demonstrated. **Expectations (15 minutes)** Assist the trainees to state their expectations based on the objections	Handouts • Program • Note books • pens Use PowerPoint Summarize trainees' "Expectations" and display on flip chart/board.
11.7.2 Introduction to recipes for AIV value added products (1 hour)	**Session Guide**
(Present slides on AIV recipes for the various products) **Plenary Presentation (30 minutes)** **AIV nutritive value and Recipes** Facilitator gives a PowerPoint presentation on nutritive value of AIVs and value added products (fermented vegetables, solar dried vegetables, frozen products -flour, cake, biscuits, cake and chapati) **Group Exercises (30 minutes)** Allow trainees discuss and raise issues on the nutritive value of AIVs and each AIV recipe they learnt about	Use PowerPoint Handouts -AIV manual Recipe books Sample vegetables and other processing ingredients

11.7.3. Making of different AIV value added products (2 hours)	Session Guide
Practical demonstration (2 hours) *(Facilitator guides the trainees in making the various products using the recipes introduced).* • Divide the trainees into groups. Provide necessary equipment • Let each group choose one recipe for preparation • Put the groups back together and analyse the products made. .	• Handouts • AIV manual • Recipe books • Requirements - Ingredients - Utensils - Cooking facilities • The facilitator may require a home economist to backstop
11.7.4 Prioritizing opportunities in AIV value addition (1 hour)	**Session Guide**
Group exercise (30 minutes) *(Facilitator guides the trainees to prioritize the AIV value added products).* • Divide the trainees into groups. • Provide flipcharts, manila papers and pelt pens to each group. • Let each group list the products developed in sessions 3 above. • Assist the groups to priorities the listed products using pairwise ranking tool and present them. Summarize the group work with the ranked list of products. **Group Exercise (30 minutes)** Allow trainees to raise any issues on AIV value added products ranking and discuss them.	• Handouts • AIV manual • Brochures • Leaflets The Requirements Checklist for prioritization Pair wise ranking tool
11.7.5 Value addition strategy development (1 hour 30 minutes)	**Session Guide**
Focused group discussion (1 hour) *(Facilitator guides the trainees to develop the strategies for the value added products).* • Divide the trainees into groups. Provide flipcharts, manila papers and pelt pens to each group. • Let each group discuss and come up with market strategies for the ranked products.	• Handouts • Flip charts • Felt pens • Participants, handouts • sample charts

Let each group present their strategies, discuss them and come up with a way forward. **Plenary Presentation (30 minutes)** Summarize the group work to come up with a list of market strategies for the products	
11.7.6 Training review (30 minutes)	**Session Guide**
(The facilitator should be able to lead the trainees in reviewing the module). **Group Exercise (30 minutes)** Review the main points about AIV Value addition together with the trainees. · What new sets of skills and knowledge did you learn from this Module? · What are some of the problems and issues that you have become more aware of in AIV value addition? · What questions do you still have about AIVs value addition?	Summary of the main points from the Module.

11.8 Participants' Reference Materials

11.8.1 Participants' Handouts

- AIV Manual
- Pamphlets, leaflets.
- Recipe books

MODULE 12

MECHANIZATION OF AFRICAN INDIGENOUS VEGETABLE PRODUCTION ACTIVITIES

12.1 Introduction

Agricultural mechanization supports the enhancing of production, productivity and profitability in agriculture by achieving timeliness in farm operations. It comes along with precision in metering and placement of inputs, reducing available input losses, increasing utilization efficiency of costly inputs (seed, chemical, fertilizer, irrigation, water. etc.), reducing unit cost of produce, enhancing profitability and competitiveness in the cost of operation. It also helps in the conservation of agricultural produce and by-products from qualitative and quantitative damages; enables value addition and establishment of agro processing enterprises for additional income and employment generation from farm produce. Agricultural mechanization is one of the important inputs that has potential to revolutionize AIV farming in Kenya especially when applied to planting, weeding, pest control, harvesting and post-harvest 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. Calibration of fertilizer and seed rates for planters described and explained
3. Use of pest control implements and tools demonstrated
4. Harvest timing and yield estimation demonstrated.

12.3. Module Target Group and Categories

This module is intended for use by service providers, public and private 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). The facilitator using this module should thoroughly familiarize themselves with the participant's handouts.

12.5. Module Duration

The Module is estimated to take **4 hours**

12. 6: Module Summary

Module 12. Mechanization of AIV production activities			
Sessions	**Training methods**	**Training materials**	**Duration**
12.6.1 Introduction, objectives and expectations	• Self-introductions • Presentations • Plenary discussions	• Flip charts • Felt pens • Projector • Laptop	30 minutes

12.6.2 Climate smart tillage options	• Presentations • Plenary discussions	• Flip chart • Felt pens • Projector • Laptop • Participants' handouts	30 minutes
12.6.3 Calibration of fertilizer and seed rates for planters	• Presentations • Plenary discussions	• Flip chart • Felt pens • Projector • Laptop • Participants' handouts • Practical	30 minutes
12.6.4 Pest and Weed control equipment and tools usage	• Presentations • Plenary discussions	• Flip chart • Felt pens • Projector • Laptop • Participants' handouts • Practical	30 minutes
12.6.5 Harvest timing, yield estimation machines and tools, Estimation of harvesting losses	• Presentations • Plenary discussions	• Flip chart • Felt pens • Projector • Laptop • Participants' handouts • Practical	1 hour
12.6.7 Module review	• Presentations	• Projector • Laptop	30 minutes
Total			**3 hours, 30 minutes**

12.7 Facilitator's Guidelines

Mechanization of AIV production activities	
12.7.1 Introduction, Objectives and Expectations (30 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module on mechanization of AIV production activities. They are then invited to introduce themselves and state their expectations). **Module Objectives (30 minutes)** The facilitator presents modules objectives By the end of the module the trainee should be able to: • Identify and explain various climate smart tillage operations • Describe and explain calibration of fertilizer and seed rate for planters • Demonstrate weed control equipment and tools, usage • Explain timing of harvest and estimation of yield *In each case stating approximate prices and availability of machines	• Summarize trainees' "expectations" and display. • PowerPoint Presentation • Distribute Participants' Handouts on Module Objectives and Training Program
12.7.2. AIV climate smart land preparation tools (30 minutes)	**Session Guide**
(The facilitator presents on recommended land preparation tools for use in AIV production). **Plenary Presentation (20 minutes)** PowerPoint Presentation Highlighting: • Overview of the AIV mechanization activities • Climate smart tillage options **Discussion (10 minutes)** Let the trainees recall what they learned and discuss any issue that may arise	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual • All participants
12.7.3. AIV calibration of fertilizer and seed rate for planters (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) PowerPoint Presentation Highlighting on: • Techniques and methods of planter seed and fertilizer rate determination **Discussion (10 Minutes)** Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual

13.7.4. AIV Chemical implements and tools operations (30 minutes)	Session Guide
Plenary Presentation (20 minutes) PowerPoint Presentation Highlighting on: • Techniques and methods of using AIV pest control equipment such as knap sack **Discussion (10 Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
12.7.5. AIV Harvest timing, yield estimation machines and tools , Estimation of harvesting losses (1 hour)	**Session Guide**
Plenary Presentation (30 minutes) PowerPoint Presentation Highlighting on: Harvest timing and estimation of yield **Discussion (30 Minutes)** Let the trainees recall what they learnt and discuss any issues that may arise	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
12.7.6 Module review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module). Summarize the main points of the training and together with the participants review the main points: • Various climate smart tillage operations • Calibration of fertilizer and seed rate for planters • Chemical implements and tools operations • Optimal crop AIV harvesting stage and yield estimation *(Discuss new sets of skills and knowledge learnt from this Module with trainees. What are some of the problems and issues that they have become more aware of in the module)?*	· The last participants' handouts · Summarize the main points from the module on a flip chart and display

12.8 Participants' Reference Materials

12.8 Participants' Handouts

- KCEP AIV Manual
- Pamphlets, leaflets.

MODULE 13
AIVs BUSINESS AND MARKET ASSESSMENT

13.1. Introduction
In Kenya, African Indigenous Vegetables (AIVs) farming is mainly carried out at subsistence level, without target markets. Rarely is enterprise analysis and planning done before establishing an enterprise mainly due to poor attitude to business, and inadequate knowledge and skills to undertake the farming as a business. Hence AIVs farming is undertaken as a traditional pastime rather than a business. Considering AIVs farming as a business is important because Kenya is facing a high rate of unemployment and poverty and agribusiness is seen as the best way to create more jobs and alleviate poverty.

Farming as a business requires enhanced skills and knowledge in agribusiness and market assessment to provide key information about the market for informed decision making. Currently, there is disconnect between production and marketing where most farmers believe their role ends at the production node, hence most produce and sell instead of producing to sell. Often, selling of farm produce is done at the farm gate which is characterized by exploitation from middlemen who facilitate farmers marketing through engaging in upstream value chains activities like sorting, grading, packaging, storage and bulking. This denies the farmers access to existing markets thus depriving them from earning justified income based on the quality and quantity of their produce. In the process, the middle men may earn more than the farmers. Conducting AIVs farming as a business requires timely availability of consumer preferred AIV products in the right quantities, quality, packaging and prices.

This module is designed to impart Trainer of Trainers with knowledge and skills that are useful in making AIVs farming a business and how to empower smallholder farmers to increase productivity and improve marketing for enhanced incomes.

13.1. Module Learning Outcomes
By the end of the module section the following outcomes should be achieved:

1 Skills and knowledge to facilitate farmers to adopt the concept of farming as a business improved
2 Knowledge and skills to guide farmers in enterprise analysis and development developed
3 Capacity to develop an AIV enterprise business plan obtained.
4 Market assessment methods and tools identified
5 Capacity to conduct market assessment enhanced
6 Capacity to facilitate farmers or their groups in developing a marketing plan improved.

13.2. Module Target Group
This module is designed for use in training extension workers, private extension service providers dealing directly with farmer groups at community level and lead farmers on quality AIVs production as a business to improve their knowledge, skill and attitude on AIVs farming as a business.

13.3. Module Users

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

13.4. Module Duration

The Module is estimated to take 8 hours

13.5 Sub-Module Summary

Sub-module on AIV agribusiness			
Sessions	**Training Methods**	**Training Materials**	**Time**
13.5.1. Agribusiness 13.5.1.1. Introduction, Climate setting, levelling of expectations and objectives.	Trainees introduction, setting of training norms and commissions and group discussions on expectations	Flip charts Mark pens and Projector Laptop	30 minutes
13.5.1.2. Introduction to AIV business management	Presentations and plenary discussions	Flip charts Mark pens and Projector Laptop	40 minutes
13.5.1.3. The concept of commercial farming.	Presentations and plenary discussions	Projector Laptop	1 hour
13.5.1.4. The key requirements for an agribusiness enterprise.	Presentations and plenary discussions	Flip charts, Mark pens Projector Laptop	1 hour
13.5.1.5. Record keeping in agribusiness.	Presentations and plenary discussions	Power point, Laptop Flip charts, Mark pens Projector	1 hour
13.5.1.6 AIV Gross Margin Analysis	Presentations and plenary discussions	Projector Laptop Flip charts Marker pens	40 minutes
13.5.1.7. AIV Business planning	Presentations and plenary discussions	Projector Laptop	20 minutes

13.5.1.8. AIV business financing	Presentations and plenary discussions	Flip charts, Mark pens Projector Laptop	40 minutes
13.5.1.9 Module Review	Plenary discussions	Projector Laptop Flip chart Marker pens	30 minutes
TOTAL			**5 hours, 20 minutes**

13.6 Facilitator's guidelines

13.6.1 Introduction, climate setting Leveling Expectations and Objectives (30 minutes)	**Session Guide**
(The facilitator welcome trainees to the module and invites them to introduce themselves stating expectations and leads in climate setting). **Trainee introduction and climate setting** Introduction of trainees using a check list, setting training norms, and trainees to share their expectations. **Plenary presentation on module Objectives** The facilitator presents modules objectives in power point By the end of the module the trainee should be able to: • Facilitate farmers to adopt the concept of farming as a Guide farmers in enterprise analysis and development developed • Develop an AIV enterprise business plan obtained. • Identify Market assessment methods and tools • Conduct market assessment enhanced • Facilitate farmers or their groups in developing a marketing plan improved.	• Provide checklist for introduction of trainees to help them build confidence in participation • Summarize and display trainees expectations • Set Norms and nominate leaders • Power point presentation on the Objectives of the AIVs training module.

13.6.2. Introduction to AIVs Business Management (40 minutes)	Session Guide
(The facilitator defines the term business, facilitates comparison between farming and a common business in the area as well as explain common terms used in business). The first point to make is that this is not so; the vast majority of small holder farmers in Kenya practice farming as a subsistence activity and only make sales without seriously considering profit. They sell to raise cash for other uses at farm and in their households. Ask these questions to initiate discussion about the session • What is a business? • What business are we familiar with? • What is agri-business? Describe/define an agri-business **Presentation on Common Terms used in Business** *(Introduce the common terms used in business and relate them to AIV farming.* Terms: Production costs, Labour cost, Yield/output, Producer price, income, Person-day, Middlemen, Saving, Credit, Value adding, Record Keeping **Characteristics of a Good Business Venture** Lead the participants to *explain the characteristics of a good business* **1. Group Exercise** Participants' Handouts number 1.6.2 will be used for group exercise. Distribute it to each participant *Facilitator asks the trainee groups to answer the following questions to compare a common retail enterprise (shop) with an agri-business on aspect of inputs, operations, financing marketing cost and record keeping"*	List the answers on flip charts Distribute Participants' Handouts 1.6.2: Definition and comparisons between farming and retail shop (business) Distribute the Participants' Handouts 1.6.3 Common terms and characteristics of a good business.

13.6.3. Concept of Commercial Farming (1 hour)	Session Guide
(The facilitator conducts an exercise on comparison between subsistence and commercial farming and leads discussion on the principles of management in relation to farming as a business). Farmers are either subsistence or commercial farmers. Subsistence farmers grow mainly for home use and only sell surplus. Commercial farmers produce for sale and consume surplus. **3.6.3.1 Group Exercise *(comparison between commercial and subsistence farming undertakings)*** In your groups, make a comparison between subsistence and commercial farming by following the table provided. This is in relation to input requirements, operational and marketing activities as follows: 1. What are the inputs involved in either of the system? 3. What are the operational activities involved in each of the two? 4. What are the marketing activities in each of the two? *Ask one of the groups to present as other discuss. Summarise the key points.*	Distribute Participants' Handout 1.6.4: Comparing commercial farming to traditional subsistence farming Make a summary of the points raised by the groups and share the results
13.6.3.2 Principles of Business Management *(Referring to Handouts 1.6.2 on definition and comparison of businesses, discuss the principles of management)* Describe Principles of business management. In plenary let participant mention what these principles stand for.	List the answers on a flip chart. Distribute Participants' Handouts 1.6.5: Principles of management and summarize the principles

13.6.4. Key Requirements for an Agri-business Enterprise (1 hour)	Session Guide
(The facilitator leads discussion on the key requirements for production and marketing as well as costs related to production and marketing). Ask the participant to discuss on and outline the inputs, operation and marketing requirement for production *(refer to Participants' the Handout Comparing commercial farming to traditional subsistence farming)* Facilitator gives comparison of farming as a business and presents the following: **13.6.4.1. Key Requirements for ALVs Enterprise** 1. Inputs required 2. What are the operational activities involved? 3. Marketing requirements What are the costs for production and marketing?	Each group to brainstorm of each question. Distribute Participants' Handouts 1.6.6: Key requirements for enterprise. Participants' Handouts 1.6.7: Costs of Production and marketing
13.6.5. Record keeping (1 hour)	**Session Guide**
Ask participants to discuss their views on the following aspects of records: 1.What is a record 2. Why do we need farm records 3. Types of farm records 4. How to keep records *(Summarize by facilitating a discussion on "record keeping*)	Participants' Handouts on types of records and importance of record keeping Participants' Handouts 1 Strategies to enhance returns from farming
13.6.6. ALVs Gross Margin Analysis **(40 minutes)**	**Session Guide**
(The facilitator guides a discussion on gross margin analysis and net income calculations). **13.6.6.1 Presentation and Discussion** Facilitator leads discussion on what a farmer needs to know or understand in order to know how a business performs and in order to decide on production. From the consideration identified above, work out the profitability of the farming either up to selling at farm level or including marketing. Conduct a gross margin analysis that will trainees understand the business well.	List answers on flip chart. Distribute Participants' Handouts 1.6.9: farming gross margin analysis

13.6.6.2 Present The Gross Margin Analysis Define/ explain Gross margin Formula for calculating gross margin Data required for computation of Gross Margin **13.6.6.3 What are the benefits of Gross Margin analysis?** Cost considerations if a farmer is also engaged in marketing the produce beyond farm gate. Group exercise – in groups trainees carry out gross margin analysis for AIV value chain by filling in the chart provided after group exercise one. Group presents while and another contributes in the discussion. **13.6.6.4 Strategies of Enhancing Returns from the AIVs farming** Ask participants to mention cost saving and income enhancing strategy for a farm. Then present in plenary *(Summarize by facilitating a discussion on "What other strategies can a farmer engage in to enhance return from AIVs)?*	Distribute handout 1.6.10 Group exercise Session guide
13.6.7 Business Planning (20 minutes)	**Session Guide**
(The facilitator should be able to define the business plan, give its importance as well as explain the keys parts). **13.6.7.1 Business Plan Definition** Initiate discussion by asking what a business plan is, then present in the plenary Facilitator presents the following: Definition/explanation of a business plan **13.6.7.2. The Benefits of a Business Plan** **13.6.7.3. Facilitator presents Parts of a Business Plan** • Present the 6 parts of a business plan	Distribute the Participants' Handouts 1.6.11: Business Planning Distribute Participants' Handouts 1.6.12: Components of a business plan .

13.6.8. Business Financing (40 minutes)	Session Guide
(The facilitator defines business financing, explain the types, sources and costs of acquiring the finance). Every business requires financing for inputs and operations. **13.6.8.1. What Is Business Financing?** Facilitator presents business financing and leads discussion on:- 1. Types of finances available to the farmers in the trainees area. 2. Sources of finances for farming: External and Internal sources **13.6.8.2. Group Exercise on Business Planning** (The facilitator to conduct a group exercise and have the groups identify the internal and external sources of finances and state their advantages and their disadvantages). In plenary discuss how to carry out a business plan for an enterprise.	Participants' Handouts 1.6.13: Sources of business finances. Cost and advantages Distribute Handouts 1.6.14 Steps in business planning Session guide
13.6.9. Module Review (30 minutes)	**Session Guide**
(The facilitator should be able to help the participant to review the module training by looking at what the message is and its application to farming as a business). Let's review together the main points about farming as a business. • What new things did you learn from this Module? • What are some of the problems and issues that you have become more aware of in the farming as a business module? • What questions do you still have about seed selection and handling? This last Participants' Handout that summarizes the main points from the Module. • Who can explain the first point-the message and its application? The second message? The third message? Thank you for joining us in this module, and we hope to see you in other modules in the future.	Distribute Participants' Handouts 1.6.15: Message from farming as a business module

13.7 Market assessment sub-module Summary

13.7.1 MARKET ASSESSMENT			
Sessions	**Training Methods**	**Training Materials**	**Time**
1. Introduction and levelling expectations	· Buzz · Presentation	· Participants' handouts · Felt pens, masking tapes and sticker glue · Laptop	10 minute 10 minutes
2. Introduction to market assessment	· Plenary presentation and discussions	· Flip charts feltpens · Projector · Laptop	30 minutes
3. Market assessment plan	· Buzz activity · Presentation discussion	· Flip charts · Marker pens · handouts	10 minute 20 minutes
4. Market assessment tools and procedures	· Presentation · Plenary discussion	· Projector/Flip charts · Laptop · Marker pens · handouts · Note books	20 minutes 20 minutes
5. Practical market assessment	· Market walk · Plenary discussions of data collected	· Samples for assessment · handout - Checklist/ tools · Flip charts · Marker pens	· 100 minutes · 30 minutes
6. Analysis of market data	· Plenary discussion · Plenary presentation	· Flip charts · Marker pens · Analysis template · Participants' handouts	· 20 minutes · 20 minutes
7. Developing a marketing plan	· Plenary discussion · Group exercise · Discussions	· Participants' handouts · Power point slides · Flip charts, felt pens	· 20 minutes · 50 minutes · 20 minutes
8. Module review	· Participants' Facilitator's summary	· Participants' handouts module review	· 20 minutes
TOTAL			2 hour 40 minutes

13.7.2 Facilitator's guidelines for AIVs training in market assessment

Sessions	Training Methods	Training Materials	Time
1. Introduction and levelling expectations	· Buzz · Presentation	· Participants' Handouts · Felt pens, masking tapes and sticker glue	· 10 minutes · 10 minutes
2. Introduction to market assessment	· Plenary presentation and discussions	· Flip charts felt pens · Projector	· 30 minutes
3. Market assessment plan	· Buzz activity · Presentation discussion	· Flip charts · Handouts	· 10 minutes · 20 minutes
4. Market assessment tools and procedures	· Presentation · Plenary discussion	· Projector/Flip charts · Handouts · Note books	· 20 minutes · 20 minutes
5. Practical market assessment	· Market walk · Plenary discussions of data collected	· Samples for assessment · Handout - Checklist/ tools · Flip charts	· 60 minutes · 30 minutes
6. Analysis of market data	· Plenary discussion · Plenary presentation	· Flip charts · Analysis template · Participants' handouts	· 20 minutes · 20 minutes
7. Developing a marketing plan	· Plenary discussion · Group exercise · Discussions	· Participants' handouts · Powerpoint slides · Flip charts, felt pens	· 20 minutes · 20 minutes · 20 minutes
8. Module review	· Participants' Facilitator's summary	· Participants' · Handouts module review	· 20 minutes
TOTAL			· **3 hour 30minutes**

13.7.3. Facilitator's Guidelines

13.7.3.1. Introduction and levelling expectations (20 minutes)	Session Guide
(The facilitator welcomes trainees to the market assessment sub-module. The facilitator invites the trainees to state their expectations).	Have Participants' brainstorm in pairs and let them agree on at least one thing they expect to learn from this course. Summarise Participants' "Expectations" on a flipchart and make displays.
Module Objectives *(The facilitator presents modules objectives)* 1. By the end of the training, the trainees should be able to:: 2. Identify the market assessment methods and tools 3. Conduct a market assessment 4. Facilitate farmers or farmer groups in developing a marketing plan.	Distribute Participants' Handouts 1.7.1: Module Objectives.
13.7.3.2. Introduction To Market Assessment (30 minutes)	**Session Guide**
(The facilitator introduces market assessment to the participants). Facilitator defines market, marketing and market assessment, and give market dimensions as well as benefits of market assessment and leads discussion on need to take farming as a business and the importance of understanding how that market operates, as a key step in the market development.	Let the participants brainstorm and definition of terms in Market assessment Discuss with the participants about their perception of terms. Present the definitions of markets, dimensions od markets and market assessment As you present this discuss in plenary with participants why their discussion is important, using flip chart or PowerPoint Present in plenary on flip chart or PowerPoint Distribute Participants' Handouts 1.7.2: Definition, dimension and benefits

13.7.3.3. Market Assessment Plan (30 minutes)	Session Guide
(The facilitator explains the steps to follow when doing market assessment) Buzz exercise *"What should the market assessment report tell a reader?"* Let them discuss in pairs for 5 minutes and present to plenary in another 10 minutes **List and discuss information to be collected for Market Assessment**	List down the need for market assessment on flip chart as they are mentioned Present in plenary Distribute Participants' Handouts 1.7.3: information required from a market assessment exercise Hand out: Include collective action as strategy for input access and produce marketing through economies of scale; Helps plan timely acquisition of inputs and delivery of produce to market.
13.7.3.4. Market Assessment Tools And Procedures (40 minutes)	**Session Guide**
(The facilitator helps the participants to develop the market assessment tools and carry out a simple market assessment). Facilitator presents the following; **4.1 Factors To Consider In Market Assessments** **4.2 Sources of Market Information** **4.3 Market assessment Tool** Importance of an appropriate mix of the following tools **4.4 Procedure for Market Assessment** Preparation Field Data Collection Analysis, Conclusions, Recommendations and Action Planning	Plenary presentation and discussion Plenary presentation Distribute Participants' Handouts 1.7.4: Tools used in market assessment. Distribute Participants' Handouts 1.7.5 generic questions for a check list or questionnaire Plenary presentation Distribute Participants' Handouts 1.7.6 Procedures for market assessment and decision making

13.7.3.5. Practical Market Assessment (2 hours 10 minutes)	Session Guide
The facilitator organises for a market tour with the participants to collect data using the tools developed. this should be by: Group exercise - Preparation for market assessment *(The facilitator enables the participants to develop the check list for each of the tools to be used in market data collection).* Develop the objectives for the visit · Organise with the market outlets about the visit · Planning with the participants on the materials required, roles of team members, brief them about the tools to use and timelines · Organise the logistics for the visit- transport, appreciation to the host · Carry out the visit · Prepare a report and share in plenary at training venue) **Preparation For A Market Assessment Tools (30 minutes)** Group exercise: Let each group develop a maximum of 5 simple questions for the following: Aggregators, loaders, and transporters; wholesaler, s retailers, market manager and other key informants, group of consumers **Market Visit (30 minutes)** Facilitate the groups collect data from a local urban set up using personal interview, FGD or observation tools. After the market visit, let them prepare the information needed ready for analysis.	Handouts 1.7.7: preparation for a market assessment visit Plenary discussion Present the exercise as in Handouts 1.7.8. Group exercise Ask each group to present the 5 questions for the tool they shall use Avail transport to and from the urban set up Session guide

13.7.3.6. Analysis of Market Data (40 minutes)	Session Guide
(The facilitator leads the participants in analysing the market data collected and preparing for development of a marketing plan). Ask the groups to present the information the collected on flip charts and display in the training hall	Display flip charts on the way for ease of reference in next sessions
Need For Analysis · Generating lists of names and number of market players, their contacts and locations · Generating average prices, volumes and trends · Calculating value added by each player as product moves to the consumer, identifying challenges and opportunities	Plenary discussion
After analysis, the data is presented in tables and charts for ease of making conclusions and recommendations.	
The analysis will help us to better understand the market characteristics and using our SWOT this will help in the strategic market planning for the produce.	
Analysis Results, Conclusions and Recommendations Facilitator leads discussion on the key analysis results desired in a market assessment and the include information to be included:	
Conclusions and recommendations and lastly action planning on: 1. Who should be my best customer/ market segment-aggregator, wholesaler or retailer? 2. How much produce can be taken by that segment at a time and at what price? Is it worthwhile to invest in value addition (sorting and grading, transport, storage, transport)? 3. Any other depending on farmer/farmer group problem statement of goals 4. What kind of marketing plan is required?	Distribute Participants' Handouts 1.7.9 Data analysis, conclusions and recommendations

13.7.3.7. Developing A Marketing Plan (1 Hour 30 minutes)	Session Guide
(The facilitator helps the participants to develop a marketing plan) Participants are allowed to brainstorm on the following: 1. Description of the target market for the produce 2. Customer profile 3. Competitor profile. Who are the other competitors to be aware of? When writing a marketing plan, you need to be clear about your marketing objectives and how you're going to achieve them. A good marketing plan sets realistic and measurable objectives (SMART); includes budgets and action plans, and allocates responsibilities. *(The facilitator lets the participants develop and list SMART objectives down for discussion. Use the guide in Handouts 1.7.11)* Facilitator guides on the elements to be included in the marketing plan.	Distribute Participants' Handouts 1.7.10: The Marketing guide Distribute Participants' Handouts 1.7.11: Marketing plan template if time allows they can complete the business plan report
13.7.3.8. Module Review (20 minutes)	**Session Guide**
(The facilitator leads the participants in reviewing the module). Let's review together the main points about market assessment and arrangements. · What new things did you learn from this Module? · What are some of the problems and issues that you have become more aware of market assessment and arrangements? · What questions do you still have about market assessments and arrangements? This last Participants' Handouts 1.7.12 summarizes the main points from the Module.	Distribute Participants' Handouts 1.7.12

Who can explain the first point - the message and its application? The second message? The third message? Thank you for joining us in this module, and we hope to see you in other modules in the future.	

13.8 Participants' Reference Materials

13.8.1 Participants' handouts

1. CIMMYT (1988). From agronomic data to farmer recommendations. An economic training manual. Completely Revised. Mexico D.F
2. CRS and MEAS. 2016. Seven steps of marketing: A SMART Skills manual. Catholic Relief Services (CRS), Baltimore, MD, and Modernizing Extension and Advisory Services (MEAS) project, University of Illinois at Urbana-Champaign
3. Spears School of Business (2012) .The nuts & bolts of great business plans, Oklahoma State University http://entrepreneurship.okstate.edu

13.8.2 Additional reference material

Food and Agriculture Organization (FAO) (1998): Agricultural Cooperative Development, a manual for trainers, Rome/Italy: FAO

Food and Agriculture Organization (FAO) (1995).. The Group Enterprise Book, a practical guide for group promoters, Rome/Italy: FAO

MODULE 14

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

This module consists of issues that influence the uptake and up-scaling of TIMPS in the AIV value chain. These issues are Agricultural Innovation Platforms, Gender and social-environmental concerns and Climate smart agricultural policy.

Agricultural Innovation Platforms provide a forum for stakeholders to interact and develop technical, institutional and organizational innovations to solve value chain challenges. Gender and social-environmental concerns are considerations aimed at avoiding inappropriate solutions to value chain challenges. Finally, Climate smart agricultural policy creates awareness on policy formulation and the various regulations that are put in place to facilitate the development of value chains. The method of delivery of each of these crosscutting issues is presented.

14.1. Introduction

This module exposes the service providers, lead farmers and facilitators to an innovation system based configuration of stakeholders called the Agricultural Innovation Platform (AIP). It is an organizational model for stimulating innovation and development and brings actors together in a way that pools together skills and knowledge used to address challenges and utilize opportunities. The actors include individuals, private and public sector organizations, policy makers and other value chain stakeholders and are brought together to seek a solution to a challenge hindering agricultural productivity within value chains such as AIV. The Agricultural Innovation Platform facilitates actors to interact, innovate, learn and change with time as they seek a solution to the common challenge or compelling agenda. In an innovation platform, information exchange takes place in an environment where every actor's contribution is valued and various benefits accrue to all in a win-win situation. The AIP has been proved to be a useful methodology for catalysing uptake, up scaling and sustaining use of various technologies.

SUB-MODULE 14.1
AGRICULTURAL INNOVATION PLATFORMS

14.1.1. Module learning Outcomes

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

1. The attributes of an innovation platform described and understood.
2. Stakeholders mobilization for initiation of an Agricultural Innovation Platform explained and demonstrated
3. The establishment, management and monitoring of Agricultural Innovation Platforms explained and demonstrated
4. The process of innovation capacity of the actors explained and understood

14.1.2 Module Target Group and Categories

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

14.1.3 Module Users

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

14.1.4 Module Duration

The module is estimated to take a minimum time duration of **3** hours

14.1.5 Module Summary

Sub-Module 14.1 Agricultural Innovation Platforms (AIP)			
Sessions	**Training methods**	**Training materials**	**Time**
14.1.6.1 Introduction, objectives and expectations	▪ Personal introductions ▪ Presentations ▪ Plenary discussions	▪ Flips charts ▪ Marker pens ▪ Projector ▪ Laptop	30 minutes
14.1.6.2 An overview of attributes of an Agricultural Innovation Platform (The characteristics of an innovation platform)	▪ Powerpoint Presentations ▪ Plenary discussions	▪ Flip charts ▪ Marker pens ▪ Projector ▪ Laptop ▪ Participants Handouts	1 hour

14.1.6.3 Pre-formation stages –stakeholder mobilization and sensitization. -AIP Phases (Initiation, Establishment, Management and Sustenance)	▪ Power point presentations ▪ Plenary discussions ▪ Role plays	Flips charts - Marker pens Projector - Laptops - Handouts - Roles	1 hour
14.1.6.4. Module review	▪ Discussions	▪ Flip Charts Marker pens	30 minutes
Total			**3 hours**

13.1.7 Facilitator's Guidelines

Sub Module 14.1: Agricultural Innovation Platform (AIP)	
14.1.7.1. Introduction, levelling of expectations and objectives (30 Minutes)	**Session Guide**
Introduction *The facilitator welcomes trainees to the module on Agricultural Innovation Platforms. They are then invited to introduce themselves and state their expectations*) **Module Objectives** *(The facilitator presents modules objectives and levels out expectations)* By the end of the module the trainee should be able to: • Explain characteristics of an innovation platform • Mobilize and sensitize stakeholders • Describe how to initiate and establish Agricultural Innovation Platforms • Explain how to manage and sustain innovation capacity of actors in Agricultural Innovation Platforms	• Summarize Trainees' "expectations" and display. • PowerPoint Presentation • Module Objectives and Training Program
14.1.7.2. The characteristics of an innovation platform (1hour)	**Session Guide**
The facilitator should present an overview of innovation platforms and their main characteristics **Plenary Presentation (30 minutes)** • Past progression of research and extension models and their shortcomings	• PowerPoint Presentation • Notes Handouts, • Brochures, information leaflets and manuals

• Agricultural Innovation Systems perspective and Agricultural Innovation Platforms model • Comparison of Agricultural Innovation Platforms with social and technical events working through committees with different roles but common goals • Value chain actor linkages and other benefits **Discussion (30 minutes)** Let the trainees recall what they learned and discuss any issue that may arise.	
14.1.7.3 Preformation and formation phases of the AIV AIP (1 hour)	**Session Guide**
Plenary Presentation (50 Minutes) **Initiation or preformation phase** • Engagement or mobilization of stakeholders in the AIV value chain • Visioning process and rules of engagement mediated by an initiator such as a change agent **Establishment** • Assessment of the status of the value chain to clearly identify the compelling agenda or bottleneck - APVC analysis to identify weaknesses in the chains. • Laying out of proper plans to define roles, establish task- based committees, expected milestones and resourcing strategies. **Management** • Keeping stakeholders focused on the vision and upholding values to ensure an inclusive and transparent process. • Neutral facilitation to ensure joint strategy building and action and the coordination of support activities. • Managing emerging experts taking up leading roles and issues as champions. **Sustainability** • Guiding in evolving and identifying fresh issues or challenges • Maintaining capacity acquired to address new issues or challenges in subsequent cycles. **Discussion (10 minutes)** Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint Presentation • Distribute Participants Handouts • Brochures, Leaflets, Manuals • Short video clips

14.1.7.4. Module review (30 minutes)	Session Guide
(The facilitator leads the trainees in reviewing the module). Summarize the main points of the training and together with the trainees review the main points on: • AIP characteristics and initiation • AIP establishment and management • Sustenance of AIV AIPs *(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?)*	• The last Participants' Handouts • Summarize the main points from the module on a flip chart and display

14.1.8 Participants' Reference Materials

14.1.8 Participants' Handouts

14.1.8 References

1. Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional change

2. Felister Makini, Wellington Mulinge, Lawrence Mose, Beatrice Salasya, Geoffrey Kamau, Margaret Makelo, and On'gala, J. (2018). Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya. FARA Research Results Vol2(6)

3. F. Makini, G. Kamau, M. Makello, A. Adekunle, G. Mburathi. (2013). Operational field guide for developing and managing local agricultural innovation platforms KARI ISSBN 978-9966-30-004-1

SUB-MODULE 14.2

AFRICAN INDIGENOUS VEGETABLES GENDER, VULNERABLE AND MARGINALIZED GROUPS (VMGs), SOCIO-ENVIRONMENTAL CONCERNS AND COHESION

Introduction

African indigenous vegetables is a major agro-enterprise and involves all the gender categories (men, women, youth vulnerable marginalized groups (VMGs) in its value chain, from production, value addition, marketing and consumption. However, women perform most activities at the production node such as planting, weeding and harvesting. Despite this significant contribution from women, gender inequalities exist in all areas of the value chains. 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 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 all the gender categories (men, women, youth and the VMGs).

African indigenous vegetables 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 African indigenous vegetables TIMPs is enhanced by field agricultural practitioners and extension officers as an effort geared towards achieving Climate Smart Agriculture "triple win" in target counties.

14.2.1 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 African Indigenous Vegetables value chain understood and explained
2. Youth empowerment in African Indigenous Vegetables value chain understood and described
3. Women empowerment in African Indigenous Vegetables value chain understood and explained
4. Strategies for inclusion of vulnerable and marginalized groups in African Indigenous Vegetables value chain identified
5. Socio-cultural barriers in African Indigenous Vegetables value chain understood and explained
6. Environmental and social management framework (ESMF) tool understood and described.

14.2.2 Module Target Group

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

14.2.3 Module Users

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

14.2.4 Module Duration

The Module is estimated to take 4 hours.

14.2.5 Module Summary

Module 14.2: Gender mainstreaming and social inclusions in the African Indigenous Vegetables value chain			
Sessions	**Training methods**	**Training materials**	**Duration**
14.2.6.1 Introduction, expectations and objectives	▪ Personal introductions ▪ Presentations ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants handouts	30 minutes
14.2.6.2 Gender mainstreaming in African Indigenous Vegetables value chain	▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Participants handouts	30 minutes
14.2.6.3 Youth empowerment in African Indigenous Vegetables value chain	▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Participants handouts	30 minutes
14.2.6.4 Women empowerment in African Indigenous Vegetables value chain	▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Participants handouts	30 minutes
14.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Participants handouts	30 minutes

14.2.6.6 Environmental and Social Management Framework	▪ PowerPoint Presentations ▪ Group discussions ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Participants handouts	30 minutes
14.2.6.7 Module Review	▪ Plenary discussions	▪ Flips charts ▪ Felt pens	30 Minutes
Total			**3 hours 30 minutes**

14.2.7 Facilitator's Guidelines

Sub Module 14.2: Gender mainstreaming and social inclusion in African indigenous vegetables value	
14.2.7.1 Introduction, Objectives and Expectations (30 Minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations) **Module Objectives (30 Minutes)** (The facilitator presents modules objectives) By the end of the module training the trainee must be able to:- • Explain gender mainstreaming and social inclusion, in African Indigenous Vegetables value chain • Describe youth empowerment in African Indigenous Vegetables value chain • Explain women empowerment in African Indigenous Vegetables value chain • Identify strategies for inclusion of vulnerable and marginalized groups in African Indigenous Vegetables value chain • Describe the environmental and social management framework (ESMF) tool	• Summarize Trainees "Expectations" and display. • PowerPoint Presentation • Flipcharts • Group exercise • Objectives and Training Program
14.2.7.2 Gender mainstreaming and social inclusion in African indigenous vegetables value chain (30 Minutes)	**Session Guide**
(The facilitator should present and explain what gender mainstreaming is, who does which activity, who has access to what resources etc. and why gender mainstreaming is important in African indigenous vegetables value chain). **Plenary Presentation (20 minutes)** • Definition of gender • What is gender mainstreaming and why it is important?	• PowerPoint Presentation, Group exercise • Plenary discussions • Distribute Participants Handouts • Group exercise • Plenary discussions

• Who does what? (gender division of roles in AIV value chain) • Who owns what? (access and control of resources & benefits) • Who makes which decisions? • Existing policies in support of gender mainstreaming **Group exercise and discussion (10 Minutes)** Let the trainees recall what they learned and discuss any issue that may arise	
14.2.7.3 Youth empowerment in African indigenous vegetables value chain s (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Why agriculture is not attractive to youth • Youth's role in the value chain • Strategies to empower youth in AIV value chain **Group work and Discussion (10 Minute)** Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint Presentation • Group exercise • Plenary discussion
14.2.7.4 Women empowerment in African indigenous vegetables value chain (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Women's role in the value chain • Challenges facing women in the value chain • Strategies for empowering women in the value chain **Plenary discussion (10 minutes)** Let the trainees recall what they learned and discuss any issue that may arise	• PowerPoint Presentation • Distribute participants' handouts • Group exercise • Plenary discussion
14.2.7.5. Strategies for inclusion of vulnerable and marginalized groups in AIV (30 minutes)	**Session Guide**
Plenary Presentation (20 hour) • Who are vulnerable and marginalized groups (VMGs) • Why gender inequality exists • Social inclusion and why • Strategies of inclusion of VMG **Plenary Discussion (10 minutes*)*** Let the trainees recall what they learned and discuss any issue that may arise	• PowerPoint Presentation • Group exercise • Plenary discussion

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

14.2.8 Participants' Reference Materials

14.2.8.1 Participants' Handouts

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

SUB-MODULE 14.3
"CLIMATE-SMART AGRICULTURAL POLICY OPTIONS

14.3. 1 Introduction

Kenya adopted Vision 2030 in 2007 as a new blue print and roadmap for political, social and economic development of the country in the next two decades. The Vision also identifies Agriculture as the engine of growth through transformation of smallholder and subsistence agriculture to innovatively and commercially oriented agriculture. Kenya promulgated the new constitution in 2010 which proposes two levels of governments (national & county) with defined functions. Agriculture is one of the devolved governance functions. However, agriculture in Kenya is facing many challenges and threats such as climate change, declining agricultural performance, limited high potential agricultural land and over-reliance on rain fed agriculture, limited diversification of Agricultural production, poor and inadequate rural infrastructure, inadequate and declining research in agriculture, agricultural sector financing and related activities and low technical capacity among the actors. Therefore, agricultural policy in Kenya revolves around the main goals of increasing productivity and income growth, especially for smallholders; enhanced food security and equity, emphasis on irrigation to introduce stability in agricultural output, commercialization and intensification of production especially among small scale farmers; appropriate and participatory policy formulation and environmental sustainability. This module introduces the national and county governments, service providers, lead farmers, facilitators and relevant stakeholders 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 understood and identified
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). 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 5 hours.

14.3. 6 Module Summary

Module 14.3: Climate-Smart Agricultural Policy Options			
Sessions	**Training methods**	**Training materials**	**Time**
14.3.6.1 Introduction, learning expectations and outcomes	▪ Personal introductions ▪ Group discussions ▪ Plenary discussions ▪ Presentations	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop	30 minutes
14.3.6.2 Agricultural Policy Frameworks in Kenya	▪ Presentations ▪ Practical exercises ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop	30 minutes
14.3.6.3 Climate-smart agriculture practices, policy options and approaches	▪ Presentations ▪ Practical exercises ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants handouts	1 hour
14.3.6.4 Climate-smart-sensitive policy cycle	▪ Presentations ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants handouts	20 minutes
14.3.6.5 Implementation of the climate-smart-sensitive policy at the county level	▪ Presentations ▪ Practical exercise ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants handouts	50 minutes
14.3.6.6 Financing and Investments for Climate-smart Agriculture	▪ Presentations ▪ Practical exercise ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ Projector ▪ Laptop ▪ Participants handouts	1 hour

14.3.6.7 Technology Policy	▪ Presentations ▪ Plenary discussions	▪ Flips charts ▪ Felt pens ▪ PowerPoint ▪ Laptop ▪ Participants Handouts	20 minutes
14.3.6.8 Module Review	Plenary discussion	▪ Flip charts ▪ Felt pens	30 minutes
Total			**5 hours**

13.3.7 Facilitator's Guidelines

Sub-Module 14.3: Climate-Smart Agricultural Policy Options	
14.3.7.1 Introduction, Expectations and Outcomes (30 Minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations). **Trainees Expectations** *(The facilitator requests the participants to form groups and list their expectations)* **Module Objectives** *(The facilitator presents module learning Objectives)* By the end of this module the trainee should be able to: • Explain the role of agricultural policy frameworks in Kenya • Identify climate-smart agriculture practices, options and approaches • Recount the stages in climate-smart-sensitive policy cycle • Describe the phases in the implementation of the climate-smart-sensitive policy at the county level • Evaluate and select financing and investments options for Climate-smart Agriculture • Explain the need for technology policy	• Summarize Participants' "Expectations" and display. • PowerPoint Presentation • Distribute Participants Handouts on Module Objectives and Training Program
14.3.7.2 Agricultural Policy Frameworks in Kenya (30 minutes)	
Plenary Presentation (20 minutes) **Presentation highlighting:** • The role of agricultural policy frameworks in Kenya ***Practical Exercise (10 minutes)*** ***(****The facilitator requests the trainees to form groups and identify the gaps between agricultural policy frameworks and the existing agricultural policies****).***	• PowerPoint presentation • Distribute participants' handouts • Group Exercise

14.3.7.3 Climate-smart agriculture practices, policy options and approaches (1 hour)	Session guide
Plenary Presentation **(30 minutes)** • Considerations for climate-smart production systems • Existing systems, practices and methods suitable for climate-smart agriculture • Institutional and policy options • Ensuring farmer organizations for market access • Gendered approach **Practical Exercise and plenary Discussions (30 minutes)** *(The facilitator requests the trainees to form groups and identify the existing climate-smart agriculture practices and the relevant policy options for implementation).*	• PowerPoint presentation • Distribute participants' handouts • Group Exercise
14.3.7.4 Climate-smart-sensitive policy cycle (20 minutes)	**Session Guide**
Plenary Presentation (10 minutes) • Stages in the climate-smart-sensitive policy cycle **Plenary Discussions (10 minutes)**	• PowerPoint presentation • Distribute participants' handouts
14.3.7.5 Implementation of the climate-smart-sensitive policy at the county level (50 Minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Phases in the implementation of the climate-smart-sensitive policy at the county level **Practical exercise (30 minutes)** *(The facilitator requests the trainees to form groups and develop a programme showing steps, activities and stakeholders for the implementation of climate-smart policies).*	• PowerPoint presentation • Distribute participants' handouts • Practical Exercise
14.3.7.6 Policy financing and investments for Climate-smart Agriculture (1 hour)	**Session Guide**
Plenary Presentation (30 minutes) • Why financing is needed • Financing gaps • Sources of financing • Financing mechanisms • Connecting action to financing • Types of subsidies to farmers **Group exercises (30 minutes)** *(The facilitator requests the trainees to form groups and identify potential sources of financing, financing mechanisms and connecting action to financing)***.**	• PowerPoint presentation • Distribute participants' handouts • Practical Exercise

14.3.7.7 Need of Technology Policy (20 minutes)	Session guide
Plenary Presentation (10 minutes) • What is a technology policy? • Why do we need technology policy? • Is technology policy inconsistent with a market oriented economy? • Technology policy in Kenya **Plenary Discussions (10 minutes)**	• PowerPoint presentation • Distribute participants' handouts
14.3.7.8 Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) • Summarize the main points of the training and together with the trainees review the main points. • Trainees lists the main points leant during the training • Discuss with trainees new things learnt from this Module Ask the trainees what are some of the problems and issues that they have become more aware of in the module	• Q& A session • Recap the main points • Test understanding • Participatory evaluation of the session

13.3.8 Participants' Reference Materials

13.3.8.1 Participants' Handouts

- Hand out on Agricultural Policies in Kenya
- AIV production manual

13.3.8.2 References

Alila, P.O. & Atieno, R. (2006). A paper for the Future Agricultures Consortium workshop, Institute of Development Studies, 20-22 March 2006. Future Agricultures.

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. www.chronicpovertynetwork.org

Chirwa, E.; Dorward, A.; Kathule, R.; Kumwenda, I.; Kydd, J., Poole, N.; Poulton, C. & Stockbridge, M. (undated). Farmer Organization for market access: Principles for policy and practice. Imperial College London. University of Malawi. Agricultural Policy Research Unit. http://www.imperial.ac.uk/agriculturalsciences/research/sections/aebm/projects/farmerorg.htm

Food and Agriculture Organization of the United Nations (2016). The Gender in Agricultural Policies Analysis Tool (GAPo). FAO 2016.16274EN/2/01.18

Food and Agriculture Organization of the United Nations (FAO) (2010). "Climate-Smart" Agriculture. Policies, Practices and Financing for Food Security, Adaptation and Mitigation.

Ha-Joon Chang (2002). African Technology Policy Studies Network (ATPS). Who needs Technology Policy? Published by The African Technology Policy Studies Network, Nairobi, Kenya. ISBN: 9966-916-18-0

RoK (2007). Kenya adopted Vision 2030.
RoK (2010). Kenya Constitution

ANNEX 1: TRAINING PROGRAM

The training program presented here assumes that the trainees report on Sunday evening as the first day and leave 12 days later on Sunday morning.

Time	Day 0 (Sunday) Travel to Venue	Duration	Remarks / Facilitator
Late Evening	▪ Arrival of participants and registration – Host ▪ Setting up and prepare training venue and materials – CTT	2 Hours	The training venue and materials are ready for use
Close of Day 0			
Time	**Day 1 (Monday)**	**Duration**	**Remarks / Facilitator**
8.00am-9.30am	**Session 1: Introduction, objectives & expectations** ▪ Welcome by host and Prayers ▪ Self-introductions –(CTT) ▪ Introduction to KCSAP project ▪ Official opening Ceremony (CEC) Introduction to the training program (CTT)	10 minutes 20 minutes 20 minutes 20 minutes 20 minutes	The trainees relax and climate set for the ten-day training
9.30 - 10.30 am	**Module 1: Climate Change and Climate Smart Agriculture in AIV value chain** **1.1. Introductions and objectives** • Introduction and Levelling of Trainees' expectations • Presentation of module objectives	30 minutes 30 minutes	
10.30 - 11.00 am	**Tea Break**	**30 minutes**	
11.00-12.00 pm	**1.2.Introduction to Climate Change and Climate Variability (1 hour)** **Presentations on:** ▪ Basic terminologies used in the module (weather, climate, variability, adaptation, coping) ▪ Climate change, climate variability and causes of climate change ▪ Climate risks impacting agriculture and Proposed adaptation measures	20 minutes 20 minutes 20 minutes	

12.00-01.00 pm	**1.3. Concept of Climate Smart Agriculture (CSA) (1 hour)** **Presentations on:** ▪ Definition of the CSA approach and their characteristics ▪ The three pillars of CSA (productivity, Adaptation and Mitigation) ▪ Why CSA is needed	20 minutes 20 minutes 20 minutes	
1.00 -2.00 pm	**Lunch Break**	**1 Hour**	
2.00 -2.40 pm	**1.4. Projected Future Scenarios that will Impact Productivity (1 hour)** **Video/power point presentation** • Short Video or PP showing projections of rainfall and temperature projections **Plenary discussion** • Climate projections impacts on food production and needed adaptation measures for AIV.	20 minutes 20 minutes	
2.40 -3.00 pm	**1.5. Module Review** Summary of key points in the moduel	20 minutes	
	End of Module 1		
3.0 -4.00 pm	**Module 2: Farmer Field and Business School Approach** **2.1. Introductions and objectives** • Introduction and Levelling of Trainees' Expectations • Presentation of module objectives:	30 minutes 30 minutes	
4.00 -5.00 pm	**2.2 Overview of FFBS key activities** **Presentation on:** • Overview of Farmer Field and Business Schools • Principles of FFBS, Characteristics of FFBS • AIV curriculum matrix	30 minutes	
5.00 -6.00 pm	Teat Break	1 Hour	
Close of Day 1			

Time	Day 2 (Tuesday)	Duration	Remarks / Facilitator
8.00-9.00am	Registration for second day participation Recap of day 1 activities	30 minutes 30 minutes	CTT
8.00-9.00am	**Continuation of Module 2** **2.3 Designing an FFBS program** Presentation of the classical steps **Group Exercise** design FFBS and presentation	30 minute 30 minutes	
9.00-10.00am	**2.4 Communication skills** **Group work on** • Communication skills	30 minutes	
10.00 - 10.30 am	**Tea break**	**30 minutes**	
10.30 - 11.00 am	**2.5 Facilitation skills** Presentation on facilitating of AIV CIGs	30 minutes	
11.00 - 11.30 am	**2.6 Organization, management and Leadership of FFBS** **Presentation on:** • FFBS leadership	30 minutes	
11.30 - 12.00 pm	**2.7.Module Review** Review together the main points about FFBS module.	30 minutes	
	End of Module 2		
12.00 -01.00 pm	**Module 3**: **AIV production and appropriate climatic requirements** **3.1. Introductions and objectives** • Introduction and Levelling of Trainees' Expectations • Presentation of module objectives	30 minutes 30 minutes	
1.00- 2.00 pm	**Lunch break**	**1 hour**	**All**
2.00 -3.00 pm	**3.2 Importance of AIV in Kenya's economy** **Presentation** Origin, place of AIV as crop and production in Kenya **Facilitator's guided discussion** Questions/answers/comments	40 minutes 20 minutes	Faciliatator
3.00 -4.00 pm	**3.3 AIV production ecological/climatic requirements (1 hour)** **Presentation on AIV topics:** • Importance of AIV, Agro-ecological zones, Climatic conditions , Soils • **Facilitator's guided discussion** • Questions/answers/comments	40 minutes 20 minutes	

4.00 - 4.45 pm	**3.4. AIV production AEZs (villages), average yields, and constraints in the target Counties** **Group work (30 mins)** Group reviewing and discussing suitability map (County by County), County or sub-county, AEZs, areas suitable , land/farm size under AIVs, yield per farm, Constraints to AIV production **Discussions/presentations from the groups** Let the trainee groups share the exercise outcomes	30 Minutes 15 Minutes	
4.45 - 5.00 pm	**3.5. Module review** Together discuss and summarize the main points from the module	15 Minutes	
	End of Module 3		
5.00 -6.00 pm	**Tea Break**	**1 Hour**	**All**
Close of day 2			
Time	**Day 3 (Wednesday)**	**Duration**	**Remarks / Facilitator**
8.00-9.00am	Registration for third day participation Recap of day 2 activities	30 minutes 30 minutes	CTT
9.00 – 10.00 am	**Module 4**: **AIV Variety Selection** **4.1. Introduction and levelling of expectations and objectives** • Introduction and Levelling of Trainees' Expectations • Presentation of module objectives	 30 minutes 30 minutes	Facilitator
10.00 - 10.30 pm	**Tea break**	**30 minutes**	
10.30 - 11.00 pm	**4.2 Introduction to AIV and the various improved AIV varieties and their uses** **Group work** Description of some of the AIV varieties they know. **Presentation (20 minutes)** AIV, Improved varieties, variety uses by category	 10 minutes 20 minutes	Facilitator

11.00 – 1.00 pm	**4.3 Recommended AIV varieties for the target counties** Presentation on Varieties for the target counties **Group Exercises** Trainees discuss and come up with AIV varieties in their county **Group Exercises** • AIV demo visit	30 minutes 30 minutes 1 hour	
1.00- 2.00 pm	**Lunch break**	**1 hour**	**All**
2.00 - 2.30 pm	**4.4. Module review** Summary of the main points of the training	30 minutes	Facilitator
	End of Module 4		
2.30 – 3.30 pm	**Module 5. AIV Seed System** **5.1. Introduction and levelling of expectations and objectives** • Introduction and Levelling of Trainees' Expectations • Presentation of module objectives	 30 minutes 30 minutes	Facilitator
3.30 - 4.30 pm	**5.2. Definition of seed and seed system in Kenya** **Group work and presentations:** What is quality seed **Presentation** • Seed system and characteristics of main seed systems (formal and informal seed systems) • Commodity corridors	 30 minutes 30 minutes	Facilitator
4.30 – 5.30 pm	**5. 3 Formal seed system in Kenya** **Presentations highlighting:** • Formal seed system	 30 minutes	Facilitator
5.30 – 6.00 pm	**Tea Break**	30 minutes	All
Close of day 3			
Time	**Day 4(Thursday)**	**Duration**	**Remarks / Facilitator**
8.00-9.00am	Registration for fourth day participation Recap of day 3 activities	30 minutes 30 minutes	CTT
9.00-10.00am	**Continuation of Module 5……..** **5.4 Informal seed system in Kenya** **Presentations: (30 Minutes)** Informal seed system **Group work and discussions** • Calculation of seed requirements for the county/ward/farmer group) and presentation	 30 minutes 30 minutes	Facilitator

10.00 -10.30 am	Tea Break	30 minutes	
10.30 – 11.00 am	**5.5. Module review** Summary the main points of the training module	30 minutes	Miriam mutua
	End of Module 5		
11.30 – 12.00 pm	**Module 6: AIV climate smart agronomic practices** **6.1. Introductions, climate setting** Facilitator & trainees self-introduction and involvement in AIVs value chains	30 minutes	Facilitator
12.00 – 1.00 pm	**Objectives and expectations** Presentation of module objectives. Expectations (group work)	 30 minutes 30 minutes	
1.00 -2.00 pm	Lunch Break	1 hour	
2.00 -3.00 pm	**6.3. Agronomic practices for AIVs production (1 hour)** Presentation of all AIV GAPS Discussions: Questions/answers and comments	 30 minutes 30 minutes	
3.00 -4.00 pm	**6.4. Appropriate inputs for AIV optimal production and their correct doses** **Group work (30 minutes)** • County groups to provide lists of AIV inputs and the rates used by farmers. **Presentation** Recommended AIV inputs (seeds, fertilizers, manures, etc.) and their rates, time	 **30 minutes** 30 minutes	
4.00 -5.00 pm	**6. 5. Module review** Summary the main points of the training module	30 minutes	
5.00 – 5.30 pm	Tea Break	30 minutes	
	End of Module 6		
Close of day 4			

Time	Day 5 (Friday)	Duration	Remarks / Facilitator
8.00-9.00 am	Registration day five participation Recap of day 4 activities	30 minutes 30 minutes	CTT
9.00-10.00 am	**Module 7: Integrated soil and water management practices for AIV production** **7.1. Introduction, Objectives and Expectations** • Introduction and Levelling of Trainees' Expectations • Presentation of module objectives	 30 minutes	
10.00 -10.30 am	**Tea Break**	**30 minutes**	
10.30 – 11.00 am	**7.2. Soil composition, properties and health** **Presentation** • Soil composition, properties and health **Discussion** • Discussion of issues that may arise	 20 minutes 10 minutes	
11.00 – 12.00 pm	**7.3. Soil and plant tissue sampling and analysis (1 hours)** **Presentation** • Soil sampling and analysis methods **Practical exercise on soil sampling (30 minutes)** • Demonstration on soil sampling method	 30 minutes 30 minutes	
12.00-1.00 pm	**Lunch Break**	**1 hour**	
1.00 – 1.30 pm	**7.4. Soil fertility and plant nutrition** **Presentation** • Potential role of different soil managements techniques in addressing soil fertility challenges in AIV smallholder farming systems **Discussion** • Discussion of issues that may arise	 20 minutes 10 minutes	
1.30 – 2.00 pm	**7.5 Soil health and (ISFM) for climate resilient cropping systems** • Presentation of ISFM **Discussion** Discussion of issues that may arise.	 20 minutes 10 Minutes	

2.00 – 2.30 pm	**7.6 Soil and water management and water harvesting technologies** **Presentation** • Principles and methods of soil and water management for increased crop productivity • Methods of tillage systems that conserve **Discussion** • Discussion of issues that may arise.	20 minutes 10 minutes	
2.30 – 3.00 pm	**7.7. Soil degradation and reclamation** **Presentation** • Soil degradation, causes and reclamation measures **Discussion** • Discussion of issues that may arise.	20 minutes 10 minutes	
3.00 – 3.30 pm	**7.8 Problematic soils and their management (1 hour)** **Presentation** • Soils with unsuitable biological, chemical and physical properties and their management **Discussion** • Discussion of issues that may arise	30 minutes 10 minutes	
3.30 – 4.00 pm	**7.9. Module review** Summary of the main points of the training module	30 minutes	
	End of Module 7		
4.30 – 5.00 pm	**Module 8: Crop Health** **8.1. Introduction, Objectives and Expectations** • Introduction and Levelling of Trainees expectations • Presentation of module objectives	30 minutes	
5.00 - 5.30 pm	**Tea Break**	**30 minutes**	
Close of day 5			
Time	**Day 6 (Saturday)**	**Duration**	**Remarks / Facilitator**
8.00 - 9.00 am	Registration day six participation Recap of day 5 activities	30 minutes 30 minutes	CTT

9.00 - 10.00 am	**Module 8 continued…….** **8.2. Major AIV pests that cause economic losses and their control** **Group work** • Trainees avail AIV pest information from their counties **Plenary Presentation** • Pests descriptions , damage and crop losses **Practical session** • Identification of AIV pests from provided specimens • Practical: show photographs of major weeds **Discussion**	15 minutes 20 Minutes 15 minutes 10 minutes	
10.30 -10.30 am	**Tea Break**	**30 minutes**	
10.30 – 11.00am	**8.3. Sustainable Integrated AIV pests management practices; scouting, post-harvest pests and threshold determination** **Presentation** • IPM principles; • Scouting • post-harvest pests on cereals **Discussion**	20 minutes 10 minutes	
11.00 – 12.00pm	**8.4. Major AIV diseases that cause economic losses, conditions that favour their development and their control methods** **Group work (15 minutes)** • Determine AIV diseases in specific counties **Presentation (15 Minutes)** • AIV diseases **Practical Exercise (30 Minutes)** • Identification of major disease based on samples presented	15 minutes 15 minutes 30 minutes	

12.00 – 1.00pm	**8.5. Sustainable Integrated Diseases Management (IDM) ; scouting and threshold determination** **Presentation (30 minutes)** • Scouting, control measures • Integrated Disease Management (IDM) • Aflatoxins post-harvest diseases **Field Visit** • Identification of diseases	30 minutes 30 minutes	
1.00 - 2.00 pm	**Lunch Break**	**1 hour**	
2.00 - 2.30 pm	**8.6. Safe use of pesticides and update source for registered pesticides** **Practical** • Ways used by farmers in mixing of pesticides **Presentation** • safe use of pesticides	10 minutes 20 minutes	
2.30 - 3.30 pm	**8.7. Module review** Summary of the main points of the training	30 minutes	
	End of Module 8		
4.00 – 4.30 pm	**Module 9. AIV harvesting and post-harvest management** **9. 1** Introduction and levelling of expectations and objectives • Introduction and Levelling of Trainees expectations • Presentation of module objectives	30 minutes	
4.30 – 5.00 pm	**Module 9 continued…….** **9. 2 AIV harvesting and drying to maintain quality(1 hour)** **Presentation** • Quality standards for AIV in Kenya and harvesting and drying **Disscussion** Issues on harvesting	20 minutes 10 minutes	
5.00 – 5.30 pm	**Tea Break**	**30 minutes**	
Close of day 6			
Time	**Day 7 (Sunday)**	**Duration**	**Remarks / Facilitator**
8.00 – 9.00 am	Registration day seven participation Recap of day 6 activities	30 minutes 30 minutes	CTT

9.00 – 9.30 am	**9.3 Proper AIV threshing, cleaning and drying** **Presentation** The processes of threshing AIV, cleaning and drying **Dissuasion** issues on harvesting	 20 minutes 10 minutes	
9.30 – 10.30 am	**9.4 AIV grain storage techniques** **Field Trip:** Travel to Egerton Njoro Campus AIV breeding field **Presentation** AIV storage methods **On-farm practical demonstration** • The salt method and moisture meter testing of AIV grain moisture content • Hermetic bags storage	 30 minutes 30 minutes	
10.30 -11.00 am	**Tea Break**	**30 minutes**	
11.00 -11.30 am	**9.5 Training review** Summary of the main points of the training	30 minutes	
	End of Module 9		
12.00 -1.00 pm	**Module 10. AIV value addition** **10.1 Introduction and levelling of expectations and objective** **Module Objectives** • What to be covered **Expectations** • trainees expectations based on the objections	 30 minutes	
1.30 - 2.00 pm	**Lunch Break**	**1 hour**	
2.00 – 3.00 pm	**10. 2 Introduction to recipes for AIV value added products** **Presentation** • Nutritive value • AIV Recipes **Group Exercises** Discuss and raise issues	 30 minutes 30 minutes	Facilitator
3.00- 5.00 pm	**10. 3. Making of different AIV value added products** **Practical's** Groups make the various products using the recipes introduced and analysis	2 hours	
5.00 – 5.30 pm	**Tea Break**	**30 minutes**	
Close of day 7			

Time	Day 8 (Monday)	Duration	Remarks / Facilitator
8.00 - 9.00 am	Registration day 8 participation Recap of day 7 activities	30 minutes 30 minutes	CTT
9.00 - 10.00 am	**10.4 Prioritizing opportunities in AIV value addition** **Group exercise** • pairwise ranking of AIV recipes according to consumption and market opportunity **Discussion** • Ranked recipes.	30 minutes 30 minutes	
10.00 -10.30 am	Tea Break	30 minutes	
10.30 -12.00 pm	**10.5 Value addition strategy development** **Focused group discussion** • To come up with market strategies for the ranked products. • Presentation of strategies **Presentation** Summary of market strategies for the products	1 hour 30 minutes	
12.00 -12.30 pm	**10.6 Training review** Review the main points about AIV Value addition	30 minutes	
	End of Module 10		
1.00 - 2.00 pm	Lunch break	1 hour	All
2.00 – 2.30 pm	**Module 11: Mechanization of AIV production activities** **11.1 Introduction, Objectives and Expectations** **Module Objectives** • What to be covered **Expectations** • trainees expectations based on the objections	30 minutes	

2.30 – 3.00 pm	**11.2. AIV climate smart land preparation tools** **Presentation** • Overview of the AIV mechanization activities • Climate smart tillage options **Discussion** • discuss any issue that may arise	20 minutes 10 minutes	
3.00 – 3.30 pm	**11.3. AIV calibration of fertilizer and seed rate for planters (1 hour)** **Presentation:** • planter seed and fertilizer rate determination **Discussion (30 Minutes)** • Discuss any issue that may arise.	20 minutes 10 minutes	
3.30 – 4.00 pm	**11. 4. AIV Chemical implements and tools operations** **Presentation** : • AIV pest control equipment; **Discussion** • discuss any issues that may arise	20 minutes 10 minutes	
4.00 – 5.00 pm	**11.5. AIV harvesting machine operating principles** **Presentation** • Harvesting machines, Harvest timing and estimation of Machine harvest yield losses **Discussion** • discuss any issues that may arise	30 minutes 30 minutes	
5.00 – 5.30 pm	**Tea Break**	**30 minutes**	
Close of Day 8			

Time	**Day 9 (Tuesday)**	**Duration**	**Remarks / Facilitator**
8.00 - 9.00 am	Registration day 9 participation Recap of day 8 activities	30 minutes 30 minutes	CTT
9.00 – 9.30 am	**Module 11 continued…….** **11.6 Machine and procedure for AIV grading** **Presentation** • PowerPoint on AIV grading machine procedure **Practical exercise** • Demonstrations on management options	15 minutes 15 minutes	

9.30 -10.00 am	**11.7 Module review** Review the main points about AIV mechanization	30 minutes	
	End of Module 11		
10.00 -10.30 am	**Tea Break**	**30 minutes**	
10.30 -11.30 am	**Module 12. AIV Business and Marketing** **12.1 Introduction and levelling of expectations and objectives (1 hour)** **Expectations (30 minutes)** • Trainees to state their expectations **Objectives (30 minutes)** • Present objectives	 30 minutes 20 minutes	
11.30 -12.00 pm	**12.7.2 Introduction to marketing channels and strategies** **Presentation** • AIV markets **Discussion** • issues on markets	 20 minutes 10 minutes	
12.00 -1.30 pm	**12.3 Identification and prioritization of market opportunities in AIV value chain** **Group exercise and presentations** • Prioritization of markets by pairwise ranking and presentation **Group discussion** • Trainees raise issues and discuss them.	 40 minutes 20 minutes	
1.30 - 2.30 pm	**Lunch break**	**1 hour**	**All**
2.30 – 3.30 pm	**12.4 AIV Community production, aggregation and marketing models (COPMAS)** **Presentation** Introduce community production and marketing system **Group Exercise** • Discussion issues on AIV community marketing	 40 minutes 20 minutes	
3.30 – 4.30 pm	**12.5 Training review** Summary and discussion of the main points of the training	30 minutes	
4.30 – 5.00 pm	**Tea Break**	30 minutes	All
	End of module 12		
Close of day 9			

Time	Day 10 (Wednesday)	Duration	Remarks / Facilitator
8.00 - 9.00 am	Registration day 10 participation Recap of day 9 activities	30 minutes 30 minutes	CTT
9.00 - 9.30 am	**Sub-Module 13.1 Agricultural Innovation Platforms (AIP)** **13.1.1 Introduction, Objectives and Expectations** **Module Objectives** • What to be covered **Expectations** • trainees expectations based on the objections	30 minutes	
9.30 - 10.30 am	**13.1.2. The characteristics of an innovation platform** Presentation Discussion	30 minutes 30 minutes	
10.30 - 11.00 am	**Tea break**	**30 minutes**	**All**
11.00 - 12.00 pm	**13.1.3 Preformation and formation phases of the AIV AIP** **Presentation on:** Initiation or preformation phase, Establishment, Management, Sustainability **Discussion (10 minutes)** On any issues arising	50 Minutes 10 minutes	
12.00 - 12.30 pm	**13.1.4. Module review** Summary of main points	30 minutes	
	End of sub module 13.1		
1.00 - 2.00 pm	**Lunch break**	**1 hour**	**All**
1.00 - 1.30 pm	**Module 13.2: Gender mainstreaming and social inclusions in the AIV value chain** **13.2.1 Introduction, Objectives and Expectations** **Module Objectives** • What to be covered **Expectations** • trainees expectations based on the objections	30 minutes	
1.30 - 2.00 pm	**13.2.2 Gender mainstreaming and social inclusion in AIV value chain (30 minutes** Presentation Gender issues Group exercise and discussion (10 Minutes) Let the trainees recall what they learned and discuss any issue that may arise	20 minutes 10 minutes	

2.00 - 2.30 pm	**13.2.3 youth empowerment in AIV value chain s (1hour)** **PowerPoint presentation** • Strategies to empower youth in AIV value chain **Group work and Discussion**	20 minutes 10 minutes	
2.30 - 3.00 pm	**13.2.4 Women empowerment in AIV value chain** **PowerPoint presentation** • Strategies to empower women in AIV value chain **Group work and Discussion**	20 minutes 10 minutes	
3.00 - 3.30 pm	**13.2.5. Strategies for inclusion of vulnerable and marginalized groups in AIV value chain** **PowerPoint presentation** • Strategies to empower VMGs in AIV value chain **Group work and Discussion**	20 minutes 10 minutes	
3.30 - 4.00 pm	**13.2.7.6. Environmental and social management framework (ESMF)** **Presentation** • Environmental and socioeconomic impacts of AIV value chain activities. **Plenary discussion (10 minutes)**	20 minutes 10 minutes	
4.00 - 4.30 pm	**13.2.7. Module review (30 Minutes)** Plenary summary of the module	30 minutes	
4.30 – 5.00 pm	**Tea Break**	30 minutes	All
	End of module 13.2		
Close of day 10			
Time	**Day 11 (Thursday)**	**Duration**	**Remarks / Facilitator**
8.00 - 9.00 am	Registration day 11 participation Recap of day 10 activities	30 minutes 30 minutes	CTT
9.00 - 9.30 am	**Module 13.3: Climate-Smart Agricultural Policy Options** **13.3.1 Introduction, Objectives and Expectations** **Module Objectives** • What to be covered **Expectations** trainees expectations based on the objections	30 minutes	

9.30 - 10.00 am	**13.3.2 Agricultural Policy Frameworks in Kenya** **Presentation highlighting:** • The role of agricultural policy frameworks in Kenya **Practical Exercise (10 minutes)** Identification of gaps	20 minutes 10 minutes	
10.00 - 10.30 am	**Tea break**	**30 minutes**	**All**
10.30 - 11.30 am	**13.3.3 Climate-smart agriculture practices, policy options and approaches** **Presentation highlighting:** • Policy on CSA **Practical Exercise and plenary Discussions** • existing climate-smart agriculture practices and the relevant policy options for implementation	30 minutes 30 minutes	
11.30 - 11.50 am	**13.3.7.4 Climate-smart-sensitive policy cycle** Plenary Presentation Plenary Discussions	10 minutes 10 minutes	
11.50 - 12.40 pm	**13.3.7.5 Implementation of the climate-smart-sensitive policy at the county level** **Plenary Presentation (20 minutes)** • Phases in the implementation of the climate-smart-sensitive policy at the county level **Practical exercise (30 minutes)** Develop a programme showing steps, activities and stakeholders for the implementation of climate-smart policies	20 minutes 30 minutes	
12.40 - 2.00 pm	**Lunch break**	**1 hour**	**All**
2.00 - 3.00 pm	**13.3.6 Policy financing and investments for Climate-smart Agriculture** **Presentation (30 minutes)** • Policy financing of CSA **Group exercises (30 minutes)** • identify potential sources of financing, financing mechanisms and connecting action to financing	30 minutes 30 minutes	

3.00 - 3.20 pm	**13.3.7 Need of Technology Policy** **Presentation** • Technology policy **Plenary Discussions**	10 minutes 10 minutes	
3.20 - 3.40 pm	**13.3.8 Module review** Summary of module main points	20 minutes	
	End of module 13.3		
3.40 - 4.00 pm	• Course Evaluation	20 minutes	All
4.00 - 4.30 pm	Announcements Way Forward Closing remarks	30 minutes	CCT
4.30 - 5.00 pm	**Tea Break**	**30 minutes**	
Close of day 10			
Time	**Day 12 (Friday)**	**Duration**	**Remarks / Facilitator**
	• Departure to various destinations		All

ANNEX 2: GENERAL REFERENCE MATERIALS

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

ANNEX 3: GENERAL REFERENCE MATERIALS

Participatory Technology Development (PTD) for african indigenous vegetable crop

Soil fertility management

Value Chain	African Indigenous vegetable
Learning Enterprise	African Indigenous vegetable
Funded Enterprise	African Indigenous vegetable VC at production level
Background Problem	Low African Indigenous vegetable production low soil fertility
Objective	To increase production through improved soil fertility mgt strategies

Factors to consider:

- Land topography
- Runs (blocks should face East to West)
- Certified seeds of African Indigenous vegetable variety
- Farmer fertility management as control

Setting the P.T.D blocks:

- Plots to be laid (10x10) M, arranged three in a row with a footpath of 1M apart.
- Preferred African Indigenous vegetable variety
- Different soil fertility management treatments
- The blocks must be right angled.
- The number of planting drills must be equal in each block.
- The recommended spacing cowpeas (60cmX20cm), Pumpkins
- 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 width and length
- Crop height
- Leaf Yields /unit area

Setting of Blocks

Plot 1	Plot2	Plot 3	Plot 4	Plot 5	Plot 6
Planting Fertilizer	Planting Fertilizer + Topdressing	Manure application	Planting fertilizer + Manure application	Planting Fertilizer + Topdressing + Manure	Farmers fertility management as control

AGRO ECOSYSTEMS ANALYSIS (AESA) ON AIV.

AESA NO ……

General information

Variety …….

Fertilizer ……

Planting date……

(Cowpeas)

(Cowpeas)

(Cowpea)

(Pumpkins)

(Pumpkins)

Agronomic data

Average Leaf length…….....……

Average plant height…….....……

Average Leaf width…….....……..

Number of leaves/Plant…….....……..

No of pods per plant……..…….

No of seeds per pod…….....……

Yield in Kg per plot…….....……..

No of Pumpkins/Plant……..……

Weight of pumpkins…….....…

Weather: …….

Time of observation: ……

Diagram of crop of enemies and insects observed

Natural Enemies	**Insects observed**
1.	1.
2.	2.
3.	3.

Observation	**Recommendation**
1. weeds	Weeding after 2 weeks
2. Holes on the leaves	Keep monitoring and control pests
3. Yellow leaves	Add foliar feeds or control disease

Kenya Climate Smart Agriculture Project (KCSAP)
P.O. Box 57811, City Square, Nairobi, 00200, Kenya