KALRO
Kenya Agricultural & Livestock Research Organization

NAVCDP
NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

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

TRAINING OF TRAINERS' MANUAL

Obanyi J.N., Wambua J.M., Muriithi I.W., Lagat K.R., Ndambuki J.,Otipa M.J., Ndungu J.N., Ketiem P.K., Wayua F.O., Wandera F.M., Imbwaga C.M., Ndubi J.M., Jelagat F., Momanyi N.V., Maina F.W., Gathungu G., Wefwila W.K., Kirigua, V. and Wasilwa, L.

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FOREWORD

The Kenya Agricultural and Livestock Research Organization (KALRO) through the Kenya Climate Smart Agriculture Project (KCSAP) and National Agricultural and the Rural Inclusive Growth Project (NARIGP), laid a strong foundation for commercialization of agriculture in Kenya. This was done through the development of Climate Smart Technologies, Innovations and Management Practices (TIMPs) and Training of Trainers (ToTs) manuals for 27 value chains through KCSAP and 5 value chains through NARIGP as well as the accompanying training for the master trainers for the two projects. During this phase, KALRO conducted 51 adaptive and 80 applied research projects through which additional TIMPs were developed and validated, with some of the research gaps identified earlier addressed. A notable inclusion was the use of the Big Data Platform to integrate digital information from value chains.

The National Agricultural Value Chain Development Project (NAVCDP) seeks to build on and deepen investments into interventions on productivity enhancement, community-led farmer extension, water management investments and data-driven value chain services from the two earlier projects. In this project, KALRO seeks to reinforce, customize and update the existing inventories of TIMPs, with emphasis on climate resilience, nutrition, and safer food production practices. With the continued support, KALRO also is poised to continue providing quality technical assistance for value chain development at all levels and build capacity of county level implementation units to anchor project activities. With the support of NAVCDP, KALRO has developed TIMPs for the two new value chains, pyrethrum and rice and is continuously updating inventories of TIMPs for all other value chains developed during the implementation of KCSAP/NARIGP. In doing so, KALRO further strengthens climate resilience and enhance value addition aspects of the updated TIMPs. The organization continues to support the strengthening of the existing Big Data platform at KALRO as the foundational database for insight-driven, more productive, resource efficient and climate-resilient farming. To enhance the effective coordination of research linkages and agriculture digitization, KALRO and the Ministry of Agriculture and Livestock Development have put in a relevant support mechanism to oversee the implementation of these activities.

Extensive information from research and background data has been used to update the Pyrethrum TIMPs inventory. To disseminate the TIMPs, this Training of Trainers' Manual has been updated. The manual takes into consideration the background, training content, training design and the facilitators guidelines in the modules. The two-part manual consists of an introductory Part I that guides on how to use the manual and Part II that comprises the training modules. The training modules have uniform outline that ensures every aspect of the TIMPs are fully covered in a way that the trainees can relate to. Various delivery methods are employed and where possible demonstrations and practical work are incorporated to enable the trainees to learn by participating in the actual field activities. The manual seeks to enhance market

participation, value addition and link agriculture to nutrition education through comprehensive coverage of relevant information that provides for these needs. The use of this Training of Trainers' Manual is expected to contribute to the achievement of the Project Development Objective (PDO), which is *to increase market participation and value addition for targeted farmers in select value chains in project areas.* This Pyrethrum ToT Manual should be used in conjunction with the respective TIMPs inventory.

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

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

PREFACE

The National Agricultural Value Chain Development Project (NAVCDP) is a Government of Kenya project with support from the World Bank. The five-year project is being implemented in 32 counties clustered in seven regions at an approximate cost of U$ 275 million. The project development objective (PDO) is "increase market participation and value addition for targeted farmers in select value chains in project areas." It is expected that this objective will be achieved through implementing the five project components, namely; Building Producer capacity for climate resilient stronger value chains; Climate Smart Value Chain Ecosystem Investments; Piloting Climate Smart Safer Urban Food Systems; Project Coordination and Management; and Contingent Emergency Response Component.

The National Agricultural Value Chain Development Project aims to support 3.8 million small-scale farmers transitioning or with the potential to transition from subsistence farmers to commercial farmers or are selling only a small percentage of their produce commercially. Additional beneficiaries of the Project include value chain actors at various levels, the extension workers, aggregators, logistics support providers and SMEs operating within the value chain. The Project places a strong focus on inclusion of women farmers within the supported Value Chains (VCs). Thirteen VC's have been selected based on a thorough qualitative and quantitative assessment of their potential. The selected VCs based on their ranking are: Dairy, Coffee, Chicken, Avocado, Banana, Mango, Irish potatoes, Tomato, Apiculture, Pyrethrum, Cashew nut, Rice and Cotton. Additional value chains prioritized by counties will be supported by their respective County Project Coordination Units.

The National Agricultural Value Chain Development Project has partnered with KALRO to further strengthen and expand the existing inventory of TIMPs with emphasis on climate resilience, nutrition, and safer food production practices. Through this partnership, KALRO has been funded to develop Technologies, Innovation and Management Practices (TIMPs) for the two new value chains-Rice and Pyrethrum, and update inventories of TIMPs for all other value chains developed during the implementation of KCSAP/NARIGP and their corresponding Training of Trainers' Manuals. It also supports the strengthening of the existing Big Data platform at KALRO as the foundational database for insight-driven, more productive, resource efficient and climate-resilient farming. Finally, the Ministry of Agriculture, Livestock Development (MoALD) has put in place relevant support mechanism with KALRO to oversee effective implementation, coordination of research linkages and agriculture digitization.

In updating this Pyrethrum ToT manuals, KALRO and its partners used available information resources. Consequently, the use of these information resources, coupled with the accompanying training and contribution of the other project components, will go a long way in enabling NAVCDP to meet its development objectives.

The National Project Coordination Unit is grateful to all who participated in the development and production of this updated ToT Manual for Pyrethrum Value Chain. It is my hope that counties and stakeholders will put this resource to good use as they transform and reorient the agricultural sector, to make it more productive and resilient, while minimizing GHG emissions under the new realities of climate change.

Samuel Guto, PhD
National Project Coordinator
National Agricultural Value Chain Development Project

Table of content

List of tables

List of abbreviations and acronyms

AFA	Agriculture and Food Authority
AIPs	Agricultural innovation Platforms
CBO	Community Based Organisation
CIDP	County Integrated Development Plan
CIGs	Common Interest Groups
CSA	Climate Smart Agriculture
CTT	Core Team of Trainers
FAO	Food and Agriculture Organization
FFBS	Farmer Field and Business Schools
FFS	Farmer Field Schools
FPO	Farmer Producer Organization
FYM	Farm Yard Manure
GAP	Good Agronomic Practices
HACCP	Hazard Analysis Critical Control Points
IDM	Integrated Disease Management
IPM	Integrated Pest Management
ISFM	Integrated Soil Fertility Management
IWM	Integrated Weed Management
KALRO	Kenya Agricultural and Livestock Research Organization
KARI	Kenya Agricultural Research Institute
KCSAP	Kenya Climate Smart Agriculture Project
LF	Lead farmers
MoALD	Ministry of Agriculture and Livestock Development
NAVCDP	National Agricultural Value Chain Development Project
NGOs	Non-government Organizations
PFPO	Pyrethrum Farmer Producer Organization
PPPs	Public Private Partnerships
TSP	Triple Superphosphate
TIMPs	Technologies, Innovations and Management Practices
ToTs	Training of Trainers
VC	Value Chain

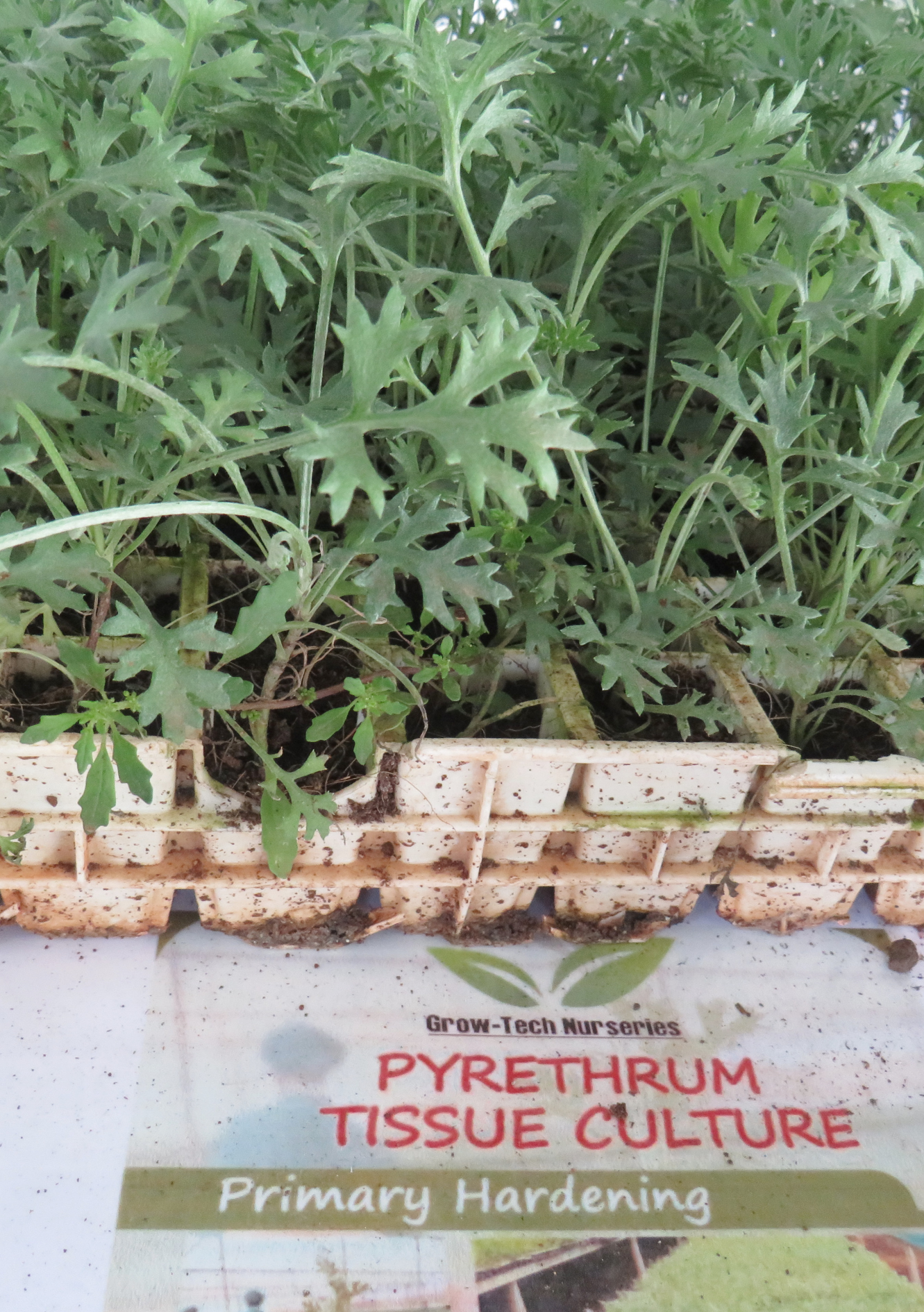
INTRODUCTION

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 training module in the value chain.

PART I

This part consists of four sections including the background of the pyrethrum value chain, content of the training, training design and facilitators' guidelines.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PYRETHRUM
TISSUE CULTURE
Primary Hardening

SECTION 1: BACKGROUND

1.1 The Role of Pyrethrum in the Kenyan Economy

Pyrethrum (*Chrysanthemum cinerariaefolium*) is a plant containing insecticidal natural products in its flowers. The crop has been grown in Kenya for more than 70 years and is currently produced across East Africa including Rwanda, Tanzania and Uganda. Pyrethrum contains a group of related compounds with a wider spectrum of activity against insects than many other single insecticides. The greatest component of pyrethrum (67%) is made up of the two esters, pyrethrin I and pyrethrin II. The crop has been traditionally used as an insecticide and is recognized as having outstanding properties that fit well among the factors desired for management of most pests. Among the key properties are low mammalian toxicity, pest toxicity, availability, cost, persistence, mode and high speed of action as a contact pesticide.

In Kenya, pyrethrum is traditionally cultivated at high altitude areas by small-scale farmers who are paid a fixed price based on pyrethrum content. Kenya has potential to produce and process more than 20,000 tonnes of pyrethrum flowers to earn KES 7.5 billion for farmers per year and KES 5.8 billion in foreign exchange from the refined extract alone. However, the current production stands at around 7000 tonnes of dried flowers per year, which is a sharp decline from a peak of around 18,000 tonnes p.a of the 1980s. While pyrethrum may not be as economically significant as it once was, efforts have been made to revitalize the industry through improved farming practices, research, and market access. Pyrethrum farming has a great potential to provide a source of income and livelihoods to many Kenyan farmers as a cash crop.

1.2 The Role of Pyrethrum in Food and Nutrition Security

Pyrethrum is not typically associated with a direct role in food nutrition. Instead, pyrethrum is primarily used in agriculture and pest control as a natural pesticide. It is used on a wide range of crops, including fruits, vegetables, and grains, to protect them from insect damage. This helps protect against agricultural yield losses ensuring a stable and consistent supply of food. When applied properly, pyrethrum has a relatively low toxicity to humans, does not leave harmful residues in food, and reduces contamination of water sources. It is considered safe for human consumption within established regulatory limits. In addition, pyrethrum is considered less harmful to the environment and farm workers compared to synthetic pesticides, reducing health risks for laborers and ensuring a stable workforce for food production. While pyrethrum is not a source of nutrition, its use in agriculture can indirectly impact food nutrition. Protecting crops from insect damage and reducing the need for synthetic chemical pesticides, may help maintain the overall quality and yield of food crops. This, in turn, can ensure that the food retains its nutritional value. Responsible use of pyrethrum is essential for maximizing its benefits while minimizing potential risks to both food production and nutrition security.

1.3 Climate Smart Pyrethrum Technologies, Innovation, and Management Practices

Climate-smart pyrethrum technologies, innovation, and management practices are crucial for both environmental sustainability and the long-term viability of pyrethrum cultivation. These practices help ensure that pyrethrum remains a valuable and environmentally responsible natural insecticide source in the face of climate change and evolving agricultural standards. This starts with the development of climate-resilient pyrethrum varieties that adapt to changing weather patterns and pests, supported by the implementation of efficient irrigation systems to ensure water availability in periods of drought, utilization of organic and integrated pest management techniques to reduce the need for synthetic pesticides and adoption of sustainable farming agronomic practices. In addition, market access is crucial where climate-smart pyrethrum products are linked to markets through certifications and partnerships with processors and buyers.

1.4 Objectives of the Training

The purpose of this training is to provide pyrethrum farmer trainers with skills and knowledge to facilitate and support Farmer Field and Business Schools (FFBS) for increased productivity through adoption of current pyrethrum technologies, innovations and management practices.

The specifically objectives of this training are to:

1. Provide farmers' trainers with relevant attitude, knowledge and skill in pyrethrum farming as a business and market assessment techniques for market led production.

2. Refresh farmer trainers' skills and knowledge in Good Agricultural Practices (GAP) including on-farm variety selection and establishment and management of pyrethrum fields.

3. Provide pyrethrum farmer trainers with knowledge and skills on the potential of value addition at individual or group level as post-harvest pyrethrum management.

4. Provide pyrethrum farmer trainers with knowledge and skills on participatory techniques for effective facilitation of adult learning processes through FFBS and developing inclusive stakeholder partnership development for sustainable up-scaling of FFBS.

After the 7-day training, TOT facilitators will train farmers for a season-long FFS session on pyrethrum GAP. The FFBS training will involve providing the trainers with techniques in participatory preparation, mobilization, planning, implementation, monitoring and evaluation of FFBS sessions. The ToTs will train farmer groups to scale up the adoption of GAP through farmer-led FFS in their villages and those neighboring them.

SECTION 2: TRAINING CONTENT

2.1 Orientation of the Module

This section of the training manual deals with the training content. It outlines the orientation and outline of the 15 modules**,** which are orientated so as to ensure adoption and up-scaling of pyrethrum TIMPs, to improve productivity, resilience and mitigation of harmful greenhouse gases. The purpose of these modules is to enhance the knowledge and capacities of trainers in understanding and disseminating the climate-smart pyrethrum practices to the intended beneficiaries, who are primarily farmers.

2.2 Module Outline

Each of the 15 modules consists of 8 parts. These parts are:

a) **Introduction** – context and background to training needs, knowledge and skills gaps being addressed

b) **Module learning outcomes** – what trainees are expected to learn

c) **Module target group**–trainee categories

d) **Module users** –facilitators

e) **Module duration** –minimum number of hours of exposure to materials

f) **Module summary** –sequence of sessions, training methods, materials and duration

g) **Facilitators guideline** –detailed sessions, training methods, materials and session guides

h) **Participant's handouts** – detailed notes and reference materials for trainees

The outline of the **15** modules is presented in **Table 1**.

Table 1 Summary of the 15 module outlines for the pyrethrum value chain

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
1	Climate change and climate smart agriculture	• Awareness on the impact of climate change on pyrethrum production	• The potential impact of climate change on pyrethrum production understood • Climate smart techniques for pyrethrum described	3 hours
2	Farmer Field and Business School (FFBS) approach in pyrethrum value chain	• Inadequate skills for exploratory learning to enhance adoption and uptake of TIMPS	• FFBS approach and concepts in pyrethrum value chain described and explained • TIMPS in pyrethrum value chain transferred to farmer trainers	6 hours 30 minutes
3	Good Agricultural Practices (GAPs) and Food Safety Management System (FSMS)	• Enhancement of food safety through lowering presence of hazardous solids/ organisms, pollutants and pathogens	• Techniques for determining pollutants in food material explored for adoption in pyrethrum value chain	5 hours 20 minutes
4	Pyrethrum production niches and climate requirements	• Identification of areas that are suitable for pyrethrum production	• Pyrethrum niches in the respective counties explained	4 hours
5	Pyrethrum variety selection	• Awareness on improved pyrethrum varieties	• The new improved varieties described	4 hours 30 minutes
6	Pyrethrum seed systems	• Awareness on both formal and informal seed systems and their operations.	• The formal and informal seed supply systems understood.	2 hours

7	Climate smart agronomic practices for pyrethrum production	• Insufficient knowledge and information on appropriate pyrethrum establishment and management practices	• Agronomic practices for pyrethrum production management described	5 hours 50 minutes
8	Integrated soil fertility and water management practices for pyrethrum production	• Inadequate soil water and fertility enhancing techniques • Insufficient skills in practices that maintain integrity of the ecosystem.	• All techniques for ISWM described	5 hours
9	Pyrethrum crop health	• Insufficient knowledge and information on pests, diseases and weeds affecting pyrethrum production and management options available for their control	• Major pests, diseases and weeds identified. • Integrated pest, disease and weed management practices in pyrethrum described. • Safe use of agro-chemicals (insecticides, fungicides and herbicides) appreciated and explained.	6 hours
10	Pyrethrum harvesting and Post- harvest management	• Awareness of postharvest technologies that reduce losses in quantity and quality	• Proper harvesting techniques and storage facilities, hygiene and monitoring described • Appropriate harvesting technologies for quality pyrethrum identified • Constraints and opportunities in pyrethrum harvest and postharvest value chain explained	3 hours

			• Climate smart and gender friendly postharvest TIMPs for minimizing losses of quality pyrethrum explained and demonstrated.	
11	Pyrethrum value addition	• Awareness on value added products of pyrethrum • Value added products	• Value addition and Pyrethrum products for farming communities and business entities identified. • Opportunities Identified and Prioritized • Value addition strategy for priority opportunities in the value chain demonstrated	6 hours
12	Food and nutrition security	• Importance of food and nutrition security	• Food availability from income generated from pyrethrum business explained. • High quality and high yield foods due to pest and disease control outlined. • Availability of nutritious foods as a result of GAP demonstrated.	2 hours
13	Mechanization of pyrethrum production activities	• Awareness of mechanization of operations along the pyrethrum production value chain	• Options of mechanization for increased yields understood.	4 hours 30 minutes
14	Pyrethrum business and Marketing	• Awareness of business options in pyrethrum value chain	• Type of aggregations by farmers available for considerations and contract farming outlined	2 hours

15	Pyrethrum Cross cutting issues 15.1 Innovation Platforms (2 hours)	• Enhancement of practitioners' know-how in facilitation of innovation platforms	• The definition and attributes of innovation platforms identified and described. • Mobilization of stakeholders for initiation, establishment, management and sustenance of an Agricultural Innovation Platform explained and demonstrated • Capacity building process of the AIP actors understood and explained.	7 hours 30 minutes
	15.2 Gender mainstreaming and social inclusion (3 hrs, 10 minutes)	• Women, youth and VMGs equal access to and benefits to resources (credit, land, technologies, innovations, management practices, voice decision making)	• Youth, women and VMGs empowerment to access the resources explained and understood	
	15.3 Policy (2 hrs 20minutes)	• Understanding productivity due to poor policies on production and marketing • Greater involvement of pyrethrum growers in policy formulation and implementation	• Increased awareness on laws Crops Act 2013 and policies governing pyrethrum • Increased pyrethrum stakeholder involvement in policy formulation and implementation	
Total Duration				**67 hours 10 minutes**

SECTION 3: TRAINING DESIGN

3.1 Delivery System

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

a) Establishment of a team of facilitators

- A Core Team of Trainers (CTT) to train farmer trainers (service providers) as facilitators of a ToT course will be established. This is done using this manual and modules contained therein.

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

b) Up-scaling –This will be done by identifying and selecting lead farmers (LF) to be trained in facilitation skills.

3.2 Partners and their roles

The partners envisioned in this training plan are:

a) Core Team of Trainers – Master trainers drawn from KALRO, Universities, and Tertiary Institutions offering agricultural sciences and State Department of Agricultural to facilitate initial training of trainers (ToTs) and other stakeholders. They will also provide backstopping services.

b) County Government – The County Government through NAVCDP Coordinating Unit will select teams to be trained as TOTs. This will include County technical staff, service providers (SPs), CBFs and other experts who will further cascade the training to CIGs and VMGs. The CPCU will be expected to make follow-ups and backstop the TIMPs training.

c) Community-Based Facilitators – The CBFs will facilitate the CIGs and VMGs. They will be expected to follow up to ensure appropriate adoption at farmers' level. The CBFs will also plan and organize exchange visits to learn best practices.

d) Lead farmers – These are early adopters or role models at the community level. They are supposed to mentor the CIG and VMG members and to allow their farms to be used as learning sites.

e) Agripreneurs – Business people whose investments in parts of crop value chain is important in spurring social change and conduct of business therein.

3.3 Training Duration

The proposed ToT course for Master trainers for 15 modules in the pyrethrum value chain shall take a total of 65 hours of training period. This does not include break hours of mid-morning, afternoon and lunch breaks.

3.4 Logic of Design and Flow of Session

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

SECTION 4: FACILITATOR GUIDELINES

4.1 Preparation of Training Materials

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

In addition:

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

4.2 Preparation of Training Venue and Sites

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

a) **Training Room** – Should have adequate space for 25 participants seated in a semi-circle or U shape arrangement and socially distanced ensuring access and unobstructed view of the front. There should be adequate space for a desk and seats for 3trainers preferably at the sides or at the back of the training room. There should also be a desk for the trainer, their training materials and LCD projector, a flip charts holder and white wall to act as a projector screen.

b) **Demonstration Site** – Should be within a walking distance with at least five distinct plots for demonstrations.

c) **Market Sites** – these include cereal retail outlets (kiosks, stalls, shops and supermarkets), whole sale and aggregation points and processing sites if any. The operators should be informed in advance about the visits. These should not be very far away, preferably less than 10 minutes' drive.

4.3 The Trainees

The trainees who will participate are extension officers, agripreneurs, lead farmers, educators, service providers and researchers with elaborate training back ground in extension and advisory services. They will be drawn from public and private sector based on considerable experience in training farmers but with minimal facilitative advisory or technology transfer skills. The facilitator should therefore act more of a facilitator than a lecturer and draw out and build on their knowledge, skills and experience that they shall bring in. As a golden rule, do not lecture them but facilitate and listen and let them feel like equals to each other and the CTT team members.

4.4 Training Program

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

4.5 Training Methods

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

Table 2 Description of Training Method

Training Method	Description of Method
Plenary presentations	Use of PowerPoint or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Group exercises, buzz groups, visits and brainstorming sessions	To be considered where skills are an issue requiring sharing and trying
Role plays and problem-solving exercises	Plenary discussions have been considered as training methods where attitude is an issue
On-farm practical demonstration and exchange visits	To be considered where hands-on practical skills are acquired through sharing and demonstration
Farmer Field and Business School Approach	To be a lead method considered most of the time where farmers have organized themselves into groups that have a regular program

4.6 Planning Schedule and Guideline for ToT Preparation

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

1. **Six weeks** – recruit master trainers, compose CTT and identify demonstration plots with appropriate pyrethrum varieties
2. **Four weeks** – send out invitation letters to participants and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members
3. **Two weeks** – confirm names of participants; reproduce training materials for facilitators and package, confirm preparedness of the field sites to be visited. Hold briefing of CTT members to finalize training plan. Confirm special guests if any
4. **Four days** –Confirm training sites preparedness, prepare sitting arrangements, and brief assistants
5. **One day** - arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at residence proposed
6. **On first day** – arrange for reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes:
    - Registration
    - Welcoming to venue by host
    - Elaborate introduction of CTT and participants
    - Introduction to the project and training course
    - Ground rules
    - Group formation

4.7 Evaluation of the Training

Half a 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 just presented in section 4.4

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

Table 3 Sample Evaluation Form

Aspect / Module	Rating		
	Very Useful (3 marks)	Useful (2 marks)	Of Limited Use (1 marks)
1. Climate change and Climate smart Agriculture			
2. Farmer Field and Business School Approach in Pyrethrum Production			
3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			
4. Pyrethrum production Niches and Climatic Requirements			
5. Pyrethrum variety selection and access to quality seeds.			
6. Pyrethrum Seed Systems			
7. Climate Smart Agronomic Practices			
8. Integrated Soil and Water Management Practices for Pyrethrum			
9. Pyrethrum Crop Health			
10. Pyrethrum Harvesting and Post-harvest Management			
11. Pyrethrum Value Addition			
12. Food Nutrition and Security			
13. Mechanization of Pyrethrum production Activities			
14. Pyrethrum Business and Marketing			
15. Cross-Cutting Issues (Agricultural Innovation Platforms, Policy, Gender Mainstreaming and Social Inclusion)			

The second direction for evaluation is trainee's group evaluation. They retreat to one room and elect a chair and a secretary. Ask them to objectively and constructively evaluate the training in about 45 minutes in the absence of the CTT members. They then present their evaluation to the CTT members and as they present, the CTT members should only give points of clarifications if any misunderstanding occurred but not try to be defensive. The CTT members then use the two evaluation results to

write a report highlighting aspects that went on well and can be replicated, challenges that were encountered, and opportunities for future ToT's improvement.

4.8 Facilitator's Training Notes and Reference Materials

4.8.1 Key Further Reading

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

4.8.2 Guide on the use of the information

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

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

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

MODULE 1: CLIMATE CHANGE AND CLIMATE SMART AGRICULTURE IN PYRETHRUM PRODUCTION

1.1 Introduction to the Module

High potential of impacts of climate change and variability in agriculture, food systems and food security are of immense concern world-wide. Kenya's agricultural production systems are likely to be highly impacted due to the low adaptive capacity and the high exposure to climate related risks. 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. In pyrethrum for instance, high temperatures will reduce pyrethrins content, and also reduce flower production. Erratic high rainfall can cause flooding and water logging, which would reduce pyrethrum production. In Kenya, clones and varieties are recommended according to low, medium and high altitude. A grower is therefore advised to choose the clones and varieties based on the altitude in order to take advantage of climatic conditions. Adoption of climate smart agriculture (CSA) through application of tools and technologies and effective communications of weather information can reduce the negative impacts of climate change and will enhance access to food security in a changing environment. Thus, there is need to create awareness and mainstream suitable climate resilient technologies, innovations and management practices (TIMPS) to increase productivity, resilience to climatic shocks and mitigate the causes of climate change.

1.2 Module Learning Outcomes

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

1. Concept of climate change and variability explained and discussed.
2. Impacts of climate change and variability on agriculture and food security shared.

3. Concept of Climate smart agriculture (CSA) shared and explained.
4. Future climate scenarios and how to manage them projected and appreciated.

1.3 Module Target Group

This module targets agricultural extension service providers, lead farmers and agripreneurs based at the county, sub-county and ward levels. It will be useful for extension service providers dealing directly with farmers groups at community level 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). The trainer using this module should thoroughly familiarize themselves with the participant's handouts (training materials).

1.5 Module Duration

The module is estimated to take about 3 hours.

1.6. Module Summary

Module 1: Climate Change and Climate Smart Agriculture in pyrethrum valuechain			
Sessions	**Training Methods**	**Training Materials**	**Time**
1.6.1. Introduction to climate change and variability	• Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Videos • Flip charts • Handouts	30 minutes
1.6.2. Impacts of climate change and variability on agriculture and food security	• Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Videos • Flip charts • Handouts	30 minutes
1.6.3. Concept of Climate smart agriculture (CSA) in pyrethrum	• Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Videos • Flip charts • Handouts	1 hour

1.6.4. Projected future climate scenarios affecting pyrethrum and how to manage	• Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts • Handouts	30 minutes
1.6.5. Module review	• Participants' questions and comments • Facilitator' • summary	• Module review	20 minutes
TOTAL			2 hours 50 minutes

1.7 Facilitators Guidelines

1.7.1. Introduction and Levelling Expectations (30 minutes)	**Session Guide**
(The facilitator introduces the trainees to this module. **Trainees' expectation (30 minutes)** *The facilitator organises the trainees into groups to come up with their expectations.* *Participant's group leaders present their expectations.* **Module objectives (30 minutes)** *(The facilitator presents modules objectives on PowerPoint)* By the end of the training module the trainee should be able to: • Explain climate change and adaptations. • Define 'climate smart agriculture'. • Describe and explain available climate smart crop management practices in pyrethrum production. • Project and explain the benefits of selected climate smart crop management practices in pyrethrum production	• PowerPoint presentation • Distribute Participants' handouts on module objectives and expectations.
1.7.2. Introduction to Climate Change and Climate Variability (30 minutes)	**Session guide**
(*The facilitator proceeds to introduce the module basics)* **Plenary Presentation** • Basic terminologies used in the module (weather, climate, variability, adaptation, mitigation, carbon sequestration, greenhouse gas emissions, coping strategies) • Explain climate change and climate variability	• PowerPoint presentation • Flip chart sketches • Discussion on the session; field experiences,

• The causes of climate change • Climate risks impacting agriculture • Proposed adaptation measures (captured in TIMPS)	coping and adaptation mechanisms adopted by farmers
1.7.3. Concept of Climate Smart Agriculture (CSA) (1 hour)	**Session Guide**
(The facilitator presents to the trainees the principles underpinning CSA and the link to deliverable of projectobjectives). **Plenary Presentation** • Definition of the CSA approach and their characteristics • The three pillars of CSA (productivity, adaptation and mitigation • Why CSA is needed	• PowerPoint presentation • Handouts • Plenary discussion
1.7.4. Projected Future Scenarios that will Impact Productivity (30 minutes)	**Session Guide**
(The facilitator 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? • Project impacts on food production and needed adaptation measures especially for pyrethrum • Short Video on showing projections of rainfall and temperature.	• PowerPoint presentation • Video presentation • Plenary Discussion
1.7.5. Module Review (20 minutes)	**Session Guide**
(The facilitator leads the trainees in summarizing the key points discussed in the module).	Plenary discussion

1.8 Reference Materials

1.8.1 Participants' Handouts

- Fact sheet on climate change

1.8.2 Further Reading

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

MODULE 2: FARMER FIELD AND BUSINESS SCHOOL (FFBS)APPROACH IN PYRETHRUM VALUE CHAIN

2.1 Introduction to the module

The FFBS methods promote exploration, discovery and adaptation under local conditions. The "right way" means not only building on suitable science and technological methods, but also fitting into local ecological, social, economic and historical contexts. Finding the "right way" means that, all stakeholders need to participate and gain ownership of the process. The vision inherent in Farmer Field and Business Schools is that trainers work alongside farmers as advisors and facilitators, encouraging independence, analysis and organization.

This module is designed for training on Farmer Field and Business Schools (FFBS) approach and concepts, which involves transfer of various technologies, innovations and management practices (TIMPs) in pyrethrum production to farmers. The trainees will thereafter facilitate farmers in the Common Interest Groups (CIGs) to learn by doing from a common plot of FFBS and then implement what they have learnt to their individual farms in order to meet the NAVCDP project objective of pyrethrum value chain commercialization. Since the methodology is participatory, it improves the learners' observation skills and creates linkages with other value-chain players, thereby making pyrethrum production profitable and sustainable.

2.2 Module Learning Outcomes

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

1. Concept of Farmer Field and Business School approach in the pyrethrum value chain, teaching and facilitating described and explained.
2. Approaches on facilitating FFBS participatory learning process and developing FFBS curriculum demonstrated and explained.

3. Knowledge and analytical skills to design simple experiments for testing and selecting the best option to mitigate the constraints of the pyrethrum value chain mapped identified and explained.
4. Knowledge on engaging FFBS to shift from the subsistence production and focus on improving productivity towards farming business described and demonstrated.
5. Knowledge and skills on disseminating TIMPS through a well-defined action plan that is specific, measurable, achievable realistic and time bound (SMART) identified and explained.

2.3 Module Target Group

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

2.4 Module Users

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

2.5 Module Duration

The module is estimated to take a minimum of 6 hours 30 minutes.

2.6 Module Summary

Module 2. Farmer Field and Business School Approach			
Sessions	**Training Methods**	**Training Materials**	**Time**
2.6.1 Introduction, Climate setting, leveling of expectations and objectives.	• Setting norms and group discussions on expectations	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	20 minutes
2.6.2 Overview of FFBS key activities	• Presentations and plenary discussions	• Pictorials • PowerPoint presentation • Projector	30 minutes

2.6.3 Introduction to Communication and communication skills	• Plenary presentation • Group discussions	• Laptop • PowerPoint presentation • Projector • Flip charts • Marker pens	30 minutes
2.6.4 Facilitation and leadership skills	• Presentation and plenary	• Laptop • PowerPoint presentation • Projector.	30 minutes
2.6.5 Organization and management in FFBS	• Plenary presentation	• Laptop • PowerPoint presentation • Projector	30 minutes
2.6.6 Developing FFBS Curriculum for the Pyrethrum value chain	• Group discussion and presentation • Plenary presentation	• Laptop • PowerPoint presentation, • Projector • Flip charts • Marker pens	40 minutes
2.6.7 FFBS marketing tools	• Group discussion, presentation and plenary presentation	• Laptop, PowerPoint presentation • Projector • Flip charts • Marker pens	30 minutes
2.6.8 Module review	• Discussions conclusions and way forward	• Flip charts • PowerPoint presentations • Laptop • Projector	30 minutes
TOTAL			**4 hours**

2.7 Facilitators Guidelines

2.7.1 Introduction, climate setting Leveling Expectations and Objectives (30 minutes)	**Session Guide**
(Introduction of participants, setting training norms, formation of FFBS sub groups (Working groups) and trainees to share their expectations) (20 Minutes) *The facilitator presents modules objectives* (20 Minutes) By the end of the module the trainee should be able to: • Describe and explain the concept, characteristics, principles and plans of Farmer Field and Business School (FFBS) as a 'learning by doing approach as it applies in pyrethrum. • Demonstrate and explain approaches to effective facilitation and participatory learning for FFBS. • Identify and demonstrate knowledge and analytical skills to design simple experiments for testing options. • Describe and explain the shift from the traditional focus on subsistence farming to improving productivity for enhanced farming business. • Identify and explain a well-defined action plan for TIMPs dissemination that is specific, measurable, achievable, realistic and time-bound (SMART).	• Provide checklist for introduction of trainees to help thembuild confidence in participation • Summarize and display trainees 'expectations' • Assign roles to the Sub groups • Set norms and nominate leaders • PowerPoint presentation on the Objectives of the FFBS training module
2.7.2 Overview of FFBS key activities (30 minutes)	**Session guide**
Plenary presentation The facilitator takes the trainees through the main concepts and pillars of FFBS which include: • Definition of FFBS • Participatory technology development (PTD) for the pyrethrum value chain TIMPS • Agro ecosystems analysis (AESA) of the pyrethrum value chain • Concept of what is this what is that • FFBS principle of Integrated production and pest management (IPPM) • FFBS Business concept and opportunities in the pyrethrum value chain stages	• PowerPoint presentation

2.7.3 Introduction to Communication and Communication skills (30 minutes)	Session guide
Group exercise (20 minutes) **Gauge the understanding of trainees on:** • What communication is • Communication channels • Barriers to effective communication • How to effectively communicate. **Plenary presentation (10 minutes)** • Communication and communication skills	• Group exercise and presentations on flip charts and PowerPoint presentation • Participants' handouts
2.7.4 Facilitation and leadership skills (30 minutes)	**Session guide**
Plenary presentation • Definition of Facilitation, facilitator and effective facilitation • Qualities of a good facilitator • Golden rules of facilitation • Roles and responsibilities of FFBS Facilitators • Difference between facilitation and teaching • Definition of leadership • Elements of leadership • Types of leadership • Characteristics of a good leader	• PowerPoint presentation
2.7.5 Organization and management in FFBS (30 minutes)	**Session guide**
Plenary presentation on FFBS implementation and framework (30 minutes) • 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.	• PowerPoint presentation • Participants' handouts

2.7.6 Developing FFBS Curriculum for the Pyrethrum value chain (40 minutes)	Session guide
Plenary presentation (20 minutes) Steps of Participatory technology development on thePyrethrum value chain production • Identify the major constraints to increased yields of • Pyrethrum value chain production • Ranking of constraints in order from highest. • Identify list of TIMPS to address the constraints • Rank the TIMPS in order from the most preferred • Develop PTD on the most preferred • Decide on the parameters for AESA • Develop FFBS curriculum using crop growth stage • Calendar for the Pyrethrum value chain **Group exercises (20 minutes)** • Pair-wise matrix ranking of constraints and TIMPs in pyrethrum value chain • Curriculum development basedon the value chain growth stages • Presentations of thegroup exercises on flip charts **Plenary presentation on curriculum development (10 minutes)** • Constraint identification and ranking • TIMPS options identification and ranking • Identification of the growth stages of the value chain • Crop and development of FFBS training curriculum	• PowerPoint presentation • Group exercises
2.7.7 FFBS Marketing tools (30 minutes)	**Session guide**
Plenary presentation (15 minutes) • Introduction to marketing concept • Marketing planning • Market survey **Group exercise (15 minutes)** • Profitability determination	• PowerPoint presentation, projector, flip charts, felt pen • Group exercise on using market information for margin determination

2.7.8 Module review (30 minutes)	Session guide
(Facilitator leads the trainees in reviewing the module) **Plenary Presentation and Discussion** • Participants' Questions and answers • Facilitators Summary	• PowerPoint presentation,

2.8 Reference Materials

2.8.1 Participants' handouts

- FFBS factsheets
- Training notes
- PowerPoint presentations

2.8.2 Further Reading

1. Ferris,S., Kaganzi,E., Best, R., Ostertag,C., Lundy, M. and Wicherde-cati, T, Co. (2006). A market facilitation guide to participatory agroenterprise. Development Central Internacionale de Agricultura Tropical (CIAT).
2. FAO (2006). Farmer Field school guidance document planning for quality programmes.

MODULE 3 GOOD AGRICULTURAL PRACTICES (GAPs) AND FOOD SAFETY MANAGEMENT SYSTEMS (FSMS)

3.1 Introduction

This module is designed to train and expose trainees to good agricultural practices and food safety management systems along the pyrethrum value chain. Good Agricultural Practices (GAPs) are based on the principles of risk prevention, risk analysis, and sustainable agriculture (by means of Integrated Pest Management (IPM) and Integrated Crop Management (ICM) to continuously improve farming systems. Hazard Analysis Critical Control Points is a seven-step management system that provides the framework for monitoring the total food chain to reduce the risk of food borne illness and consequently death. The system which is designed to identify and control potential problems before they occur.

The only important tool kit to assure safety through monitoring in the pyrethrum value chain is the Hazard Analysis and Critical Control Points (HACCP) system. This critical tool is already incorporated into the Codex Alimentarius of the world as well as into the national public health food safety legislation of Kenya. The HACCP approach can be applied to all stages of the pyrethrum value chain process, ranging from production to processing, transportation, and retail in commercial establishments. This will set limitation values for monitoring so that action can be taken if the set-out values of hazards are out of the defined range required.

3.2 Module Learning Outcomes

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

1. GAP's on matters of food safety and quality along the pyrethrum value chains articulated.
2. Utilization of resources (water, soil, manure, fertilizers, and other inputs) while optimizing environmental protection and conservation understood.

3. Worker safety and health within the crop production demonstrated.
4. Traceability in food safety and quality mapped and outlined.
5. Risks/hazards of food safety along the crop production chain identified.
6. Critical control points (CCPs) and critical limits (CLs) at different levels of crop production mapped and determined.
7. Preventive and corrective measures for the control of hazards identified and defined.
8. Need for legal safe food production as a moral market requirement understood

3.3 Module Target Group

This module targets agricultural extension service providers and agripreneurs based at sub-county and ward levels, Lead farmers, and all value chain players. It will also be useful for private extension service providers dealing directly with farmer groups at the 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), in the pyrethrum value chain target Counties. The facilitator using this module should thoroughly familiarize themselves with the Participants' Handout (training materials).

3.5 Module Duration

The estimated duration is 5 hours 20 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 leveling of expectations	• Participants' expectations • Plenary Presentation	• Marker pens • Flip chats • PowerPoint • Laptop • Projector	30 minutes
3.6.2 Understanding what is GAP and its application in the pyrethrum value chains	• Plenary Presentations • Group work	• Flip charts • PowerPoint • Laptop • Projector	20 minutes

3.6.3 Discussion of the factors to consider when selecting a site for agricultural activities through Risk Assessment	• Group work • Farm visit within the training site • Group presentations	• Flip charts • Marker pens • Projector • Laptop • Pictorials/ • video clips • Datasheets	30 minutes
3.6.4 Review of GAP requirements for audit and types of protocols possible	• Group work • Plenary Presentations • Mock Audit	• Data forms • Flip charts • PowerPoint • Laptop, • Projector • Pictorials • Datasheets • Audit form	30 minutes
3.6.5 Safe use of pesticides and calibration of sprayers and nozzles	• Group work on nozzles and rate of discharge • Safety guidelines • Pictorials/video clips	• Knapsacks • Measuring cylinders • Tape measure • Nozzles • Empty clean • Pesticide containers	1 hour
3.6.6 Introduction to site selection	• Plenary Presentation • Plenary discussion	• Projector • Laptop	20 minutes
3.6.7 GAP checklists and audit	• Plenary Presentation • Group exercise	• Flip charts • Marker pens • Projector • Laptop	20 minutes
3.6.8 Understanding of food safety management system in pyrethrum value chains	• Brainstorming • Plenary presentation • Group discussions	• Flip charts • PowerPoint • laptop • Projector • Pictorials	20 minutes

3.6.9 Determination of food safety risks and hazards in pyrethrum value chains (hazard analysis)	• Plenary Presentation • Group discussions	• PowerPoint • Participants' handouts	30 minutes
3.6.10 Determination of critical control points (CCP) in pyrethrum value chains	• Plenary Presentation • Group discussions	• PowerPoint • Laptop • Projector • Flip charts	20 minutes
3.6.11 Prevention and corrective measures for CCP in pyrethrum value chains	• Plenary Presentation • Group discussions	• Flip charts • PowerPoint • Laptop • Projector	20 minutes
3.6.12 Module review	• Participants' questions and comments • Facilitator's summary	• Participants' handouts	20 minutes
TOTAL			**5 hours 20 minutes**

3.7 Facilitator's Guidelines

Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)	
3.7.1 Introduction, Objectives, and Leveling Expectations (30 Minutes)	**Session Guide**
(The facilitator welcomes trainees to the module on FSMS and introduces him/herself stating their profile and experience of working with farmers). **Trainees' introductions and expectations (10 minutes)** The facilitator invites the trainees to state their expectations after brainstorming in their respective county groups	• PowerPoint presentation • Participants handouts • Group exercises

Module Objectives (20 minutes) The facilitator presents module training objectives in PowerPoint By the end of the module the trainee should be able to: • Appreciate GAP's on matters of food safety and quality. • Demonstrate utilization of resources (water, soil, manure, fertilizers, and other inputs) and environmental protection and conservation. • Enhance worker safety and health within the production system. • Identify risks /hazards of food safety within the crop production chain. • Map and determine critical control points (CCPs) at different levels of crop production. • Define preventive and corrective measures for the control of hazards.	
3.7.2 Understanding what GAP is and its application in the Pyrethrum value chain (20 minutes)	**Session Guide**
The facilitator leads discussions on understanding of GAPs and its relevance to actors in the pyrethrum value chain **Plenary Presentation** • Understanding GAP in the context of pyrethrum production. • Explain the role of GAPs in a safe and sustainable food production system for growers and consumers. • Understanding GAPs as the key to high commodity market destinations.	• PowerPoint presentation • Participants handouts • Group exercises
3.7.3 Discussion of factors to consider when selecting a site for agricultural activities through Risk Assessment (30 minutes)	**Session Guide**
(The facilitator guides 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	• PowerPoint presentation • Participants' hand outs • Plenary discussion

• Types of Mandatory farm records • General guidelines to Conservation Agriculture.	
3.7.4 Review of GAP Requirements for audit and types of protocols possible. (30 minutes)	**Session Guide**
(*The facilitator leads the trainees in summarizing the key points discussed in the module)* **Plenary presentation** • 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 handouts
3.7.5 Safe use of pesticides and calibration of sprayers and nozzles (1 hour)	**Session guide**
The facilitator organizes the groups to identify the level of Knowledge of pesticide uses and safety knowledge. Determination of pesticide quantities to use and PHI **Plenary presentation** • Formation of groups for practical activities • Guided Knapsack calibration • Different types of nozzles and their use • Pesticide safety **Group Exercise** • Practical session on the calibration of pesticides, different types of pesticides and their handling	• PowerPoint presentation • Pesticide containers • Knapsack sprayers Nozzles • Participants' handouts • Group Exercise

3.7.6.Introduction to Site Selection (20 minutes)	Session Guide
(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 (CA)	• Plenary presentation
3.7.7 GAP Checklists and Audit (20 minutes)	**Session Guide**
(Facilitator guides the trainees on self-assessment (Internal audit and corrective measures for non-compliance) **Plenary Presentation (10 minutes)** • Need for mandatory records in GAPs • Internal Audit procedures • Practical on Mock Audits • Interpretation of audit reports • Compliance and corrective actions. **Group Exercise (10 minutes)** • Groups audit a farm or a process within the training site • Present audit results and verdict and corrective actions.	• PowerPoint presentation • Global GAP checklists • Participants' handouts • Group exercise
3.7.8 Understanding of Food Safety Management System (FSMS) in pyrethrum value chains (20 minutes)	**Session guide**
(The facilitator introduces the food safety system by defining it and sharing its benefits with the trainees). **Plenary Presentation** • Overview of Food Safety Management Systems • Why food safety is important in crop 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 • Participant's handouts

3.7.9 Determination of food safety risk/ hazards in pyrethrum value chains (hazard analysis) (30 minutes)	• **Session Guide**
(The facilitator should guide discussions on the steps of identification of food safety hazards. **Plenary Presentation** • Explain the concept of risk identification (Hazard analysis) • Listing the types of hazards that cause illness or death • Determine factors influencing the 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 pyrethrum production • Produce flow diagrams	• PowerPoint presentation • Participants handouts • Group exercise .
3.7.10 Determination of critical control points (CCP) in pyrethrum value chains (30 minutes)	**Session Guide**
(*The facilitator introduces the topic of determination of critical control points (CCP)* **Plenary presentation** • Why it is important to determine CCP in the 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/ guidelines) for each CCP **Group Exercise** • Groups to identify and establish critical control points and critical limits for pyrethrum	• PowerPoint presentation • Participants' handouts • Group Exercise

3.7.11 Prevention and corrective measures for CCP in pyrethrum value chains (20 minutes)	Session guide
(*The facilitator introduces the topic of 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 pyrethrum	• PowerPoint presentation • Participants handouts • Group exercises
3.7.12 Module Review (20 minutes)	**Session Guide**
(The facilitator leads the trainees in summarizing the key points discussed in the module)	Plenary discussion

3.8 Reference Materials

3.8.1 Participants' handouts

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

3.8.2 Further Reading

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

MODULE 4: PYRETHRUM PRODUCTION NICHES AND CLIMATIC REQUIREMENTS

4.1 Introduction

This module exposes service providers, lead farmers, Agri-prenuers and facilitators to the different types of production ecological (altitudes, soils, AEZs, and climatic conditions) suitable for pyrethrum production in the target Counties. In Kenya, pyrethrum clones and varieties are suitable for high altitudes between 1700 and 2100 meters above sea level. There is a definite correlation between the altitude, temperature, and pyrethrin content where best flower pyrethrin content is increased with an increase in altitude. Temperatures play a significant role in the pyrethrin content as well as in the flowering of plants as it affects bud initiation. The crop requires soils that are rich in phosphorus, calcium, and magnesium with a minimum pH of 5.6. Pyrethrum requires a minimum of 750 mm annual rainfall well spread over the season. There is a need for knowledge of the production niches and climatic conditions for the production of the crop in the various target counties. Knowledge of production niches and climatic requirements for pyrethrum is critical to achieving economical gains.

4.2 Module Learning Outcomes

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

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

4.3 Module Target Group and Categories

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

4.4 Module users

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

4.5. Module Duration

The module is estimated to take a minimum of 2 hours.

4.6 Module summary

Module 4: Pyrethrum production niches and climatic requirements			
Sessions	**Training methods**	**Training materials**	**Time**
4.6.1 Introductions and climate setting	• Presenter introduction • Self-introduction of trainees • Plenary discussions to share expectations • Presentations of objectives	• Flips charts • Marker pens • Laptop for PowerPoint presentation	20 minutes
4.6.2 Importance of pyrethrum in Kenya's economy	• Plenary presentations	• Flips charts • Marker pens • PowerPoint presentation	20 minutes
4.6.3 Pyrethrum production ecological/ climatic requirements for optimal yields	• Plenary presentation • Plenary discussions	• Flips charts • Marker pens • Laptop for PowerPoint presentation • Projector • Participants handouts • Suitability maps	30 minutes
4.6.4 Pyrethrum production Agro-ecological zones (AEZs) average yields, and constraints in the target Counties	• Plenary Presentations • Plenary discussions • Group exercise	• Flips charts • Marker pens • Laptop for PowerPoint presentation	40 minutes

4.6.5 Module review	• Discussions/ conclusion and the way forward	• Flip charts • Marker pens • Participants handouts	20 minutes
Total			**2 hours 10 minutes**

4.7 Facilitator's Guidelines

Module 4: Pyrethrum production niches and climatic requirements	
4.7.1 Introductions and climate setting (20 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and introduces him/herself. He/she invites trainers to introduce themselves and state their expectations). The facilitator introduces the module and presents the module's objectives **Introduction of Objectives (20 minutes)** By the end of this training module the trainee should be able to: • Define and explain the importance of pyrethrum in Kenya's economy. • Describe altitudes and soil types/characteristics for pyrethrum production. • Describe climatic conditions (temperatures, rainfall, and humidity) required for pyrethrum production. • Describe specific county agro-ecological zones for pyrethrum production.	• List the trainees' expectations on a flip chart and clearly display them for all to see. • PowerPoint presentation • Distribute participants handout • Expectations lists kept for later reviewing compliance
4.7.2 Importance of pyrethrum in Kenya's Economy (20 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Origin of pyrethrum crop • Why pyrethrum is important in Kenyan households • Key counties producing pyrethrum in Kenya • General pyrethrum production in Kenya	• PowerPoint presentation • Distribute to Participants' Handouts • Product specimens

4.7.3 Pyrethrum production ecological/ climatic requirements for optimal yields (30 minutes)	Session Guide
Plenary Presentation (20 minutes): Presentation on Pyrethrum topics such as: • Altitude and Agro-ecological zones for pyrethrum production • Climatic conditions (Rainfall, Temperature and humidity) • Ideal Soils (soil types, pH, general fertility for Pyrethrum). **Facilitator's guided discussion (10 minutes)** Questions/answers/comments	• PowerPoint Presentation • Suitability maps • Distribute to participants Handouts (training materials) • Plenary discussions
4.7.4 Pyrethrum production Agro-ecological zones (AEZs) average yields, and constraints in the target Counties (40 minutes)	**Session Guide**
Plenary Presentation (15 Minutes) *The facilitator guides in reviewing and discussing the suitability map (county by county)* **Group work (15 minutes)** Trainer to bring out specific County or sub-county AEZs, land size, yields, and constraints to pyrethrum production. Then, the trainees provide in the plenary: • Agro-ecological zones (AEZs) and % area suitable for pyrethrum. • Average land/farm size under pyrethrum production in Kenya. • Average flower yield per farm • Constraints to pyrethrum production. **Discussions (10 minutes)** Let the trainee groups share the exercise outcomes	• PowerPoint presentations • Open discussions with the guidance of the facilitator • Plenary discussions • Suitability maps • Group exercise
4.7.5. Module review (10 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Together with trainees discuss and summarize the main points from the training with specific reference to: • Pyrethrum production ecological/climatic requirements, pyrethrum production AEZs (villages)average yields, and constraints in the target counties. • Randomly, trainees indicate new thing(s) learnt from the module. The results arerecorded per county presented	• Participants' handouts/ training materials • Summarize the main points of themodule on a flip chart and display

• Randomly, trainees pinpoint the way forward issues.	• Plenary discussion

4.8 Reference Materials

4.8.1 Participants' Handouts

1. Pyrethrum Growers Manual, Second edition 1998.
2. Pyrethrum leaflets /Brochure
3. Pyrethrum factsheets

4.8.2 Further Reading

1. Pyrethrum Principles of Production and Utilisation 2007
2. Ikahu, JMK, Ngugi, CW and Maengwe, EO (1994). The performance of recommended clones in different ecological zones in Kenya. Pyrethrum post Vol. 19 (2): 47-53a.

MODULE 5: PYRETHRUM CLONE AND VARIETY SELECTION

5.1. Introduction to the Module

The pyrethrum clone and variety selection module is designed to expose master trainers to all available improved clones and varieties, their flower yield potential, pyrethrin content, pest and disease resistance, and target agro-ecological areas of production. The choice of appropriate pyrethrum clones and varieties for a agro-ecological location is very important because all the clones/varieties have been developed and validated extensively through breeding systems before recommendation. However, farmers are not able to identify varieties suited to their regions, therefore making it necessary for farmer trainers in the pyrethrum target counties to be trained on the different pyrethrum clones and varieties, their suitable areas of production and their end uses.

5.2 Learning Outcomes

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

1. Factors to consider when selecting pyrethrum clone understood.
2. Improved pyrethrum clones and varieties, their ecological areas of cultivation, and their attributes described and identified.
3. Recommended varieties for specific agro-ecological regions articulated

5.3 Module Target Group

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

5.4. Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT) in the pyrethrum value chain target counties. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

5.5 Module Duration

The module is estimated to take 2 hours 40 minutes.

5.6 Module Summary

Module 5: Pyrethrum Variety Selection			
Sessions	**Training Methods**	**Training Materials**	**Time**
5.6.1. Introduction, leveling of Expectations and objectives	• Plenary presentation • Group discussions and presentation of expectations	• Flip charts • Marker pens • PowerPoint presentation • Laptop • Projector	20 minutes
5.6.2. Introduction to various improved pyrethrum varieties and clones, their ecological areas of cultivation, and their attributes.	• Plenary Presentations • On-farm practical demonstration	• PowerPoint presentation • Projector • Flip charts • Manila papers • Marker pens • Variety and clone specimens	1 hour 30minutes
5.6.3 Appropriate clones and varieties for specific regions	• Plenary Presentation Group Exercises	• PowerPoint • Projector • Pyrethrum suitability maps • Exercise guide	30 minutes
5.6.4 Module review	• Group Exercises • Facilitator's summary	• Participants' handouts • Pyrethrum • manual	20 minutes
TOTAL			**2 hours 40 minutes**

5.7 Facilitator's Guidelines

Pyrethrum Variety Selection	
5.7.1. Introduction, leveling of Expectations and objectives (20 minutes)	**Session Guide**
Introduction (10 minutes) (*The facilitator welcomes trainees to the module on pyrethrum varieties. He/she introduces the module, and presents the objectives).* The facilitator invites the trainees to introduce themselves and state their expectations. **Module Objectives (10 minutes)** *(The facilitator presents module objectives)* By the end of the module the trainee should be able to: 1. Explain factors to consider when selecting a pyrethrum clone or variety. 2. Identify the various pyrethrum clones and varieties, and their ecological areas of cultivation 3. Identify recommended clones and varieties suited to the counties of interest.	• Summarize trainees' expectations and display. • Distribute participants' handouts • PowerPoint presentation displayed • Module objective Program
5.7.2. Introduction to various improved Pyrethrum varieties and clones, their ecological areas of cultivation, and their attributes. (1 hour 30 minutes)	**Session Guide**
(The facilitator should describe the pyrethrum crop, and guide the trainees in identifying the improved clones and varieties and their attributes). **Group work (10 minutes)** Ask trainees to highlight and describe some of the pyrethrum clones and varieties they know. **Plenary Presentation (20 minutes)** • What is a pyrethrum clone and variety? • Recommended pyrethrum clones and varieties. **On-farm demonstration (1 hour)** Demonstrate to the trainees the different physical attributes used to identify different clones and varieties, including flower size, height, and bush size.	• Distribute participants' handouts • Group exercise • Plenary discussions • Pyrethrum clones / variety samples • Pyrethrum brochures/ leaflets

5.7.3 Recommended pyrethrum varieties for the target counties (30 minutes)	Session Guide
Plenary Presentation Varieties for the target counties (15 minutes) • Pyrethrum growing regions in Kenya. • Pyrethrum clones and varieties suited for each target counties. • Altitude and climate conditions for the target counties **Group exercises (15 minutes)** Trainees discuss and come up with pyrethrum varieties in their county facilitate them to recall what they learned and discuss any issues that may arise.	• Distribute participants' handouts. • Group exercise • Pyrethrum suitability maps
5.7.4.Module review (20 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training Together with the trainees review the main points in improved pyrethrum clones and 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 the module?	• Interactive Q & A session • Way forward • Participatory evaluation of the session

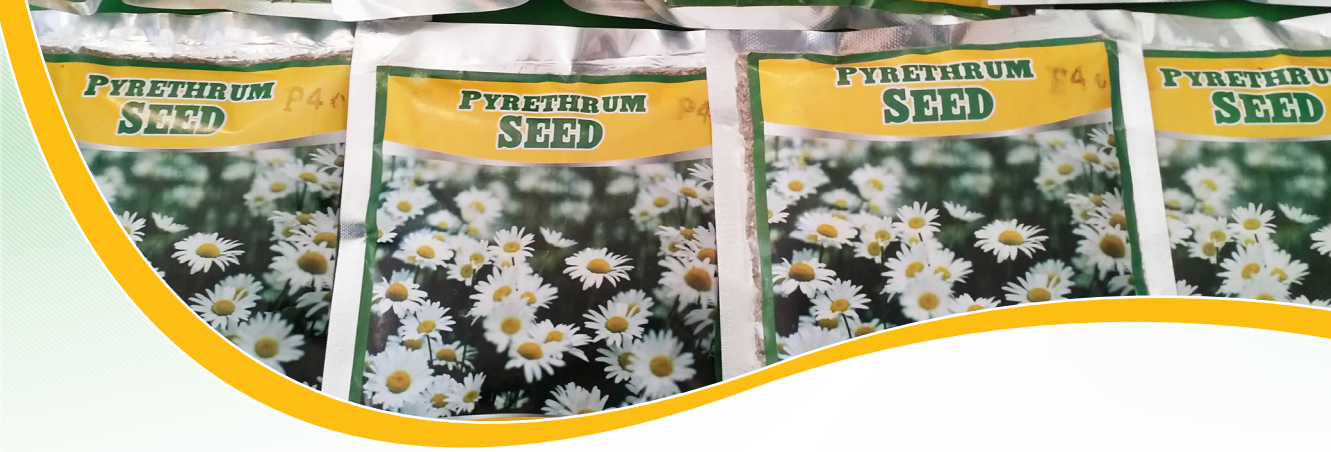
5.8 Reference Materials

5.8.1 Participants' Handouts

- Production Guides.
- Pyrethrum leaflets
- Pyrethrum Factsheets and Brochures

5.8.2 Further Reading

1. Ikahu, JMK and Ngugi, CW (1998). Yield assessment of newly developed pyrethrum varieties in different ecological zones in Kenya. Pyrethrum Post Vol. 17(1):21
2. Parlevliet, JE and Brewer, JG (1971). The botany, agronomy and breeding of pyrethrum. Report of the Ministry of Agriculture Molo, Kenya.
3. Parlevliet, JE and Contant, RB (1970). Selection for combining ability in pyrethrum.Euphytica 19: 4-11.



MODULE 6: PYRETHRUM SEED SYSTEMS

6.1 Introduction to the Module

Pyrethrum planting material is normally through splits and seeds whose genetic origin and stability cannot truly be traced. These are materials/ clones which were bred long ago and have been recycled over time. The varieties which produce seed cannot easily be identified by the farmers. Some of the nurseries which produce clean seedlings for planting through tissue culture or seed are not equally able to provide true to type clones on varieties. Continued overuse of this material without breeding to introduce new genes over many years make production of improved varieties uneconomical, thus undermining the incentives for farmer, private sector investment in commercial production and marketing of such seeds and clones. This in turn has limited the dissemination of improved high-quality seed and clones of pyrethrum.

The practice of repeated recycling of clones and seed system is only suited for subsistence production. As rural life becomes more commercialized and global markets become more competitive, farmers need to shift from small scale agricultural farming to high volume commercial pyrethrum flower production. This module exposes service providers, lead farmers and facilitators to the various seed systems in pyrethrum production also covers the importance of quality seeds and clones, how to improve on pyrethrum seed and clone provision. In addition it covers community seed and clone production and gives direction on how to interface formal and informal seed and clone production to enable farmers venture into clean true to type commercial seed and clone production.

6.2 Module Learning outcomes

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

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

6.3 Module Target Group and Categories

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

6.4 Module Users

This module is intended for use by Master trainers who are core members of the Core Team of Trainers (CTT) in the pyrethrum value chain target counties. The trainers should thoroughly familiarize themselves with value chain in target groups and the participants' handouts.

6.5 Module Duration

The module is estimated to take a minimum of 2 hours.

6.6. Module Summary

Module 6: Pyrethrum Seed Systems			
Sessions	**Training methods**	**Training materials**	**Time**
6.6.1 Introduction, objectives and expectations	• Personal introduction • Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint presentation	10 minutes
6.6.2 Definition of seed/clone and seed system in Kenya	• Group work • Presentations	• Flips charts • PowerPoint Presentation	20 minutes
6.6.3 Formal seed/ clone system in Kenya	• Presentations • Discussions	• PowerPoint Presentation • Flips charts • Felt pens	30 minutes
6.6.4 Informal seed/ clone system in Kenya	• Presentations • Discussions	• PowerPoint Presentation • Flips charts • Felt pens	30 minutes
6.6.5 Module review and discussions	• Group work • Discussions • Presentation	• Flips charts	30 minutes
Total			**2 hours**

6.7 Facilitator's Guidelines

Module 6: Pyrethrum 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 on main pyrethrum seed system. 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 training module the trainee should be able to: • Describe pyrethrum seed systems in Kenya. • Explain and discuss the importance of formal seedsystem in pyrethrum production. • Explain and discuss importance of informal seed system, community seed bulking and its interface with formal seed production for enhanced production of quality seeds and clones.	• Summarize trainees' "Expectations"and display • PowerPoint presentation • Distribute participants' handouts
6.7.2. Definition of seed/clone and seed system in Kenya(1 hour)	**Session Guide**
Group work and presentations: (30 minutes) • What is quality seed and clone? **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' handouts
6.7.3 Formal seed system in Kenya (30 minutes)	**Session Guide**
Plenary presentations highlighting: • Legal requirements for seed and seedling certification • Seed and seedling 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

6.7.4 Informal seed system in Kenya (1 hour)	Session Guide
Plenary presentations: (30 Minutes) • Seed and clonal multiplication • Pyrethrum seed/seedling 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 requirements for the county/ward/ farmer group and present	• Group work • PowerPoint presentation • Distribute participants' handouts
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: • Pyrethrum seed systems and their characteristics. • Importance of using certified seed/ clones. • Informal seed/ clones. • 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

6.8 Reference Materials

6.8.1 Participants' Handouts

- Pyrethrum leaflets
- Pyrethrum production handout

6.8.2 Further Reading

1. Gichuru, S.P., Ottaro, W.G.M., Ngugi,C.M. and Ikahu, J.K.M. (1990) The use of tissue culture technique for commercial propagation of pyrethrum clones in Kenya. Biotechnology Kenya pg- 182-187.

MODULE 7: CLIMATE-SMART AGRONOMIC PRACTICES FOR PYRETHRUM PRODUCTION

7.1 Introduction

This module is designed for training facilitators on pyrethrum crop management practices and their benefits. To cultivate pyrethrum successfully while optimizing the production of pyrethrins, specific agronomic practices should be followed. Pyrethrum clones and varieties cannot achieve their genetic yield potential if farmers continue to practise outdated practices. Agronomic practices are continually evolving as a result of scientific research, technological advancements, and the continuous change in climatic conditions.

Inadequate dissemination of knowledge on agronomic practices is one of the main challenges crippling the sector, as it is essential for optimizing crop yields, reducing environmental impacts, and ensuring the sustainability of production systems. It is critical for farmer Master trainers, public/private extension service providers, agri-preneurs and lead farmers in the pyrethrum growing target counties, to be facilitated to guide farmers in appropriate pyrethrum agronomic practices.

7.2 Module Learning Outcomes

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

1. Agronomic practices for pyrethrum production described and demonstrated.
2. In-depth knowledge of proper agronomic practices in pyrethrum cultivation understood
3. Agro-ecological zone-specific advice on pyrethrum production agronomic practices Outlined.
4. Inputs, their application, and their right measurements for pyrethrum production understood.
5. Timing for operations in pyrethrum production described and articulated.

7.3 Module Target Group and Categories

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

7.4 Module users

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

7.5. Module Duration

The module is expected to take 5 hour 50 minutes.

7.6 Module Summary

Module 7: CLIMATE SMART AGRONOMIC PRACTICES FOR PYRETHRUM PRODUCTION			
Sessions	**Training Methods**	**Training Materials**	**Time**
7.6.1. Introduction and leveling of expectations	• Presenter introductions • Self-introduction of trainees • Plenary discussions	• Laptop • PowerPoint presentation • Flip charts • Handouts	20 minutes
7.6.2 Introduction to agronomic practices	• Plenary discussions • Plenary presentation	• Flip charts • Marker pens • PowerPoint presentation • Laptop • Handouts	30 hour
7.6.3 Site selection and land preparation	• Plenary presentation • Group exercise	• Pictorials/ video • Flip charts • Marker pens • Handouts	30 minutes
7.6.4 Planting, spacing, and plant population	• Plenary presentation • Demonstrations at a farm at the training site	• Laptop • Projector • PowerPoint • Flip charts • Marker pens • Handouts	1 hour

		• Pyrethrum cuttings, seedlings • Farm tools e.g hoes	
7.6.5 Fertilizer and manure application	• Plenary presentation • Demonstrations at a farm at the training site	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens • Participants' handouts	30 minutes
7.6.6 Weeding, flower picking, and cutting back	• Plenary presentation • Demonstrations at a farm at the training site	• PowerPoint presentation • Pictorials • Flip charts • Marker pens • Farm tools e.g Sickle	1 hour
7.6.7 Crop rotation, intercropping, and agroforestry	• Plenary presentation • Group exercise	• Laptop • Pictorials/videos • Marker pens • Flip charts • Handouts	40 minutes
7.6.8 Nursery management	• Plenary presentation • Demonstrations at a farm at the training site	• Laptop • Projector • PowerPoint presentation • Flip charts • Participants' handouts	1 hour
7.6.9. Module review	• Group exercise • Facilitator' summary	• Module review • Participants' handouts	20 minutes
TOTAL			**5 hours 50 minutes**

7.7 Facilitators Guidelines

Module 7: Climate-smart agronomic practices for Pyrethrum	
7.7.1. Introduction and leveling of expectations Introductions, climate setting (20 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module on agronomic practice systems in pyrethrum production. They are then invited to introduce themselves and state their expectations) **Objectives (30 minutes)** *(The facilitator presents the module objectives).* By the end of the training module, the trainee must be able to: • Explain and describe agronomic practices for Pyrethrum production. • Describe and explain inputs, their application, and their right rates for pyrethrum production. • Explain agroecological zone-specific pyrethrum production agronomic practices. • Specify the right timing for pyrethrum production	• Summarize the trainees' expectations on a flipchart and display • Group exercise (listing and presenting expectations). • Expectations lists kept for later reviewing compliance
7.7.2 Introduction to Agronomic Practices (30 minutes)	**Session guide**
(The facilitator introduces the agronomic practices in place). **Plenary Presentation** • Agronomic practices and their benefits **Discussion** • Facilitator lead discussion on agronomic practices in pyrethrum farming.	• PowerPoint presentation • Plenary discussion • Distribute participants' handouts and training materials
7.7.3. Site selection and land preparation (30 minutes	**Session guide**
(The facilitator engages the trainees in discussions on site selection and land preparation) **Plenary Presentation (15 minutes)** The facilitator presents on: • Parameters for site suitability for pyrethrum including field history, soil (pH, drainage, texture, and nutrients), climate (temperature and rainfall), and topography (slope and elevation).	• PowerPoint Presentation • Groups discussions • Distribute participants' handouts/training materials • Flip charts

• Proper land preparation to provide necessary soil conditions for the successful establishment of seeds or seedlings. **Group discussions (15 minutes)** • Ask the trainees to give their views on suitable site selection and criteria for this. Let them explain how land should be prepared.	
7.7.4 Planting, spacing, and plant population (1 hour)	**Session guide**
(*The facilitator explains and demonstrates to the trainees how to plant and space pyrethrum crops).* **Plenary presentation (15 minutes)** The facilitator presents a PowerPoint presentation on: • The recommended methods for splits and seedlings planting. • Proper pyrethrum spacing rates and their benefits • Economical plant population on different acreages of established field **Farm Demonstrations (45 minutes)** The facilitator should simulate how each of the above is done in the field.	• PowerPoint Presentation • Distribute participants handouts • Prepared Farm for demonstrations • handouts/training materials • pyrethrum splits and clone specimens
7.7.5 Fertilizer and manure application (30 minutes)	**Session guide**
Plenary presentation (15 minutes) The facilitator presents on: • The importance of plant nutrients from organic or inorganic sources in soils to enhance productivity. • Recommended rates of fertilizer and manure application and application methods. **Farm Demonstrations (15 minutes)** • The facilitator should demonstrate how each of the above is done in the field.	• PowerPoint Presentation • Flip charts and marker pens • Farm demonstrations • Handouts/training materials • Fertilizer and manure specimen • Farm tools
7.7.6 Weeding, flower picking, and cutting back (1 hour)	**Session guide**
Plenary presentation (15 minutes) The facilitator presents on: • The importance of weeding and the types of weeds • Timely flower picking and drying and its effect on pyrethrum content • How and when to cut back pyrethrum bushes	• PowerPoint Presentation • Pictorials • Farm demonstrations

Farm Demonstrations (45 minutes) • The facilitator should help trainees identify and simulate how flower picking and cutbacks are done in the field.	• Distribute handouts/ training materials
7.7.7 Crop rotation, intercropping, and agroforestry (40 minutes)	**Session guide**
Plenary presentation (40 minutes) The facilitator presents on: • Crop rotation and its advantages • The benefits of an intercrop system • Suitable crops for pyrethrum intercrop and the right crop stages for establishment • How and why agroforestry can be incorporated into pyrethrum production.	• PowerPoint Presentation • Pictorials/ videos • Distribute handouts/ training Materials
7.7.8 Nursery management (1 hour)	**Session Guide**
Plenary presentation (15 minutes) The facilitator presents on: • Seedbed preparation and management • Sexual and asexual propagation in nursery establishment • Nursery inspection, licensing, and certification • Nursery as a business. **Farm Demonstrations (45 minutes)** • The facilitator should illustrate how each of the above practices is done in the field.	• PowerPoint Presentation • Farm demonstration site • Handouts/training materials • Pyrethrum seed specimens • Farm tools • AFA and KEPHIS manuals
7.7.9 Module review (20 minutes)	**Session Guide**
(The trainer leads the trainees in reviewing the module as a group and then give a presentation on the module review). **Group Exercise (10 minutes)** Review the main points about agronomic practices; • 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 agronomic practices? • What questions do you still have about agronomic practices? **Plenary presentation (10 minutes)** Summarize the main points of the training in the module.	• The last Participants' handouts/training materials • Summarize the mainpoints of the moduleon a flip chart and display

7.8 Reference Materials

7.8. 1 Participants' Handouts

- Pyrethrum Production Guides
- Pyrethrum Leaflets
- Pyrethrum Factsheets and Brochures

7.8.2 Further Reading

1. Pyrethrum Board of Kenya (1992). Recommendations arising from Agronomic Research and other Sources in Kenya
2. Ngugi, C.W., Ikahu, J.M.K. and Gichuru, S.P. (1989). The effects of venzar in weed control in established pyrethrum fields. Pyrethrum Post Vol 1. 17(2): 52-55
3. Parlevliet, J.E. and Brewer, J.G. (1971). The botany, agronomy and breeding of pyrethrum. Report of the Ministry of Agriculture Molo, Kenya.
4. KALRO, Pyrethrum Production Manual 2019.

MODULE 8: INTEGRATED SOILAND WATER MANAGEMENT PRACTICES FOR PYRETHRUM PRODUCTION

8.1 Introduction to the module

Integrated Soil and Water Management (ISWM) refers to managing land and water resources to satisfy human needs while maintaining the integrity of ecosystems. It integrates soil, water, and nutrient management practices to improve agricultural productivity, reduce soil erosion, and protect water quality. The performance of the agriculture sector in Kenya has continued to decline over the years due to poor application of ISWM which has resulted in increased soil acidity, mining of nutrients, and lowering of the soil organic matter content caused by non-use organic resources. Consequently, 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 and Water Management (ISWM) offers the best options for improving soil fertility soil moisture while allowing for climate change adaptation.

Pyrethrum requires deep soils rich in phosphorus (P), calcium (Ca) and magnesium (Mg), slightly acidic with a pH of 5.0-6.5. Pyrethrum is mostly cultivated by smallholder farms, characterised by continuous cultivated over time, with inadequate replenishment of soil nutrients. Pyrethrum is produced in low, medium and high altitudes, all of which require specific ISWM recommendations for optimum productivity. While TIMPs to mitigate low pyrethrum production are available, farmers, however, have not realized the full benefits due to limited adoption of ISWM. This module introduces service providers, lead farmers and facilitators to the importance of integrated soil and water management practices for enhanced pyrethrum production.

8.2 Module learning outcomes

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

1. Knowledge on soil composition, various physical, chemical and biological properties and what constitutes a healthy soil, including soil classification acquired.
2. Soil and plant tissue sampling for laboratory analysis, interpretation and utilization of results from accredited laboratories in Kenya discussed and understood.
3. Soil fertility and plant nutrition for increased crop productivity (4R Stewardship that includes nutrient source and application rates, timing and placement) understood.
4. Knowledge on soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping acquired.
5. Knowledge on water harvesting technologies, soil and water management acquired.
6. Knowledge and skills for identifying temporary or permanent decline of land productive capacity and provide various solutions to soil degradation imparted and understood.
7. Awareness on the occurrence of problematic soils and their management increased and understood.

8.3 Module Target Group and Categories

This module is intended for service providers, Agripreneurs, and county public extension agents in pyrethrum 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) in the pyrethrum value chain. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts.

8.5 Module Duration

The module is estimated to take a minimum of 5 hours.

8.6 Module Summary

Module 8. Integrated soil and water management practices for pyrethrum production			
Sessions	**Training methods**	**Training materials**	**Duration**
8.6.1 Introduction, objectives and expectations	• Introduction • Presentations • Plenary discussions	• Flip charts • PowerPoint presentation • Laptop • Projector	30 minutes

8.6.2 Soil composition, properties andhealth,	• Presentations • Practical's on how to conduct soil sampling and analysis	• Flip charts • PowerPoint presentation • Participants' handouts • Laptop • Projector	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 • PowerPoint presentation • Participants' handouts • Laptop • Projector	1 hour
8.6.4 Soil fertility and plant nutrition	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Participants' handouts • Laptop • Projector	30 minutes
8.6.5 Soil health and (ISFM) for climate resilient cropping systems	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes
8.6.6 Soil and water management and water harvesting technologies	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes
8.6.7 Soil degradation and reclamation	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes

8.6.8 Problematic soils and their management	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes
8.6.9 Module review and discussion	• Discussions	• Flip charts	30 minutes
Total			**5 hours**

8.7 Facilitator's Guidelines

Module 8. Integrated Soil and Water Management (ISWM) practices for pyrethrum production	
8.7.1. Introduction, Objectives and Expectations (30 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module 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 training the trainee should be able to: • Acquire knowledge on 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. • Appreciate soil fertility and plant nutrition for increased crop productivity (4R Stewardship that includes nutrient source and application rates, timing and placement). • Acquire knowledge on soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping systems. • Acquire knowledge on water harvesting technologies, soil and water management. • Acquire knowledge and skills for identifying temporary or permanent decline of land productive capacity and provide various solutions to soil degradation. • Gain awareness on the occurrence of problematic soils and their management increased.	• Summarize trainees' "expectations" and display • PowerPoint presentation • Distribute participants' handouts

8.7.2. Soil composition, properties and health (30 minutes)	**Session Guide**
(The facilitator presents on soil composition, properties and health). **Plenary Presentation (20 minutes)** Soil composition, properties and health • Description of soil composition • Description of soil properties • Describe what soil health is all about **Discussion (10 minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts
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 availableexamples • Soil sampling guidelines. **Practical exercise on soil sampling (30 minutes)** Demonstration on soil sampling method	• PowerPoint presentation • Distribute participants' handouts • Practical 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 inpyrethrum hum smallholder farming systems • Integrated Soil Fertility Management techniques • Soil management guidelines. **Discussion (10 minutes**) Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts
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	• PowerPoint presentation • Distribute participants' handouts

• Manure management, mulching, organic amendments and composting for increased use of organic manure for improving agricultural production • Pyrethrum crop rotation • Conservation agriculture as a climate smart agriculture practice. **Discussion (10 minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	
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 crop productivity • Methods of tillage systems that conserve water for crop use • Principles of soil fertility management for increased crop productivity • Methods of soil fertility management for increased crop productivity **Discussion (10 minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	**Session Guide** • PowerPoint presentation • Distribute • Participants' handouts
8.7.7 Soil degradation and reclamation (30 minutes)	**Session Guide**
Plenary Presentation (20 minutes) • Overview of soil degradation and reclamation. • Reclamation measures of degraded soil • Identification of the causes of soil degradation • Identification of reclamation measures of degraded soil **Discussion (10 minutes)** Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts

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
8.7.9. Module review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module). Summarize the main points of the module together with the trainees. • Discuss with trainees about new things learnt from this Module. • Ask them to 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 Reference Materials

8.8.1 Participants' Handouts

1. Soil Management Extension Manual [KCEP-CRAL Manual, 2019]
2. Soil Management Leaflets [KCEP-CRAL PAMHPLETS, 2019}
3. OFRA Technical Training Manual

8.8.2 Further Reading

1. Ngugi, C.W., Ikahu (1989).The response of pyrethrum to phosphorus and nitrogen fertilizers. Pyrethrum Post Vol 1. 17(2): 70-73

MODULE 9: PYRETHRUM CROP HEALTH

9.1 Introduction

Pyrethrum pests, diseases and weeds are important biotic production constraints which cause significant yield losses of 10-100%. The cumulative effects of climate change, emergence of new pests and diseases, invasive weeds and cost of production cannot be underestimated. Further, limited knowledge, skills and lack of implementation of good agricultural practices among pyrethrum farmers on the recommended crop health management options have led to yield losses. Synthetic agro-chemicals that offer quick fixes are predominantly used by farmers in the control of these pests, disease pathogens and weeds leading to cases of overuse of these pesticides. Occasionally farmers using pesticides do not apply the recommended dose of pesticides leading to resistance or high residual levels on crops. These practices pose a long term hazardous impacts on soil biology, human health including terrestrial and aquatic ecosystems due to resistance and high cumulative build up. Therefore, implementation of a proper integrated insect pest, disease and weed management program is very critical in minimizing crop losses and ensuring that both environmental and food safety concerns are adequately addressed. Provision of viable Integrated Pest Management (IPM) options for the control of these biotic impediments so as to obtain high yields of pyrethrum can cushion farmers. Comprehensive IPM packages include cultural, mechanical, use of resistant or tolerant varieties and chemical control options that farmers should be encouraged to use.

This module exposes lead farmers, service providers and facilitators to the importance of maintaining crop health as well as human and environmental safety when producing pyrethrum. The module introduces the major pyrethrum pests, diseases and weeds, their distribution and management. It also unveils the economic losses caused by the mentioned pests, diseases and weeds. Finally, the module gives details of the recommended sustainable integrated pests, disease and weed management practices, which if applied timely and accurately, can help reduce the yield losses and improve the quality of pyrethrum production in the country.

9.2 Module Learning Outcomes

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

1. Major pests, diseases and weeds identified.
2. Integrated pest, disease and weed management practices in pyrethrum described.
3. Safe use of agro-chemicals (insecticides, fungicides and herbicides) appreciated and explained.

9.3 Module Target Group

This module targets county public and private extension agents, service providers, agripreneurs 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) in the pyrethrum value chain target counties. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts (training materials) before the training sessions.

9.5 Module Duration

This module is estimated to take 6 hours.

9.6 Module Summary

Module 9: Pyrethrum Crop Health			
Sessions	**Training methods**	**Training materials**	**Time**
9.6.1 Introduction, objectives and expectations	• Self-introductions • Group exercise • Plenary presentation • Plenary discussion	• Flip charts • Marker pens • PowerPoint presentation	30 minutes
9.6.2 Major pyrethrum pests that cause economic losses and conditions that favor their transmission.	• Group work • Plenary presentation • Plenary discussion • Practical exercise/ examination	• Flip charts • Marker pens • Laptop and projector • Participants' handouts	1 hour

9.6.3 Sustainable Integrated Pest Management (IPM) practices for pyrethrum pests: scouting and threshold determination	• Plenary presentations • Plenary discussion	• Flip charts • Marker pens • Laptop and projector • Participants' handouts	30 minutes
9.6.4 Major Pyrethrum diseases that cause economic losses, conditions that favor their development	• Group work • Plenary Presentation • Plenary discussion • Practical exercise	• Flip charts • Marker pens • Laptop and Projector • Participants' handouts	1 hours
9.6.5 Sustainable Integrated Management of Pyrethrum diseases: scouting for threshold determination	• Presentations • Plenary discussion • Field demonstration	• Flip charts • Marker pens • Laptop and projector • Participants' handouts	1 hour
9.6.6 Integrated weed management (major weeds of pyrethrum)	• Plenary presentation • Plenary discussion • Field demonstration	• Flip charts • Marker pens • Laptop and projector • Participants' handouts	1 hour
9.6.7 Response/Safe use of agro-chemicals and update source of registered agro-chemicals (PCPB registered products)	• Presentations • Practical • Plenary discussion	• Laptop and projector • Flip charts • Marker pens • Participants' handouts	30 minutes
9.6.8 Module review	• Plenary discussions • Take away messages	• Flip charts • Marker pens • Participants' handouts	30 minutes
Total			**6 hours**

9.7 Facilitator's Guidelines

Module 9: Pyrethrum Crop Health	
9.7.1. Introduction and leveling of expectations and objectives (30 minutes)	**Session Guide**
Introduction (15 minutes) *The facilitator welcomes trainees to the module on pyrethrum crop health. They are then invited to introduce themselves and state their expectations.* **Module Objectives (15 minutes)** *(The facilitator presents modules objectives)* By the end of the module training the trainee should be able to: • Identify major pests, diseases and weeds. • Describe and explain integrated pest, disease and weed management strategies in Pyrethrum. • Explain safe use of agro-chemicals (pesticides, fungicides and herbicides).	• Summarize trainees' "Expectations" • PowerPoint presentation • Participants' handouts
9.7.2. Major Pyrethrum pests that cause economic losses and conditions that favour their transmission; emerging/migratory pests (1 hour)	**Session Guide**
(The facilitator makes a presentation on the common Pyrethrum pests that are of economic importance) **Group work (15 minutes)** • Trainees to share pyrethrum pest information from their respective Counties **Plenary presentation (20 minutes)** • Names of pests and their descriptions • Symptoms of their infestation/type of damage • Data on economic significance of the common pyrethrum pests • Modes of insect pest transmission **Practical exercise (15 minutes)** • Identification of pyrethrum pests from provided specimens **Discussion (10 minutes)** • Let the trainees recall what they learned and discuss any issue that may arise	• PowerPoint presentation • Group exercise • Practical exercise • Participants' handouts
9.7.3. Sustainable Integrated Pest Management (IPM) practices for pyrethrum pests: scouting and threshold determination (30 minutes)	**Session Guide**

Plenary Presentation (20 minutes) • IPM principles; how to implement them with a focus on cultural, physical, biological and chemical pest management options. • Critical considerations for proper scouting • Threshold determination and when to implement control measures • An overview on the safe use of agro-chemicals (demonstration on how to select most suitable pesticides for the management of pests in pyrethrum orchards). **Discussion (10 minutes)** Let the trainees recall what they learned and seek clarification on the principles of sustainable IPM options	• PowerPoint presentation on scouting for pests • Participants' handouts
9.7.4. Major Pyrethrum diseases that cause economic losses, conditions that favour their development (1 hour)	**Session Guide**
Group work (15 minutes) • Determination of Pyrethrum diseases in specific counties **Plenary presentation (15 minutes)** • Presentations on Pyrethrum diseases and conditions that favor their development **Practical exercise (30 minutes)** • Identification of major disease species causing economic damage based on samples presented	• PowerPoint presentation • Participants' handouts • Disease identification guidelines • Practical exercise
9.7.5. Sustainable Integrated Diseases Management (IDM); scouting and threshold determination (1 hour)	**Session Guide**
Plenary presentation (30 minutes) • Critical considerations for scouting and when to implement Pyrethrum disease control measures • Presentation on Integrated Disease Management (IDM) in Pyrethrum • An overview on the safe use of recommended agro-chemicals (demonstration on how to select most suitable fungicides for the management of major Pyrethrum diseases). **Field visit (30 minutes)** - Visit to a nearby Pyrethrum field for collection and identification of diseased pyrethrum plant samples	• PowerPoint presentation • Participants' handouts • Disease management guidelines • Field demonstration

9.7.6 Integrated weed management of major weeds of Pyrethrum (1 hour)	Session Guide
Plenary presentation (45 minutes) • Identification of weeds • Major types of weed in the pyrethrum field • Integrated weed management **Plenary discussion (15 minutes)** Integrated weed management	• PowerPoint presentation • Participants' handouts • Plenary discussion
9.7.7. Response/safe use of agro- chemicals and update source of registered agro- chemicals (PCBB-registered products (30 minutes)	**Session Guide**
Plenary presentation (10 minutes) **Plenary demonstration (5 minutes)** **Plenary discussion (15 minutes)**	• PowerPoint presentation • Participants' handouts • Plenary discussion
9.7.8. Module review (1 hour)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training: The facilitator should review the following main points about pests, diseases an weeds affecting Pyrethrum production: • Major pests of pyrethrum and their economic impacts in production. • IPM management options for pests in pyrethrum production • Major diseases of pyrethrum and their economic impact in production. • IDM management options for diseases in pyrethrum production • Major weeds of pyrethrum and their economic impacts in production. • Integrated weed management options for pyrethrum *(Discuss with trainees the new things learnt from this module.*	• PowerPoint presentation

9.8 Further Reading Materials

9.8.1 Participants handouts

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

9.8.2 Further Reading

1. Increasing pyrethrum yields by planting the right material for your area. 2022. Brochure. Carolyne Imbwanga. Pyrethrum Processing Company of Kenya limited.
2. Kenya Pyrethrum Compedium. 2022. Janet Obanyi.
3. Diseases of pyrethrum in Tasmania: Challenges and Prospects for management; In Plant Diseases, American Phytopathology, Sept 2008. Sarah J. Pethybridge, Frank S. Hay Paul Esker, Calum Wilson, Tim Groom, David H. Gent, Forrest W. Nutter, Jr.
4. Causal agent of Pyrethrum Wilt and factors influencing the disease development. 1997. Kinyua Z.M. MSc. Thesis in Agriculture, University of Nairobi.
5. http://www.knowledgebank.irri.org/training/fact-sheets/pest-management/diseases
6. Pest Control Products Board List of registered products (www.pcpb.co.ke)
7. Ngugi, C.W., Ikahu, J.M.K. and Gichuru, S.P. (1989). The effects of venzar in weed control in established pyrethrum fields. Pyrethrum Post Vol 1. 17(2): 52-55

MODULE 10: PYRETHRUM HARVESTING AND POST-HARVEST MANAGEMENT

10.1 Introduction to the module

Inappropriate harvesting, and postharvest handling methods are major production constraints that cause postharvest loss along the pyrethrum value chain. In Kenya, pyrethrum flowers are harvested manually and the stage of harvest is a key determinant of pyrethrin content. Poor timing of harvest leads to losses of pyrethrin. Inappropriate harvesting methods leads to reduced production due to poor quality and low pyrethrin content.

Use of inappropriate harvesting containers such as gunny bags leads to fermentation of the picked flowers. Inefficient drying of flowers lead to fermentation and loss of pyrethrin content, hence reduced quality. The dried flowers should be packed in well-aerated bags and transported to the processing factory. In order to maintain quality of harvested flowers, trainees should be trained on post-harvest to adequately secure high returns from pyrethrum flower production. This module introduces service providers and lead farmer trainers to pyrethrum constraints and opportunities in postharvest value chain enhanced production.

10.2 Module learning outcomes

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

1. Appropriate harvesting and post-harvest technologies for quality pyrethrum identified.
2. Constraints and opportunities in pyrethrum harvest and postharvest value chain explained.
3. Climate smart and gender-friendly postharvest TIMPs for minimizing the losses and enhancing quality of pyrethrum explained and demonstrated.

10.3 Module target group

This module targets public and private agricultural extension agents, agripreneurs, service providers and lead farmers based at the sub county and ward levels. It can also be used for private extension service providers.

10.4 Module duration

The module is estimated to take a minimum of 3 hours 15 minutes.

10.5 Module users

This module is intended for use by Master trainers of farmers, facilitators, trainers of lead farmers and service providers in the pyrethrum value chain. The trainers using this module should thoroughly familiarize themselves with the TIMPs documents and the participants' handouts (training materials).

10.6 Module summary

Module 10: Pyrethrum Harvesting and Postharvest Management			
Sessions	**Training methods**	**Training materials**	**Time**
10.6.1 Introduction, expectations and objectives	• Personal introduction Presentation • Group work • Plenary discussions	• Flip charts • PowerPoint presentations • Participants handouts	30 minutes
10.6.2. Constraints and opportunities in post- harvest management of pyrethrum	• Group exercise • Plenary presentation	• Flip charts • Videos • Participants' handouts	45 minutes
10.6.3 Pyrethrum postharvest TIMPs • Maturity indices • Harvesting • Drying • Sorting and grading • Storage-sisal bags • Pyrethrum stores	• Group work • Brainstorming sessions • Plenary presentation • Practical demonstration	• PowerPoint • Pyrethrum TIMPs manual • Participant handouts • Materials for demos (pyrethrum, tarpaulin, moisture meter, sisal bags, dryers etc.) • Video	1 hour 30 minutes
10.6.4. Module review	• Facilitator's summary • Group exercise	• Flip charts • Projector • Laptop • Module evaluation forms	30 minutes
Total			**3 hours 15 minutes**

10.7. Facilitators' guidelines

Module 10: Pyrethrum Harvesting and Postharvest Management	
10.7.1 Introduction and levelling of expectations and objectives (20 minutes)	**Session guide**
(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations) **Introduction and Module Objectives (15 minutes)** *(The facilitator presents module's objectives)* By the end of the module training the trainee should be able to: • Explain the correct maturity indices and harvesting techniques for pyrethrum. • Explain the whole range of postharvest practices for pyrethrum. • Explain the constraints and opportunities in postharvest. • Explain and demonstrate climate smart and gender-friendly postharvest TIMPs for minimizing the losses and enhancing quality of pyrethrum. **Expectations (10 minutes)** *Assist the trainees to state their expectations based on the objectives*	• Participants' handouts • Training program • PowerPoint presentation • Summarize trainees' "Expectations" and display on flip chart/ board.
10.7.2 Constraints and opportunities in postharvest handling of pyrethrum (40 minutes)	**Session guide**
(Highlight the pyrethrum postharvest techniques – harvesting, drying, sorting, grading and packaging, storage-sisal bags, pyrethrum stores) **Group work (30 minutes)** • Trainees discuss constraints in the postharvest handling of pyrethrum, and suggest solutions **Group presentation (10 minutes)** Trainees present results of group work in plenary	• PowerPoint presentation • Pyrethrum TIMPs Manual • Participants' handouts

10.7.3 Pyrethrum harvest and postharvest value chain TIMPs (1 hour 30 minutes)	Session guide
(Facilitator uses slides to train) **Plenary Presentation (1 hour)** PowerPoint presentation on components of pyrethrum postharvest chain highlighting: • Maturity indices and harvesting of pyrethrum (importance of harvesting at the right maturity index, advantages and disadvantages of harvesting too early or too late) • Preparations of farmers needs prior to harvesting • Pyrethrum harvesting methods • Drying methods for pyrethrum flowers • Sorting and grading • Storage-sisal bags etc. **Practical demonstrations (30 minutes)** • Determination of moisture content using moisture meter for storage • Drying using tarpaulin, solar dryers, etc. • Storage of pyrethrum using sisal bags	• PowerPoint presentation • Participants' handouts • Materials for demos (pyrethrum, tarpaulin, moisture meter, sisal bags and dryers etc.) • Video presentation
10.4 Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) **Plenary presentation (10 minutes)** • Together with the trainees, summarize the main points of the training. **Group Exercise (20 minutes)** *Together with the trainees review the main points about pyrethrum harvesting and postharvest handling* • What new ideas did you learn from this Module? • What are some of the problems and issues that you have become more aware of in harvesting and post-harvesting? • What questions do you still have about post-harvest handling?	• Summary of the main points from the Module

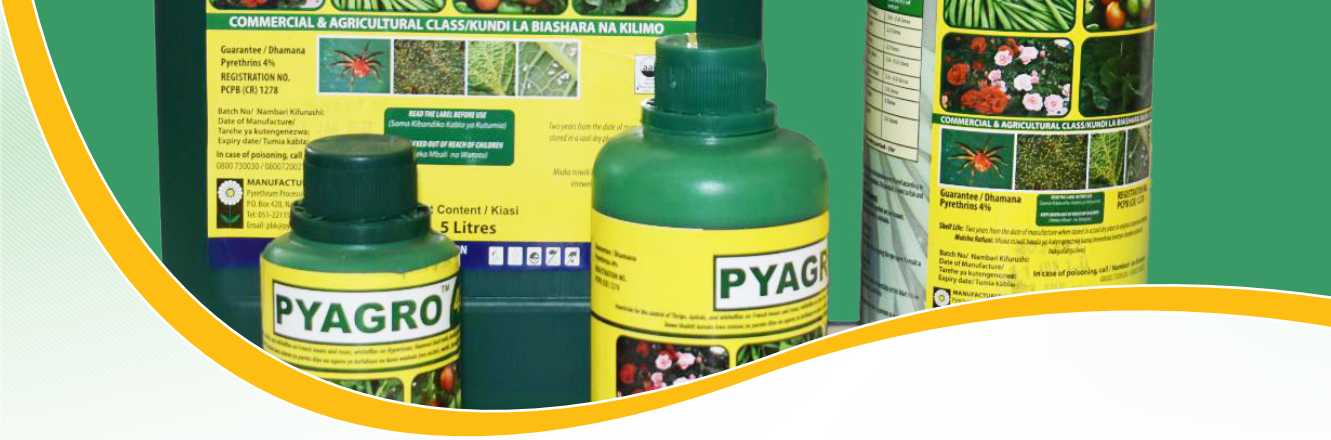
10.8 Further Reading Materials

10.8.1 Participants' Handouts

- Pyrethrum brochures and leaflets
- Pyrethrum farmers' handbook

10.8.2 Further Reading

1. Pyrethrum TIMPs Inventory.
2. Kamau J.K, Kiiya W., Ajanga S., Wanyonyi N., Gathungu G., Mahasi M., Mwangi J. and Pertet E. (2019). Pyrethrum Propagation. KALRO.
3. Crop Nutrition Laboratory (CROPNUTS). Undated. Pyrethrum Growing in Kenya: Suitability Factors.
4. Ngugi C. W., Ikahu J. K., and Gathungu G. K. (2008). *Pick Pyrethrum at the Correct Stage*. KARI Information Brochure Series 63/2008.
5. Wanja N., Busienei T. P. and Peter E. P. (2008). *Use Pyrethrum Solar Dryers for Increased Income.* KARI Information Brochure Seris 75/2008.
6. Wanja N., Busienei T. P. and Peter E. P. (2008). *Use Mat Solar Dryer to Dry Pyrethrum.* KARI Information Brochure Seris 74/2008.



MODULE 11: PYRETHRUM VALUE ADDITION

11.1 Introduction to the module

Returns to value chain players are low due to limited knowledge of the various opportunities for value addition and product diversification to meet consumer needs. Farmers desire better returns for their pyrethrum. Testing of farmers' pyrethrum and provision of important flower quality data to buyers during selling may mitigate loss of farmers' flowers value from subjective quality assessments. There are market opportunities for products derived from flower and byproducts of pyrethrum. Value addition will attract youth to agribusiness. It is therefore, envisaged that promotion of value added options will greatly enhance adoption, production and returns from pyrethrum. This module is designed for equipping the extension service providers with pyrethrum value adding options and skills for training pyrethrum farmers, youth and primary processors.

11.2 Module learning outcomes

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

1. Value added products from pyrethrum introduced and trained.
2. Constraints and opportunities in value addition of pyrethrum discussed and the solutions suggested.
3. Pyrethrum-based value added products identified and explained.
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 agents, agripreneurs, service providers and lead farmers based at the sub county and ward levels.

11.4 Module duration

The module is estimated to take 5 hours 30 minutes.

11.5 Module users

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

11.6 Module summary

Module 11: Pyrethrum Value Addition			
Sessions	**Training methods**	**Training materials**	**Time**
11.6.1. Introductions, expectations and objectives	• Personal introduction Presentation • Group work • Plenary discussions	• Flip charts • PowerPoint presentation • Participants' handouts	30 minutes
11.6.2. Pyrethrum based value added products	• Group exercise • Plenary presentation	• Flip charts • Videos • Participants' handouts	2 hours 30 minutes
11.6.3. Prioritizing opportunities in pyrethrum value addition	• Group work • Brainstorming sessions • Plenary presentation • Practical demonstration	• Projector • Laptop • Participants' handouts • PowerPoint presentation • Flip charts • Felt pens	1 hour
11.6.4 Constraints in value addition and utilization of pyrethrum	• Group exercise • Plenary presentation	• Constraints in value addition • Checklist for prioritization • Pairwise ranking tool • Flip charts • Felt pens • Participants' handouts • Projector • Laptop	30 minutes

11.6.5 Value addition strategy development	• Presentations • Plenary discussion • Practical demonstration • Field visit to processing firms / groups	• Projector • Laptop • Participant handouts • Checklist for Prioritization • Pair wise ranking tool	1 hour 30 minutes
11.6.6. Module review	• Facilitator's summary • Group exercise	• Flip charts • Projector • Laptop • Module evaluation forms	30 minutes
Total			**5 hours 30 minutes**

11.7. Facilitators' guidelines

Module 11: Pyrethrum value addition	
11.7.1 Introduction and levelling of expectations and objectives (30 minutes)	**Session guide**
Introduction and expectations (15 minutes) *(The facilitator welcomes trainees to the module on value addition of pyrethrum. They are then invited to introduce themselves and state their expectations)* **Module Objectives (15 minutes)** *(The facilitator presents modules objectives.)* By the end of the module training the trainee should be able to: • Identify on pyrethrum value added products and services. • Identify and prioritize value addition opportunities in pyrethrum value chain. • Demonstrate how to develop a value addition strategy for the priority opportunities.	• Participants' handouts • Training Program • PowerPoint presentation • Summarize trainees' "expectations" and display on flip chart/ board.

11.7.2 Pyrethrum based value added products (2 hours 30 minutes)	Session guide
Plenary presentation (30 mintes) • Overview of Pyrethrum based value added products • Meaning of value addition • Requirements for value addition of pyrethrum • Pyrethrum based value added products **Practical exercise (2 hours)** • Facilitator discusses and demonstrates each product	• PowerPoint presentation • Participants' handouts • Group exercise • Various pyrethrum-based products
11.7.3 Prioritizing opportunities in pyrethrum value addition (1 hour)	**Session guide**
Group exercise (30 minutes) *(Facilitator guides the trainees to prioritize the pyrethrum value added products)* • Divide the trainees into groups • Provide flipcharts, manila papers and pelt pens to each group • Let each group list pyrethrum value products • 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 pyrethrum value added products and services ranking and discuss them	• PowerPoint presentation • Participant handouts • Pairwise ranking
11.7.4 Constraints in value addition of Pyrethrum, and suggested solutions (30 minutes)	**Session guide**
Group exercise (20 minutes) • Groups discuss the constraints in Pyrethrum value addition **Plenary presentation (10 minutes)** • Overview of constraints in value addition of Pyrethrum	• PowerPoint presentation • Group exercise

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. • 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	• Handouts • Flip charts • Participants, handouts • sample charts
11.7.6 Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing he module) Review the main points about pyrethrum value addition together with the trainees. • What new ideas did you learn from this module? • What are some of the problems and issues that you have become more aware of in pyrethrum value addition? • What questions do you still have about pyrethrum value addition?	• Summary of the main points from the module.

11.8 Further Reading Materials

11.8. 1 Participants' Handouts'

- Pyrethrum brochures and leaflets
- Pyrethrum TIMPs manualFact sheets
- Entry and exit questionnaire on their smart forms
- Summary of key policies

11.8.2 Further Reading

1. KARI 2008. Crop production handbook, oil crops and horticulture
2. Agricultural Innovation Platform establishment guide

MODULE 12: FOOD AND NUTRITION SECURITY IN PYRETHRUM PRODUCTION

12.1. Introduction

Food security is the availability, accessibility, stability and utilization of safe and nutritious food at household level at all times. To attain food security, there is need to enhance availability, accessibility, stability and utilization of safe and nutrition food. Pyrethrum has the potential to contribute to food and nutrition security through ensuring alternative source of income to address the first three dimensions of food security. Pyrethrum provides large quantities of high quality pest and disease control chemicals that are environmentally friendly. While it is imperative to encourage increased pyrethrum production by farmers, it is advisable for farmer to set aside land for food crop production. In addition farmers are advised to apply good agricultural practices such as intercropping and kitchen gardening to ensure food availability, accessibility and stability. Nutrition education is also important to pyrethrum growers to enable them to maintain good health and wellbeing as they engage in pyrethrum production.

12.2. Module learning outcomes

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

1. Importance of nutrition awareness among pyrethrum growers discussed and explained.
2. The relationship between pyrethrum and food security discussed and demonstrated.
3. Good agricultural practices that ensure food availability discussed, demonstrated and appreciated.

12.3. Module target group

This module targets nutritionists, agricultural extension service providers and agripreneurs based at sub-county and ward levels. It will also be useful for private extension service providers dealing directly with farmer groups at community level 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 (CCT) in the pyrethrum value chain target counties. The trainers using the module should thoroughly familiarise themselves with the participants' handouts (training materials).

12.5. Module duration

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

12.6. Module summary

Module 12: Pyrethrum and food and nutrition security			
Sessions	**Training methods**	**Training materials**	**Time**
12.6.1 introduction, objectives and Expectations	• Participatory introduction • Plenary presentation • Group exercise	• Projector • Laptop • Flip charts	30 minutes
12.6.2 Nutrition awareness among pyrethrum growers *(The facilitator will lead the trainees on the importance of nutrition even as they engage in other activities)*	• Group exercise • Plenary presentation	• Flip charts • Felt pens • Laptop • Projector	30 minutes
12.6.3 The relationship between pyrethrum and food security *(in terms of generating income and pest and disease management*)	• Group exercise • PowerPoint presentation	• Flip charts • Marker pens • Projector • Laptop	20 minutes
12.6.4 Good agricultural practices that ensure food availability (*Intercropping nutritious crops, kitchen gardening and dietary diversification)*	• Group exercise • Plenary presentation	• Laptop • Projector • Flip charts • Marker pens • Pyrethrum manual	45 minutes

12.6.5 Module review	• Plenary presentations	• flip charts • module evaluation forms	20 minutes
Total			**2 hours 25 minutes**

12.7 Facilitators guidelines

Module 12: Pyrethrum and food security	
12.7.1 Introduction and leveling of expectations	**Session guide**
(*The trainer introduces the trainees to the module on pyrethrum and food security)* **Trainee's expectations (20 minutes)** (*The facilitator organizes the trainees into groups to state and list their expectations)* **Module objectives (10 minutes)** **(***The trainer presents module objectives on PowerPoint)* By the end of the module training the trainee should be able to: • Discuss and appreciate the importance of nutrition among pyrethrum growers. • Demonstrate and discuss the relationship between pyrethrum and food security. • Discuss, demonstrate and appreciate role of Good agricultural practices in ensuring food availability.	• PowerPoint presentation • Note books • Summarize the trainees expectations and display on the flip chart
12.7.2 Nutrition awareness among pyrethrum growers	
(The facilitator will lead the trainees in discussion importance of good nutrition practices among pyrethrum growers) **Plenary presentation (30 minutes)** • Dietary diversification (DASH, Balanced and SHARP diets)	• Group exercise • PowerPoint presentation
12.7.2 The relationship between pyrethrum and food security	
(The facilitator leads the trainees in discussing the relationship existing between food security and pyrethrum) **Plenary presentation (20 minutes)** • Role of pyrethrum in food security in terms of disease and pest control and as a source of income	• Group exercise • Flip charts • PowerPoint presentation

12.7.3 Good agricultural practices that ensure food availability among pyrethrum growers	
• Good agricultural practices (*refer to GAP in pyrethrum production).* **Plenary presentation (45 minutes)** *(The facilitator leads the trainees in discussing good agricultural practices among pyrethrum grower and its effect on food and nutrition security)*	• PowerPoint presentation • Group exercise • Pyrethrum manuals
12.7.4 module summary	
Group exercise (20 minutes) **(***The facilitator will guide the trainees on reviewing the module and question and answer session***).** • Review the trainees' expectations to gauge whether they were met What are the new things learnt from the module	• Summary of the main points from the module

12.8 Reference Materials

12.8.1 Participants' Handouts

- Pyrethrum manuals and leaflets

12.8.2 Further Reading

1. John Omiti, N. W. (2007). Policy and Institutional Interventions to Revitalize Kenya Pyrethrum Industry. Nairobi: Kenya Institute for Policy Research and Analysis.

MODULE 13: MECHANIZATION OF PYRETHRUM PRODUCTION ACTIVITIES

13.1 Introduction

Agricultural mechanization enhances production, productivity and profitability in agriculture by achieving timeliness in farm operations. It also helps in the conservation of agricultural produce and by-products from qualitative and quantitative damages and losses. Agricultural mechanization in pyrethrum production is of key importance as it has the potential to enhance production and increase profitability in Kenya, especially when applied in planting, cutting back, harvesting and post-harvest activities. The use of improved pyrethrum driers will enable farmers to harvest and dry flowers during bad weather conditions, significantly reduce the potential losses of flowers through spillage, soiling, fermentation and therefore improve on the quality of flowers. Use of improved tractor drawn ridger and motorized cutback (bush cutter) machines will also enable farmers to save on time, amount of labour application and labour cost for it will speed up both the planting and cutting back processes.

13.2 Module Learning Outcome

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

1. Use of three improved types of driers (portable, stationery and biomass) demonstrated.
2. Use of tractor drawn ridger demonstrated.
3. Planting time estimation demonstrated.
4. Drying time of pyrethrum flowers demonstrated.
5. Estimation of harvesting losses demonstrated.

13.3 Module Target Group

This module targets agricultural extension service providers and agro entrepreneurs 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.

13.4 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 pyrethrum value chain target counties. The facilitator using this module should thoroughly familiarize themselves with the Participants' Hand outs (training materials).

13.5 Module Duration

The module is estimated to take a minimum of 2 hours and 50 minutes.

13.6 Module summary

Module 13: Mechanization of pyrethrum production activities			
Sessions	**Training Methods**	**Training Materials**	**Time**
3.6.1 Introduction, objectives and levelling of expectations	• Groups to bring out their expectations • Plenary Presentation	• Module objectives • Mark pens • Flip chats • PowerPoint presentation	20 minutes
3.6.2 Demonstration on the use of Improved pyrethrum tractor drawn ridger	• Group Work • Farm visit within training site • Group presentations	• Flip charts • PowerPoint presentation • Laptop • Projector • Pictorials • Video	30 minutes
3.6.3 Demonstration of use of the portable solar drier	• Plenary Presentations • Group work • Plenary • Practical lessons	• Flip charts • PowerPoint presentation • Laptop • Projector • Pictorials • Video • Sample portable drier	30 minutes
3.6.4 Demonstration of use of the stationery solar drier	• Group Work • Farm visit within training site • Group presentations	• Flip charts • PowerPoint presentation • Laptop • Projector • Pictorials • Sample of the drier	30 minutes

3.6.5 Demonstration of use of the Biomass drier	• Group Work • Farm visit within training site • Group presentations	• Flip charts • PowerPoint presentation • Laptop • Projector • Pictorials • Sample of the drier	30 minutes
3.6.6 Motorized bush cutter	• Group Work • Farm visit within training site • Group presentations	• Flip charts • PowerPoint presentation • Laptop • Projector • Pictorials • Video	30 minutes

13.7 Facilitators Guidelines

Module 13: Mechanization of pyrethrum production activities	
13.7.1 Introduction, Objectives and Leveling Expectations (20 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations) The facilitator presents modules objectives By the end of the module training the trainee should be able to: • Demonstrate the different driers and their usage • Demonstrate on estimated time of drying • Demonstrate losses during drying • Display the improved tractor drawn ridger • Display the motorized cutback machine • Demonstrate how to make furrows	• Summarize trainees' "expectations" and display. • PowerPoint Presentation • Distribute Participants' Handouts on module Objectives and Training Program
13.7.2 Demonstration on the use of Improved pyrethrum tractor drawn ridger (30 minutes)	**Session Guide**
(The facilitator introduces, explain and display Improved pyrethrum tractor drawn ridger) • Explain and demonstrate how to make furrows • Demonstrate the time taken to make furrows • Demonstrate the time taken when planting • Demonstrate on the amount of labour use and application	• Flip charts • PowerPoint • Laptop • Projector • Pictorials • Video

13.7.3 Demonstration of use of the portable solar drier (30 minutes)	Session Guide
(The facilitator introduces, explain and demonstrate the improved portable, pyrethrum driers) Practical lessons to: • Compare the sizes and portability • Demonstrate on estimated time of drying • Demonstrate losses during drying • Compare the improved driers usage versus the traditional drying methods • Demonstrate on the amount of labour use and application	• PowerPoint Presentation • Distribute participants' handouts on module Objectives and Training Program
13.7..4 Demonstration of use of the stationery solar drier (30 minutes)	**Session guide**
(The facilitator introduces, explain and demonstrate the improved Stationery pyrethrum driers) Practical lessons to- • Compare the sizes and portability • Demonstrate on estimated time of drying • Demonstrate losses during drying • Compare the improved driers usage versus the traditional drying methods • Demonstrate on the amount of labour use and application	• PowerPoint Presentation • Distribute participants' handouts on module Objectives and Training Program
13.7.5 Demonstration of use of the Biomass drier (30 minutes)	**Session Guide**
(The facilitator introduces, explain and demonstrate the improved Biomass pyrethrum driers) Practical lessons to- • Compare the sizes and portability • Demonstrate on estimated time of drying • Demonstrate losses during drying • Compare the improved driers usage versus the traditional drying methods • Demonstrate on the amount of labour use and application	• PowerPoint Presentation • Distribute participants' handouts on module Objectives and Training Program

13.7.6 Motorized cut back (bush cutter) machine (30 minutes)	Session Guide
The facilitator will explain and display what a motorized cut back (bush cutter) is • Demonstrate how it operates • Demonstrate the time saved when using this machine • Compare its usage against convectional cut back method • Demonstrate on the amount of labour use and application	• Flip charts • PowerPoint • laptop, projector • Pictorials • Video

13.8 Reference Materials

13.8.1 Participants' Handouts

- Improved Pyrethrum driers manuals
- Machine manuals
- Brochures and flyers

13.8.2 Further Reading

Wanja, N., Busienei, T. P. and Pertet, E. P. (2008). Use Pyrethrum Solar Dryers for Increased Income. KARI Information Brochure Series 75/2008.

MODULE 14: PYRETHRUM BUSINESS AND MARKETING

14.1 Introduction

Pyrethrum is considered to be one of the important industrial crops for production of pyrethrin for processing organic chemicals and earning household incomes for small scale farmers as a cash crop in Kenya. The main challenges are lack of proper marketing channels, limited knowledge of available markets low production, lack of planting material and trust in market sustainability. There is also limited knowledge of requirements for access to various markets, including market standards, phytosanitary requirements and lack of knowledge on record keeping and gross margin analysis. Markets and marketing the pyrethrum dry flowers is a major issue of concern to small-scale farmers and other actors in the pyrethrum value chain in Kenya, particularly inconsistency in supplying sufficient volumes required for trade, seasonal supply and price fluctuations. To strengthen the value chain therefore it is important to equip farmer facilitators with the skills and knowledge on pyrethrum farming business and marketing strategies.

14.2 Module Learning Outcomes

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

1. Business concepts and emerging farming business models appreciated and understood.
2. Opportunities and challenges associated with pyrethrum farming enterprise identified.
3. Tools for management (Budgeting, entrepreneurship, Record keeping, Break-even & Gross Margin) of pyrethrum flower production appreciated.
4. Marketing strategies mapped and identified.
5. Details of a Small Farm Business Plan identified

14.3 Module Target Group

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

14.4 Module Users

This module is intended to be used by a Master Trainer who is among the membersof the core team trainers. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts.

14.5 Module Duration

The module is estimated to take 2 hours.

14.6. Module Summary

Module 14: Pyrethrum Business and Marketing			
Sessions	**TrainingMethods**	**Training Materials**	**Time**
14.6.1. Levelling of participants' expectations aboutthe module	• Introduction • Discussion	• PowerPoint presentation • Laptop • Projector • Flip charts	15 minutes
14.6.2. Module introduction, Objectives Expectations	• Plenary discussion • Presentations	• Flip charts • PowerPoint • Laptop • Projector	10 minutes
14.6.3. Business concept and emergingfarming business models Exercise	• Plenary discussion • presentations	• PowerPoint • Laptop • Projector • Flip charts • Marker pens	20 minutes
14.6.4. Opportunities and challenges associated with pyrethrum businesses - SWOT analysis	• Plenary discussion • Presentations	• PowerPoint • Laptop • Projector	20 minutes

14.6.5 Tools for management of Pyrethrum production: – Budgeting, entrepreneurship, Recordkeeping, Break-even & Gross Margin	• Plenary discussion • Presentations	• PowerPoint presentation • Laptop • Projector	15 minutes
14.6.6 Marketing strategies	• Plenary discussion • Presentations	• Laptop • Projector • PowerPoint presentation	20 minutes
14.6.7 Details of a Small Farm BusinessPlan: Pulling It All Together:	• Plenary discussion • Presentations	• Laptop • Projector • PowerPoint presentation	10 minutes
14.6.8. Training review	• Facilitator's summary: Take away	• Module review • Participants Handouts	10 minutes
TOTAL			**2 hours**

14.7 Facilitators Guidelines

Module 14: Pyrethrum Business and Marketing	
14.7.1 Levelling participants' expectations about themodule (15 minutes)	**Session Guide**
14.7.1.1 Module Title *(The facilitator welcomes trainees to the module and introduces him/herself by stating his/her profile and experience.)*	• Handouts • Program • Note books • pens • PowerPoint slides
14.7.1.2 Participants expectations	
(The facilitator asks the trainees to state their expectations by listing on a flip chart) **Plenary Discussion**	• Summarize trainees' "Expecta-tions" and display on flip chart/ board.

14.7.2: Module introduction, objectives and expectations (10 minutes)	
(The facilitator introduces the module and states the objectives and expectations) By the end of this module training the trainee should be able to: • Appreciate and understand business concepts and emerging farming business models. • Identify opportunities and challenges associated with pyrethrum farming enterprise. • Appreciate tools for management (Budgeting, entrepreurship, Record keeping, Break-even & Gross Margin) of pyrethrum flower production. • Identify marketing strategies. • Identify details of a Small Farm Business Plan.	• PowerPoint slides • Factsheets
14.7.3: Business concept and emerging farming business models (20 minutes)	**Session Guide**
(The facilitator highlights elements of business conceptand emerging farming business models) **Plenary Presentation (5 minutes)** • Business concept • Emerging farming business models **Group Exercise (15 minutes)** Discuss areas of adjustments in the models	• PowerPoint slides • Handouts • Flipcharts
14.7.4: Opportunities and challenges associated with pyrethrum dry flower businesses - SWOT analysis (20 minutes)	Session Guide
Plenary Presentation • Community production and marketing system (COPMAS) **Group Exercise (20 minutes)** Allow trainees to raise any issues of pyrethrum dry flower marketing and discuss them.	• Use Power-Point • Handouts • Pyrethrum manual • Brochures • Leaflets

14.7.5: Training review (30 minutes)	Session Guide
(The facilitator leads the trainees in reviewing the module). **Plenary Presentation (15 minutes)** Summarize the main points of the training**Group Exercise (15 minutes)** Review the main points about pyrethrum marketingchannels and strategies together with the trainees. • What new things did you learn from this module? • What are some of the problems and issues that you have become more aware of pyrethrum dry flower marketing? • What questions do you still have about marketing of?	• Summary of the main points from theModule.

14.8 Reference Materials

14.8.1 Participant's Handouts

- Pyrethrum production Handout
- Pyrethrum leaflets
- Brochures

14.8.2 Further Reading

1. Tawedzegwa M. (2012). Farming as a family business. Training manual.
2. Ngugi, CW, Ikahu, JMK and Gathungu, GK (2006). Pyrethrum production for Agribusiness and economic empowerment. Kenya farmer issue 138: Volume 3 page 48-50

MODULE 15: PYRETHRUM CROSS-CUTTING ISSUES (AGRICULTURAL INNOVATION PLATFORMS, POLICY, GENDER MAINSTREAMING AND SOCIAL INCLUSION)

15.1 Introduction to the module

This module consists of issues that influence the uptake and up-scaling of TIMPS in the pyrethrum 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. 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 cross-cutting issues is presented.

SUB MODULE 15.1: AGRICULTURAL INNOVATION PLATFORMS

15.1.1 Introduction to the Sub-Module

Agricultural Innovation Platform (AIP) is an organizational model for stimulating innovation and development that brings actors together in a way that pools together skills and knowledge to address challenges and utilize opportunities. The actors include individuals, private and public sector organizations, policy makers, agripreneurs and other value chain stakeholders. This module exposes the actors to an innovation systems-based configuration of stakeholders. These actors come together in an innovation platform to seek technical, institutional or organizational solutions

to critical challenge hindering agricultural productivity within a value chain. The Agricultural Innovation Platform facilitates actors to interact, innovate, learn and change with time as they seek solutions to the common challenges.

In an innovation platform every actor's contribution is valued and benefits accrue to all in a win-win situation. The AIP is a useful methodology for development, testing and scaling of innovations in the pyrethrum value chain.

The training module aim at enhancing practitioners' know-how in facilitating innovation platforms specifically:

- To reach a better understanding of innovation platforms
- To better understand the AIP facilitation process and its challenges
- To come up with practical solutions to participants challenges
- To develop a way forward in training and coaching of AIP at home situations.

The participants unpack the concept of innovation platforms critically analyzing what can be achieved with innovation platforms and because they are seen as vehicles for the following purposes by the participants:

- Dissemination and scaling out of technology
- Enhancing information flow and learning
- Making value chain work
- Enhancing resource efficiency
- Enhancing innovation and creativity
- Enhancing farmer capacity

15.1.2 Sub-Module learning Outcomes

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

1. The definition of innovation platforms clearly described and explained.
2. The characteristics of an innovation platform described and understood.
3. Process of mobilization of stakeholders for initiation, establishment, management and sustenance of an Agricultural Innovation Platform explained and demonstrated.
4. The innovation capacity building process of the AIP actors explained and understood.
5. Get exposed to successful pyrethrum innovation platforms.
6. Understand benefits and challenges of agricultural innovation platforms.

15.1.3 Sub-Module Target Group and Categories

The target users are county extension staff, agripreneurs, private agricultural service providers and lead farmers at sub-county and ward level.

15.1.4 Sub-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 have an in-depth understanding of the participants' handouts.

15.1.5 Sub-Module Duration

The module is estimated to take a minimum of 2 hours.

15.1.6 Module Summary

Sub-Module 15.1 Agricultural Innovation Platforms (AIP)			
Sessions	**Training methods**	**Training materials**	**Time**
15.1.6.1 Introduction, objectives and expectations	• Personal introductions • Presentations • Plenary discussions	• Flips charts • PowerPoint presentation • Laptop • Projector	10 minutes
15.1.6.2 Definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational)	• PowerPoint Presentations • Flip charts • Plenary discussions	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' hand outs	10 minutes
15.1.6.3. Characteristics of an Agricultural Innovation Platform	• PowerPoint presentations • Plenary discussions • Role plays • Flips charts • PowerPoint presentation	• Laptop • Projector • Hand outs • Role plays	50 minutes
15.1.6.4 Phases of an innovation platform (Initiation, Establishment, Management and Sustenance	• PowerPoint presentations • Plenary discussions • Role plays	• Flips charts • PowerPoint presentation • Laptop • Projector • Hand outs • Role plays	20 minutes

15.1.6. 5 Case studies of successful AIPS	• PowerPoint presentations • Plenary discussions • Role plays • Flips charts	• Laptop • Projector • Hand outs • Role plays	10 minutes
15.1.6. 6 Benefits and challenges of AIPS	Discussions	Flip charts	20 minutes
15.1.6.7. Module review			
TOTAL			**2 hours**

15.1.7 Facilitator's Guidelines

Sub Module 15.1 Agricultural Innovation Platform (AIP)	
15.1.7.1 Introduction, levelling of expectations and objectives (10 minutes)	**Session Guide**
Introduction *(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations)* **Module Objectives** *(The facilitator presents modules objectives and levels out expectations)* By the end of the module the trainee should be able to: • Define innovation process and the innovation products. • Explain characteristics of an innovation platform. • Describe how to initiate and establish Agricultural Innovation Platforms. • Explain how to manage and sustain innovation capacity of actors in Agricultural Innovation Platforms. • Get exposed to successful pyrethrum innovation platforms. • Understand benefits and challenges of agricultural innovation platforms.	• Summarize Trainees' "expectations" and display. • PowerPoint Presentation • Module Objectives and • Training Program

15.1.7.2 Definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational) (10 minutes)	Session Guide
The facilitator presents an overview of innovation platforms and their main characteristics **Plenary Presentation** • Past progression of research and extension models and their shortcomings • 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** • Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Notes, handouts, Brochures, information • leaflets and manuals
15.1.7.3. Characteristics of an Agricultural Innovation Platform (20 minutes)	**Session Guide**
Plenary Presentation (40 minutes) • Characteristics of Agricultural Innovation Platforms • Why Agricultural innovation platforms are used • Where to form Agricultural Innovation Platforms • Establishment of linkages between value chain actors in agricultural innovation platforms **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
15.1.7.4 Stages of an innovation platform (Initiation, Establishment, Management and Sustenance (20 minutes)	**Session Guide**
Plenary Presentation (50 Minutes) **Initiation or preformation phase** • Engagement or mobilization of stakeholders in the pyrethrum value chain to lay down rules of engagement mediated by a change agent **Establishment phase** • Assessment of the status of the value chain to clearly identify the compelling; the weaknesses in the chains. • Planning, defining roles and establish working structure and resource acquisition	• PowerPoint Presentation • Distribute Participants handouts • Brochures, Leaflets, • Manuals • Short video clips

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.	
15.1.7. 5 Case studies of successful AIPS (10 minutes)	**Session Guide**
• Pyrethrum Processing Company of Kenya (PPCK): Processing of pyrethrum and multiplication of planting materials to supply to farmers. • Engage the participants in the discussion of the factsheets and application /use of the information • Invite a participant from the successful AIP to make a presentation • Let the trainees recall what they learned and discuss any issue that may arise.	• Fact sheets • Annual Reports • Marketing models and pathways • Case study reports
15.1.7. 6 Benefits and challenges of AIPS (10 minutes)	**Session Guide**
• List the benefits of a successful AIP • Participants reflect on what they want to do at home in terms of AIP initiation then develop concrete and achievable action plans based on a challenge that they could address back home. • Involvement of all the stakeholders in the pyrethrum value chain that will ensure easy flow of operations.	• Plenary sessions by the different categories • Champions selected to campaign for attitude change
15.1.7.7. Module review (30 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training and together with the trainees review the main points on: • AIP characteristics and initiation • AIP establishment and management • Sustenance of rice 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 he module on • a flip chart and display • Administer online exit questionnaire and present analysis real time

15.1.8 Reference Materials

15.1.8.1 Participants' Handouts

- Fact sheets
- Entry and exit questionnaire on their smart forms
- Agricultural Innovation Platform establishment guide
- Summary of key policies

15.1.8.2 Further Reading

1. Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional changes
2. Felister Makini, Wellington Mulinge, Lawrence Mose, Beatrice Salasya, Geoffrey Kamau, Margaret Makelo, and Ong'ala, J. (2018). Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya. FARA Research Results Vol. 2 (6) 3.
3. F. Makini, G. Kamau, M. Makelo, 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 15.2: PYRETHRUM GENDER, VULNERABLE AND MARGINALIZED GROUPS (VMGs), SOCIO, ENVIRONMENTAL CONCERNS AND COHESION

15.2.1 Introduction to the Sub module

Pyrethrum is one of the important cash crops in Kenya. The crop involves all the gender categories [men, women, youth, vulnerable marginalized groups (VMGs)] in its value chain from production, marketing and consumption. Women perform most of the crop's production activities comprising planting, weeding and harvesting while men mostly perform the tasks of land preparation and marketing.

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

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

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

15.2.2 Sub module learning outcomes

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

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

15.2.3 Sub module Target Group

This sub module is intended for service providers, county public extension agents and agripreneurs in pyrethrum value chains.

15.2.4 Sub module Users

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

15.2.5 Sub module Duration

The sub module is estimated to take a duration of 1 hours and 30 minutes.

15.2.6 Module Summary

Sub module 15.2: Gender mainstreaming and social inclusion in the pyrethrum value chain			
Sessions	**Training methods**	**Training materials**	**Duration**
15.2.6.1 Introduction, expectations and objectives	• Personal introduction • Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Laptop • Participants' handouts	20 minutes
15.2.6.2 Gender mainstreaming in pyrethrum value chain	• PowerPoint Presentations • Group Exercise • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	20 minutes
15.2.6.3 Youth empowerment in pyrethrum value chain	• PowerPoint Presentations • Group exercise • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
15.2.6.4 Women empowerment in pyrethrum value chain	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes

15.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
15.2.6.6 Environmental and Social Management Framework	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
15.2.6.7 Sub module Review	• Plenary discussion	• Flips charts • Felt pens	10 minutes
Total			**1 hours 30 minutes**

15.2.7 Facilitator's Guidelines

Sub module 15.2: Gender mainstreaming and social inclusion in pyrethrum value	
15.2.7.1 Introduction, Objectives and Expectations (20 minutes)	**Session Guide**
(The facilitator welcomes trainees to the sub module and thereafter invites them to introduce themselves and state their expectations). **Sub module Objectives (20 minutes)** *The facilitator presents modules objectives* By the end of the module training, the trainee should be able to: • Appreciate gender mainstreaming and social inclusion, in pyrethrum value chain. • Explain youth empowerment in pyrethrum value chain. • Appreciate women empowerment in pyrethrum value chain. • Recognize strategies for inclusion of vulnerable and marginalized groups in pyrethrum value chain. • Explain the environmental and social management framework (ESMF) tool.	• Summarize trainees "expectations" and display. • PowerPoint Presentation • Group exercise • Objectives and Training Program

15.2.7.2 Gender mainstreaming and social inclusion in pyrethrum value chain (20 minutes)	Session Guide
(The facilitator presents and explain what gender mainstreaming is, who does what activity, who has access to what resources among others. and why gender mainstreaming is important in pyrethrum value chain). **Plenary Presentation (20 minutes)** • Definition of gender • What is gender mainstreaming and why it is important? • Who does what? (gender division of roles in pyrethrum 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** Let the trainees recall what they learned and discuss any issues that may arise	• PowerPoint presentation, Group exercise • Plenary discussion • Participants' handouts • Group exercise • Plenary discussion
15.2.7.3 Youth empowerment in pyrethrum value chain s (10 minutes)	**Session Guide**
Plenary Presentation (10 minutes) • Why agriculture is not attractive to youth • Youth's role in the value chain • Strategies to empower youth in pyrethrum value chain. **Group exercise and discussion (20 Minute)** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Group exercise • Plenary discussion • Participants' handouts
15.2.7.4 Women empowerment in pyrethrum value chain (30 minutes)	**Session Guide**
Plenary Presentation (10 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** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Distribute participants' handouts • Plenary discussion • Participants' handouts

15.2.7.5. Strategies for inclusion of vulnerable and marginalized groups in pyrethrum value chain (10 minutes)	Session Guide
Plenary presentation (10 min) • Who are vulnerable and marginalized groups (VMGs) • Why gender inequality exists • Social inclusion and why • Strategies of inclusion of VMG. **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Plenary discussion • Participants' handouts
15.2.7.6. Environmental and social management framework (ESMF) (10 minutes)	**Session Guide**
Plenary presentation (10 minutes) • Objective of ESMF in pyrethrum value chain • Environmental and social safeguards of pyrethrum • Safeguard policies triggered by the project **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Plenary discussion
15.2.7.7 Sub module review (10 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 pyrethrum value chain • Women empowerment in pyrethrum value chain • Strategies for inclusion of vulnerable and marginalized groups in Pyrethrum value chain • Environmental and Social Management Framework of Pyrethrum activities. Let the trainees recall what they learned and discuss any issues that may arise.	• Summary of the main points from the module on a flip chart and display

15.2.8 Reference Materials

15.2.8.1 Participants' handouts

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

15.2.8.2 Further reading

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

SUB-MODULE 15:3: AGRICULTURAL POLICY OPTIONS FOR SUPPORTING SMALLHOLDER FARMERS' PYRETHRUM PRODUCTION AND MARKETING

15.3.1 Introduction to the sub-module

This module is designed to train Trainer of Trainers (ToTs') on skills that are useful in making smallholder farmers' agency central in Pyrethrum policy making in Kenya. This is through identifying policy options, classifying policy objectives and instruments, using policy cycle to develop new policies and using policy validation cycle to update policies related to pyrethrum production and marketing. Pyrethrum is mainly grown by smallholder farmers with less than 5 acres of land. In most cases pyrethrum occupies an area of a quarter of an acre to three acres. Due to the renewed interest in the crop, there is opportunity for increase in acres, productivity and incomes for small holder farmers if they adopt good agriculture practices and reduce post-harvest losses while creating better market linkages. Smallholder pyrethrum farmers in Kenya face several challenges which include unavailability of quality planting material, access to quality inputs, capital and liquidity constraints, limited access to production technologies and institutional support and poor infrastructure. Programs and policy makers need to reduce the barriers that smallholders face in pyrethrum production and marketing.

15.3.2 Module Learning Outcomes

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

1. The role of the Crops' Act in addressing pyrethrum issues understood.
2. The importance of inclusion of pyrethrum issues in the County Integrated Development Plan through the farmers 'participation discussed and demonstrated.
3. Relevant areas in the agricultural policy options in the pyrethrum value chain that impacts most to the smallholder farmer identified and discussed.
4. The policy instruments for achieving desirable policy objectives identified and classified.
5. The use of policy cycle in the development of new agricultural policies discussed and explained.
6. The use of policy validation cycle to update agricultural policies mapped and explained.

15.3.3 Module Target Group

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

15.3.4 Module Users

This module is intended for use by Master trainers who are members of the Core Team of Trainers (CTT) in the pyrethrum value chain target Counties. The facilitator using this module should thoroughly familiarize themselves with the Participants' Hand outs (training materials).

15.3.5 Module Duration

The module is estimated to take 2 hours 20 minutes.

15.3.6. Module Summary

Sub-module 15.3: Agricultural policy options for influencing pyrethrum production and marketing			
Sessions	**Training Methods**	**Training Materials**	**Time**
15.3.6.1 Levelling of participants' expectations about the module	• Personal introduction • Discussion	• Projector • Flip charts • Laptop	15 minutes
15.3.6.2. Module introduction, Objectives Expectations	• Personal introduction Presentation	• Projector • Flip charts • Felt pens • Laptop	10 minutes
15.3.6.3 The crops act 2013 areas relevant for pyrethrum	• Presentation • Discussion	• Projector • Laptop	10 minutes
15.3.6.4 farmer involvement in CIDP development for inclusion of Pyrethrum issues	• Presentation • Discussion	• Projector • Laptop	10 minutes
15.3.6.5 National agricultural policies with smallholder farmers agency	• Personal introduction Presentation	• Projector • Laptop	15 minutes
15.3.6.6. Policy options and their objectives	• Plenary presentation	• Projector • Laptop	10 minutes
15.3.6.7. Policy instruments	• Plenary presentation • Plenary Discussion	• Projector • Laptop	20 minutes

15.3.6.8. Policy development cycle	• Plenary presentation • Plenary Discussion	• Projector • Laptop	20 minutes
15.3.6.9. Policy validation cycle	• Plenary presentation • Plenary Discussion	• Projector • Laptop	20 minutes
15.3.6.10. Training review	• Facilitato r's summary: Takeaways	• Module review • Participants Handouts	10 minutes
TOTAL			**2 hours 20 minutes**

15.3.7 Facilitators Guidelines

Sub-module 15.3: Agricultural policy options to support pyrethrum production and marketing	
15.3.7.1 Levelling participants' expectations about the module (5minutes)	**Session Guide**
15.3.7.1 Module title *(The facilitator welcomes trainees to the module on Agricultural policy options and introduces him/herself by stating his/her profile and experience).*	• Handouts • Program • Note books • Felt pens • PowerPoint slides
15.3.7.2 Participants expectations (10minutes)	
(The facilitator asks the trainees to state their expectations by listing on a flip chart). **Plenary Discussion**	• Summarize trainees' "Expectations" and display on flip chart/board.

15.3.7.3 Module introduction, objectives and expectations (10 minutes)	
(The facilitator introduces the module and states the objectives and expectations) By the end of the module training, the trainee should be able to: • Understand the role of the Crops Act in addressing pyrethrum issues. • Discuss and demonstrate the importance of inclusion of pyrethrum issues in the County Integrated Development Plan through the farmers' participation. • Identify gaps in the policy options that you feel have the most impact on farmers • Identify and classify the policy instruments for achieving policy objectives • Understand and explain the use of policy development cycle in the development of new agricultural policies • Map and explain the use of policy validation cycle to update agricultural policies	• PowerPoint presentation • Factsheets
15.3.7.3 Crops act 2013 and relevant sections to pyrethrum (10 minutes)	
The facilitator to highlights the Crops act 2013and areas relevant for pyrethrum issues.) Plenary Presentation **(10 minutes)** • Make presentation on crops act 2013 areas relevant for pyrethrum. discussion	• PowerPoint presentation

15.3.7.4 importance of farmer involvement in CIDP development (10 minutes)	
The facilitator to explain the importance of farmers' involvement in the CIDP and the stages where they should make their contributions on inclusion of pyrethrum issues to be addressed.) Plenary Presentation **(10 minutes)** • Make presentation on CIDP making process Discussion on how farmers can get involved in the CIDP making process.	
15.3.7.5 National agricultural policies with smallholder farmers agency (15 minutes)	**Session Guide**
(The facilitator to highlight the types of the National agricultural policies) **Plenary Presentation (10 minutes)** • Make presentation on the available agricultural policies Discuss how the National agricultural policies fail to make smallholder farmers' agency central **(5 minutes)**	• PowerPoint slides • Handouts • Flipcharts
15.3.7.6 Policy options and their objectives (10 minutes)	**Session Guide**
(The facilitator to highlight the types of policy options and their objectives relevant to pyrethum production and marketing) **Plenary Presentation (5 minutes)** • Make presentation on the available policy options and their objectives Discuss which policy options are applicable to pyrethrum production and marketing **(5 minutes)**	• PowerPoint slides • Handouts • Flipcharts
15.3.7.7 Policy instruments (20 minutes)	**Session Guide**
(The facilitator describes the policy instruments) **Plenary Presentation (10 minutes)** **Group Exercise (10 minutes)** Discuss successes and failures of policy instruments in influencing production and marketing of pyrethrum	• Handouts • Flip charts, • Manila papers, • Pelt pens

15.3.7.8 Policy development cycle(20 minutes)	Session Guide
Plenary Presentation (10 minutes) (*The facilitator discusses the components of policy cycle and their relationship to the production and marketing of pyrethrum)* **Plenary Discussion (10 minutes)**	• Use PowerPoint • Handouts
15.3.7.9 Policy validation cycle (20 minutes)	**Session Guide**
Plenary Presentation (10 minutes) (*The facilitator highlights the components of policy validation cycle. The facilitator also discusses the relevance of policy validation in the production and marketing of pyrethrum)* **Plenary Discussion (10 minutes)**	• Use PowerPoint • Handouts
15.3.7.10 Training review (10 minutes)	**Session Guide**
(The facilitator leads the trainees in reviewing the module. Conclude by thanking the trainees) Plenary Presentation **(10 minutes)** Summarize the main points of the training	Summary of the main points from the Module.

15.3.8 Reference Materials

15.3.8.1 Participants' Handouts

- Fact sheets
- Entry and exit questionnaire on their smart forms
- Agricultural Innovation Platform establishment guide
- Summary of key policies

ANNEXES

ANNEX 1: TRAINING PROGRAMME

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

NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT
TRAINING OF TRAINERS FOR PYRETHRUM VALUE CHAIN FOR COUNTIES
VENUE: XXXX

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 NAVCDP project ▪ Official opening Ceremony (CECM) 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 - 10.00 am	Module 1: Climate Change and Climate Smart Agriculture in Pyrethrum value chain 1.1. Introductions and objectives	30 minutes	
10.00 - 10.30 am	**Tea Break**	**30 minutes**	

10.30am-11.00 pm	1.2. Introduction to Climate Change and Climate Variability	30 minutes	Facilitator
11.00-12.00 noon	1.3. Concept of Climate Smart Agriculture (CSA)	1 hour	
12.00-12.40pm	1.4. Selected Future Scenarios that will Impact Productivity.	40 minutes	
12.40-1.00pm	1.5. Module Review	20 minutes	
End of Module 1			
1.00 -2.00 pm	**Lunch Break**	**1 Hour**	
2.00 -2.30 pm	Module 2: Farmer Field and Business School Approach 2.1. Introductions and objectives	30 minutes	
2.30 -3.00 pm	2.2 Overview of FFBS key activities	30 minutes	
3.00-4.00 pm	2.3 Designing an FFBS program	1 hour	
4.00 -4.30 pm	2.4 Communication skills	30 minutes	
4.30-5.00pm	2.5 Facilitation skills	30 minutes	
5.00 -6.00 pm	Tea Break	1 Hour	
Close of Day 1			
Time	**Day 2 (Tuesday)**	**Duration**	**Remarks / Facilitator**
8.30-9.00am	Registration for second day participation Recap of day 1 activities	30 minutes	CTT
9.00-9.30am	Continuation of Module 2 2.6 Organization, management and Leadership of FFBS	30 minutes	
9.30-10.00am	2.7. Module Review	30 minutes	
End of Module 2			
10.00 - 10.30 am	**Tea break**	**30 minutes**	
10.30 - 11.00 am	Module 3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS) 3.6.1 Introduction, objectives and levelling of expectations	30 minutes	
11.00 – 11.20 pm	3.6.2 Understanding what is GAP and its application in the pyrethrum value chain	20 minutes	
11.20 – 11.50 pm	3.6.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk Assessment	30 minutes	
11.50 -12.20 pm	3.6.4 Review of GAP requirements for audit and types of protocols possible	30 minutes	

12.20- 12.40pm	3.6.5 Introduction to Site Selection	20 minutes	
12.40-1.00	3.6.6 GAP checklists and Audit	20 minutes	
1.00 -2.00 pm	**Lunch Break**	**1 Hour**	
2.00-3.00 pm	3.6.7 Safe use of Pesticides and calibration of sprayers and nozzles	1 hour	
3.00- 3.20pm	3.6.8 Understanding of food safety management system in crop value chains	20 minutes	
3.20- 3.50 pm	3.6.9 Determination of food safety risk/hazards in crop value chains (hazard analysis)	30 minutes	
3.50-4.10pm	3.6.10 Determination of critical control points (CCPs) and Critical limits (CLs) in Pyrethrum value chain	20 minutes	
4.10-4.30pm	3.6.11 Prevention and corrective measures for CCPs in pyrethrum value chain	20 minutes	
4.30 - 5.00pm	3.6.12 Module review	20 minutes	
End of Module 3			
5.00 - 6.00 pm	Tea Break	1 Hour	
Close day 2			
Time	**Day 3 (Wednesday)**	**Duration**	**Remarks / Facilitator**
8.00-8.20am	Registration for third day participation Recap of day 2 activities	20 minutes	CTT
8.20-8.40. am	Module 4: Pyrethrum production niches and appropriate climatic requirements 4.1. Introductions and objectives	20 minutes	
8.40-9.00 am	4.2 Importance of Pyrethrum in Kenya's economy Presentation	20 minutes	
9.00-9.30am	4.3 Pyrethrum production ecological/ climatic requirements	30 minutes	
9.30-10.00	4.4. Pyrethrum production AEZs , average yields, and constraints in the target Counties	30 minutes	
10.00-10.30 am	**Tea break**	**30 minutes**	
10.30-10.40 am	4.4 . Pyrethrum AEZ continues	10 minutes	
10.40-10.50 pm	4.5. Module review	10 minutes	
	Total	**2 hours**	

End of Module 4			
10.50-11.10 pm	Module 5: Pyrethrum Variety Selection 5.1. Introduction and levelling of expectations and objectives	20 minutes	
11.10- 12.40pm	5.2 Introduction to Pyrethrum improved varieties, clones, and their pyrethrum contents.	I hour 30 minutes	
12.40-1.00 pm	5.3 Recommended Pyrethrum varieties and clones for the target counties	20 minutes	
1.00- 2.00 pm	**Lunch break**	1 hour	All
2.00 -2.10 pm	5.3 Recommended pyrethrum varieties continues	10 minutes	
2.10-2.30 pm	5.4 .Module review	20 minutes	Facilitator
	End of Module 5	2 hours 40 minutes	
2.30- 2.40 pm	Module 6. Pyrethrum Seed System 6.1. Introduction and levelling of expectations and objectives	10 minutes	Facilitator
2.40 – 3.00 pm	6.2. Definition of seed and seed system in Kenya	20 minutes	Facilitator
3.00 – 3.30 pm	6. 3 Formal seed system in Kenya	30 minutes	Facilitator
3.30 - 4.00 pm	6.4 Informal seed system in Kenya	30 minutes	
4.00 – 4.30 pm	6.5. Module review	30 minutes	
	End of Module 6	2 hours	
4.30 – 4.50 pm	Module 7: Climate smart agronomic practices for Pyrethrum production 7.1. Introductions, climate setting	20 minutes	Facilitator
4.50 -6.00 pm	**Tea Break**	**1 Hour**	**All**
Close of day 3			
Time	**Day 4 (Thursday)**	**Duration**	**Remarks / Facilitator**
8.00-8.30am	Registration for fourth day participation Recap of day 3 activities	30 minutes	CTT
8.30 – 9.00 am	7.2. Objectives and expectations	30 minutes	
9.00 -9.30 am	7.3. Agronomic practices for Pyrethrum production	30 minutes	
9.30 – 10.00 am	7.4. Appropriate inputs for Pyrethrum optimal production and their correct doses	30 minutes	
10.00-10.30 am	**Tea break**	30 minutes	

10.30-11.00am	7.4. Appropriate inputs for Pyrethrum optimal production and their correct doses continues..	30 minutes	
11.00 – 11.30 am	7.5. Fertilizer and manure application	30 minutes	
11.30am -12.30pm	7.6. Weeding, flower picking and cutting back	1 hour	
12.30 -1.00pm	7.7. Crop rotation, inter cropping and agroforestry	30 minutes	
1.00- 2.00 pm	**Lunch break**	**1 hour**	**All**
2.00-2.10 pm	7.7. Crop rotation, inter cropping and agroforestry continues	10 minutes	
2.10- 3.10pm	7.8. Nursery management	1 hour	
3.10- 3.30pm	7. 9. Module review	20 minutes	
	End of Module 7	5 hours 50 minutes	
3.30-4.00pm	Module 8: Integrated soil and water management practices for Pyrethrum production 8.1. Introduction, Objectives and Expectations	30 minutes	
4.00-4.30	8.2. Soil composition, properties and health	30 minutes	
4.30-5.30pm	8.3. Soil and plant tissue sampling and	1 hour	
5.30 – 6.00 pm	**Tea Break**	30 minutes	All
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	CTT
9.00-9.30am	8.4. Soil fertility and plant nutrition	30 minutes	
9.30 -10.00 am	8.5 Soil health and (ISFM) for climate resilient	30 minutes	
10.00 -10.30 am	**Tea Break**	**30 minutes**	
10.30 – 11.30 am	8.6 Soil and water management and water harvesting technologies	30 minutes	
11.30 – 12.00 am	8.7. Soil degradation and reclamation	30 minutes	
12.00-12.30 pm	8.8 Problematic soils and their management	30 minutes	
12.30- 1.00 pm	8.9. Module review	30 minutes	
1.00-2.00 pm	**Lunch Break**	**1 hour**	

2.00 – 2.30 pm	Module 9: Crop Health 9.1. Introduction, Objectives and Expectations	30 minutes	
2.30 -3.30 pm	9.2. Major Pyrethrum pests that cause economic losses and their control	1 hour	
3.30 – 4.00 pm	9.3. Sustainable Integrated Pyrethrum pest management practices; scouting, and threshold determination	30 minutes	
4.00-5.00pm	9.4. Major Pyrethrum diseases that cause economic losses, conditions that favour their development and their control methods	1 hour	
5.00 - 6.00 pm	**Tea Break**	**30 minutes**	
Close of day 5			
Time	**Day 6 (Saturday)**	**Duration**	**Remarks / Facilitator**
8.00 – 8.30 am	Registration day six participation Recap of day 5 activities Module 9 continues…..	30 minutes	CTT
8.30 am – 9.30am	9.5. Sustainable Integrated Disease Management (IDM) ; scouting and threshold determination	1 hour	
9.30 - 10.30 am	9.6. Integrated weed management (major weeds of pyrethrum)	1 hour	
10.30 -11.00 am	**Tea Break**	**30 minutes**	
11.00 – 11.30am	9.7. Safe use of pesticides and update source for registered pesticides	30 minutes	
End of Module 9			
11.30 am– 12.00pm	**Module 10.** Pyrethrum harvesting and post-harvest management 10. 1 Introduction and levelling of expectations and objectives	30 minutes	
12.00 – 12.45pm	10. 2 Pyrethrum harvesting and post-harvest constraints and opportunities to maintain quality (1 hour) Presentation	45 minutes	
1.00 - 2.00 pm	**Lunch Break**	**1 hour**	
2.00 - 2.30 pm	9.8. Module review	30 minutes	
2.30 - 4.00 pm	10.3 Pyrethrum post-harvest TIMPs Maturity indices harvesting, drying Proper Pyrethrum sorting and grading Presentation	1 hour 30 minutes	
4.00 – 4.30 pm	10.4 Training review	30 minutes	

	End of Module 10		
4.30 – 5.00 pm	Module 11. Pyrethrum value addition 11.1 Introduction and levelling of expectations and objective	30 minutes	
5.00 – 5.30 pm	**Tea Break**	**30 minutes**	
Close of day 7			
Time	**Day 7(Sunday)**	**Duration**	**Remarks / Facilitator**
8.00 – 8.30 am	Registration day seven participation Recap of day 6 activities	30 minutes	CTT
8.30 -9.30am	11. 2 Introduction to Pyrethrum value added products	1 hour	Facilitator
9.30 – 10.30 am	Pyrethrum value added products continues….	1 hour	
10.30 -11.00 am	**Tea Break**	**30 minutes**	
11.00 -12.00noon	11.3 Prioritizing opportunities in Pyrethrum value addition	1 hour	
12.00 -12.30 pm	11.4 constraints in Value addition and utilization of pyrethrum	30 minutes	
12.30-1.00 pm	11.5 Value addition strategy development	30 minutes	
1.00 - 2.00 pm	**Lunch Break**	**1 hour**	
2.00 – 3.00 pm	11.5 Value addition strategy development	1 hour	
3.00- 4.30 pm	11.6 Training review	30 minutes	
	End of Module 11		
4.30 -5.00pm	Module 12: Pyrethrum and food and Nutrition Security 12.1. Introduction, objectives and expectations	30 minutes	
5.00 – 5.30 pm	Tea Break	30 minutes	
Close of day 8			
Time	**Day 8(Monday)**	**Duration**	**Remarks / Facilitator**
8.00 – 8.20 am	Registration day eight participation Recap of day 7 activities	20 minutes	CTT
8.20- 8.50 am	12.2. Nutrition awareness among pyrethrum growers	30 minutes	
8.50 – 9.10am	12.3 The relationship between pyrethrum and food security	20 minutes	
9.10—9.55am	12.4 Good agricultural practices that ensure food availability	45 minutes	

10.00- 10.30am	**Tea break**	30 minutes	
10.30 – 10.50 am	12.5 Module review	20 minutes	
	End of Module 12		
11.50-12.10 pm	Module 13: Mechanization of Pyrethrum production activities 13.1 Introduction, Objectives and Expectations Module Objectives	20 minutes	
12.10am-12.40 pm	13.2. Pyrethrum climate smart land preparation tools Presentation Improved tractor drawn ridger	30 minutes	
12.40 pm-1.10pm	13 3. Pyrethrum implements and tools operations. - Motorized bush cutter	30 minutes	
1.10 - 2.00 pm	**Lunch break**	**1 hour**	**All**
2.00-2.30 pm	13.4. Pyrethrum flower drying technologies Portable pyrethrum driers	30 minutes	
2.30 -3.00 pm	13.5 Stationary Pyrethrum dryers	30 minutes	
3.00- 3.30 pm	13.6 Biomass dryers	30 minutes	
3.30- 4.00 pm	13.7 Module review Review the main points about Pyrethrum mechanization	30 minutes	
	End of Module 13		
4.00-4. 25pm	Module 14. Pyrethrum Business and Marketing 14.1 Introduction and levelling of expectations and objectives	25 minutes	
4.25-4. 45pm	14.2.Introduction to marketing channels and strategies Business concept and emerging farming business models	20 minutes	
4.45-5.05 pm	14.3 Opportunities and challenges associated with pyrethrum business. SWOT analysis	20 minutes	
5.05 – 5.20 pm	14.4. Tools for management of pyrethrum production. Budgeting entrepreneuship, record keeping, break even and Gross margin	15 minutes	

5.20 pm -5.40 pm	14.5 Pyrethrum Community production, aggregation and marketing models (COPMAS) Marketing strategies	20 minutes	
5.40-5.50 pm	14.6 Details of a small Farm Business plan. Pulling it together	10 minutes	
5.50-6.00pm	14.6 Training review	10 minutes	
	End Module 14	**2 hours**	
5.20 – 6.00 pm	**Tea Break**	**30 minutes**	**All**
Close of day 8			
Time	**Day 9 (Tuesday)**	**Duration**	**Remarks / Facilitator**
8.00 – 8.20 am	Registration day 9 participation Recap of day 8 activities	20 minutes	CTT
8.20- 8.30 am	Sub-Module 15.1 Agricultural Innovation Platforms (AIP) 15.1.1 Introduction, Objectives and Expectations Module Objectives	10 minutes	
8.30 – 8.40 am	15.1.2 Definition of Agricultural innovation systems and different types of innovations	10 minutes	
8.40 -9.30 am	15.1.3. The characteristics of an innovation platform	50 minutes	
9.30 – 9.50 am	15.1.4 Preformation and formation phases of the Pyrethrum AIP	20 minutes	
9.50 – 10.00 am	15.1.5 case studies of successful AIPs.	10 minutes	
10.00- 10.30am	**Tea break**	**30 minutes**	**All**
10.30 – 10.50 am	15.1.6. Benefits and challenges of AIPs	20 minutes	
10.50 am - 11.10	15.1.7. Module review Summary of main points	20 minutes	
	End of sub module 15.1		
12.00- 12.20 pm	Sub Module 15.2 Gender mainstreaming and social inclusions in the Pyrethrum value chain 15.2.1 Introduction, Objectives and Expectations Module	20 minutes	

12.20am -12.40pm	15.2.2 Gender mainstreaming and social inclusion in Pyrethrum value chain	20 minutes	
12.40-12.50pm	15.2.3 youth empowerment in Pyrethrum value chain	10 minutes	
12.50 – 1.00 pm	15.2.4 Women empowerment in Pyrethrum value chain	10 minutes	
1.00 - 2.00 pm	**Lunch break**	**1 hour**	**All**
2.00 - 2.10 pm	15.2.5. Strategies for inclusion of vulnerable and marginalized groups in Pyrethrum value chain	10 minutes	
2.10 - 2.20 pm	15.2.6. Environmental and social management framework (ESMF)	10 minutes	
2.20 - 2.30 pm	15.2.7. Module review Plenary summary of the module	10 minutes	
	End of sub-module 15.2		
2.30 - 2.45pm	Sub-Module 15.3: Climate-Smart Agricultural Policy Options Agricultural policy options to support Pyrethrum production and marketing 15.3.1 levelling participants expectations about the module	15 minutes	
2.45-2.55pm	15.3.2 Module introduction, objectives	10 minutes	
2.55- 3.05pm	15.3.3 Agricultural Policy Frameworks in Kenya Crops act 2013 and relevant sections to Pyrethrum	10 minutes	
3.05-3.15 pm	15.3.4. Farmer involvement in CIDP development	10 minutes	
3.15 – 3.30 pm	15.3.5. National Agriculture policies with small holder farmers' agency	15 minutes	
3.30 -3.40 pm	15.3.6 Climate-smart agriculture practices, policy options and approaches Policy options and their objectives	10 minutes	
3.40 -4.00 pm	15.3.7. Climate-smart-sensitive policy cycle Policy instruments	20 minutes	
4.00 – 4.20 pm	15.3.8 Policy development cycle	20 minutes	
4.20 -4.40 pm	15.3.9. Policy validation cycle	20 minutes	
4.40 – 5.00 pm	15.3.10. Training review	20 minutes	
5.00– 6.00. pm	**Tea Break**	**30 minutes**	**All**
Close of day 9			

Time	Day 10 (Wednesday)	Dration	Remarks / Facilitator
8.30 - 9.00 am	Registration day ten participation Recap of day 9 activities	30 minutes	CTT
9.00 -9.20 am	Course Evaluation	20 minutes	All
9.20 – 9.50am	Announcements Way Forward Closing remarks	30 minutes	CCT
9.50 - 10.20 am	**Tea break**	**30 minutes**	**All**
Close of day			
Departure to various destinations			**All**

ANNEX 2: REFERENCE MATERIALS

No	Category / Modules	Publication title	Reference types	No Pages	Farmer Category A= New entrant/Pyrethrum Elite farmer B=Elite Pyrethrum Farmer
1	Climate Change And Climate Smart Agriculture	Esilaba, A.O. *etal*. (2019). KCEP CRAL Climate Smart Agriculture Extension Manual.Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya	Publication Manual		A/B
2	Farmer Field and business school Approach	FFBS fact sheet Ferris,S., Kaganzi, E., Ostertag,C., and Wicherdecati, T,Co. (2006) A market facilitation guide to participatory agroenterprise development central internacionale de Agricultura Tropical (CIAT) FAO (2006) Farmer Field school guidance document planning for quality programmes	Fact sheet Manual	3 88 93	A/B
3	Good Agricultural practices and food safety systems	Hazard Analysis Critical Control Point Principles and Application Guidelines (2018). National Advisory Committee on Hazards Criteria for Foods. Food Safety Manual for Farmer Field Schools (2010). A training reference guide on food safety in global FFS Programmes, FAO. Global GAP Version V	Book	120	A/B

4	Pyrethrum production niches and climatic requirements	Pyrethrum Principles of Production and Utilisation 2007 Ikahu, JMK, Ngugi, CW and Maengwe, EO (1994). The performance of recommended clones in different ecological zones in Kenya. Pyrethrum post Vol. 19	Book Book	 53	A/B
5	Pyrethrum clones and varietal selections	Production Guides. Pyrethrum leaflets Pyrethrum Factsheets and Brochures Pyrethrum Growers manual	 Manual	 25	A/B
6	Pyrethrum seed systems	Pyrethrum leaflets Pyrethrum production handout	Manual		A/B
7	Climate Smart Agronomic practice for pyrethrum Production	Pyrethrum production Guides. Pyrethrum leaflets Pyrethrum Factsheets and Brochures	Manual Factsheet		A/B
8	Integrated soil and water management for pyrethrum production	Soil Management Extension Manual [KCEP-CRALManual 2019] Soil Management Leaflets [KCEP-CRAL PAMHPLETS 2019} OFRA Technical Training Manual	Manual Leaflet Manual		A/B
9	Pyrethrum Crop Health	Fact sheets on pyrethrum pest identification and their control Factsheets on pyrethrum disease identification and their control Factsheets on pyrethrum weed identification and their management Weed Management Manual. Mwangi, H.W. KALRO-Kabete	Fact sheets Manual		**A/B**

10	Pyrethrum harvest and post harvest management	Pyrethrum TIMPs Inventory Kamau J.K, Kiiya, W., Ajanga, S., Wanyonyi, N., Gathungu, G., Mahasi, M., Mwangi, J. and Pertet, E. (2019). Pyrethrum Propagation. KALRO Pyrethrum brochures and leaflets Farmer's handbook Crop Nutrition Laboratory (CROPNUTS). Undated. Pyrethrum Growing in Kenya: Suitability Factors. www.cropnuts.com Ngugi, C. W., Ikahu, J. K., and Gathungu, G. K. (2008). *Pick Pyrethrum at the Correct Stage*. KARI Information Brochure Series 63/2008. Wanja, N., Busienei, T. P. and Peter, E. P. (2008). *Use Pyrethrum Solar Dryers for Increased Income.* KARI Information Brochure Seris 75/2008. Wanja, N., Busienei, T. P. and Peter, E. P. (2008). *Use Mat Solar Dryer to Dry Pyrethrum.* KARI Information Brochure Seris 74/2008.	Publication Publication Book Brochure Brochure Brochure		**A/B**
11	Pyrethrum value addition	Pyrethrum brochures and leaflets Pyrethrum TIMPs manual Fact sheets Entry and exit questionnaire on their smart forms Agricultural Innovation Platform establishment guide Summary of key policies	Manual Fact sheet		**A/B**

12	Pyrethrum Food and nutrition security	Improved Pyrethrum driers manuals Machine manuals Brochures and flyers Wanja, N., Busienei, T. P. and Pertet, E. P. (2008). *Use Pyrethrum Solar Dryers for Increased Income.* KARI Information Brochure Seris 75/2008.	Manual Manual Brochures		**A/B**
13	Pyrethrum Business and marketing	Pyrethrum production Hand-out Pyrethrum leaflets Brochures Tawedzegwa M.(2012). Farming as a family business. Training manual.	Handout Leaflet Brochure		**A/B**
14	Pyrethrum cross cutting issues (Agriculture innovation platform, Policy, Gender mainstreaming, and Social inclusion)	Fact sheets Entry and exit questionnaire on their smart forms Agricultural Innovation Platform establishment guide Summary of key policies Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional changes Felister Makini, Wellington Mulinge, Lawrence Mose, Beatrice Salasya, Geoffrey Kamau, Margaret Makelo, and Ong'ala, J. (2018). Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya. FARA Research Results Vol. 2 (6) 3. F. Makini, G. Kamau, M. Makelo, A. Adekunle, G. Mburathi. (2013). Operational field guide for developing and managing local agricultural innovation platforms KARI ISSBN 978-9966-30-004-1	Fact sheet Manual Policy book		**A/B**

		Gender mainstreaming and social inclusion factsheets Gender mainstreaming and social inclusion guides Commonwealth secretariat, (2001). Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and other stakeholders. Marlborough house, London. Fact sheets Entry and exit questionnaire on their smart forms Summary of key policies			

ANNEX 3: FFBS LEARNING MATERIALS

PARTICIPATORY TECHNOLOGY DEVELOPMENT (PTD) AND CURRICULUM ON PYRETHRUM SOIL FERTILITY MANAGEMENT:

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

Factors to consider:

- Land topography
- Runs (blocks should face East to West)
- Certified seeds of preferred Pyrethrum variety
- Organic and inorganic fertilizer use management

Setting the P.T.D blocks:

- 4 plots of 10M by 10 M
- Improved Pyrethrum varieties
- The blocks must be right angled.
- Different soil fertility management treatments
- During data collections: collect the data using 10 plants per plot.
- Other TIMPs should be applied equally in each block.
- Weeding and spraying should also be done the same time

Parameters Measurement

- No of leaves per plant
- Leaf length
- Leaf width
- Panicle size
- Yield /unit area

Setting of Blocks

Plot 1 Inorganic fertilizer P source	Plot 2 Inorganic fertilizer compound fertilizer	Plot 3 Inorganic compound fertilizer plus organic Fertilizer	Plot 4 Farmers practice

AGRO ECOSYSTEMS ANALYSIS (AESA) ON PYRETHRUM

AESA NO ……

General information
Variety ……... .
Fertilizer …….
Planting date……...
Weather: …….

Agronomic data
No of leaves per plant……
Leaf length…..……
Leaf width…….....…..
Head size…….....…
Yields per unit area……

Time of observation: ……..…..
Diagram of pests and natural enemies observed:……..

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

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