



Kenya Climate Smart
Agriculture Project



CLIMATE SMART AGRICULTURAL TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES FOR SORGHUM VALUE CHAIN

Training of Trainers' Manual



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MARCH 2020

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LIST OF ABBREVIATIONS

AIP	Agricultural innovation Platform
ASALs	Arid and Semi-Arid Lands
B	Boron
CA	Conservation Agriculture
Ca	Calcium
CAN	Calcium Ammonium Nitrate
Cl	Chlorine
COPMAS	Community Production and Marketing System
CTT	Core Team of Trainers
Cu	Copper
DAP	Di Ammonium Nitrate
EABL	East African Breweries Limited
ET	Evapotranspiration
FAW	Fall Army Worm
Fe	Iron
GAP	Good Agronomic Practices
IDM	Integrated Disease Management
IPM	Integrated Pest Management
IWM	Integrated Weed Management
K	Potassium
KALRO	Kenya Agricultural and Livestock Research Organization
KARI	Kenya Agricultural Research Institute
KCSAP	Kenya Climate Smart Agriculture Project
Kg	Kilogram
LF	Lead Farmers
Mg	Magnesium
Mo	Molybdenum
N	Nitrogen
NPK	Nitrogen Phosphorus Potassium
P	Phosphorus
S	Sulphur
ToTs	Training of Trainers
Zn	Zinc
MASL	Metres above sea level
ha	Hectare
TIMPs	Technologies, Innovattous and Managemnt Practices
CIGs	Common Interest Group
FFBs	Farmer Field Business School
INRM	Intergrated Natural Resource Mnagement
ISFM	Intergrated Son Fertility Mnagement
ITK	Indigenous Technical Knowledge
APVC	Agriculture Product Value Chain
VMGs	Valunerable and Marginalized Groups
ESMF	Environmental and Social Management Framework

Preface

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

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

To catalyze uptake of TIMPs, Kenya Agricultural & Livestock Research Organization (KALRO) in conjunction with partners in the National Agricultural Research Systems (NARS) and Consultative Group for International Agricultural Research (CGIAR) compiled inventories of TIMPs for each of the 13 prioritized value chains (cassava, green grams, sorghum, millet, pigeon peas, bananas, tomatoes, potatoes, apiculture, indigenous chicken (meat and eggs), dairy (cattle and camel), red meat (cattle, sheep and goats) and aquaculture and 3 cross cutting value chains (natural resource management, pastures and fodder and animal health). The TIMPs were categorized into those ready for upscaling, those that needed validation and gaps that required further research. Training of Trainers’ (ToT) manuals focusing on TIMPs that are ready upscaling for each of the value chains were subsequently developed and form the basis of training county extension staff, service providers and lead farmers. They are in turn expected to cascade this training to beneficiaries in the targeted smallholder farming, agro-pastoral and pastoral communities in the 24 project counties of Marsabit, Isiolo, Tana River, Garissa, Wajir, Mandera, West Pokot, Baringo, Laikipia, Machakos, Nyeri, Tharaka Nithi, Lamu, Taita Taveta, Kajiado, Busia, Siaya, Nyandarua, Bomet, Kericho, Kakamega, Uasin Gishu, Elgeyo Marakwet and Kisumu.

KALRO having the mandate of implementing of activities under Component 2, has been instrumental in using its information resources and those of partners and collaborators to come up with the inventories of TIMPs and corresponding ToT Manuals. The use of these information resources coupled with the accompanying training and the contribution of the other project components, will go a long way in enabling the KCSAP to meet its development objective.

The National Project Coordination Unit is grateful to all who participated in the development and production of this Training of Trainers' Manual for *Climate Smart Agricultural Technologies, Innovations and Management Practices for Sorghum Value Chain*. It is my hope that counties and other users will put this resource to good use as they transform and reorient their agricultural systems to make them more productive and resilient while minimizing GHG emissions under the new realities of a changing climate.

Francis Muthami
National Project Coordinator
Kenya Climate-Smart Agriculture Project

Foreword

Kenya Climate-Smart Agriculture Project (KCSAP) tasked the Kenya Agricultural & Livestock Research Organization (KALRO) with the implementation of the project Component 2, on ‘Strengthening Climate-Smart Agricultural Research and Seed Systems’. The component activities are geared towards the development, validation, adoption and delivery of context specific climate smart agriculture (CSA) technologies, innovation and management practices (TIMPS). The other responsibility was development of sustainable seed production and distribution systems for priority value chains to enhance availability and access to seed, breeds and fingerlings by target beneficiaries under Components 1 (Upscaling Climate-Smart Agricultural Practices). Against this background, KALRO and her NARS partners have developed, validated and availed CSA TIMPS for dissemination and adoption. The TIMPS have further been unpacked during the development of Training of Trainers (ToT) Manuals for use in training public and private extension service providers and lead farmers.

The ToT Manuals are instructional guides to be used for teaching and learning step-by-step procedures of implementing CSA innovations for each of the 13 value chains being addressed. The training content is drawn from the CSA TIMPS that support respective value chains. The content are arranged in progressive modules supported by extensive information from research information and background data drawn from the TIMPS. Their relevance are based on the needs teased out of the value chains and the project objectives. The ToT Manuals training design takes into consideration the delivery system, the partners and their roles, the duration of training and logical flow of the sessions. Similar content requiring similar delivery systems are grouped together while the roles of the partners are tapped in the training and planning of the training sessions.

The Manual is divided into modules, which have a uniform outline that ensures every aspect of the TIMPs are fully covered in way that the trainees can absorb and relate to. Various delivery methods are deployed and where possible demonstrations and practical work are incorporated to enable the trainees learn by participating in the actual field activities. Furthermore, to ensure that the training across various groups is standardized, trainers guidelines, detailed descriptions of the trainees, program, training methods and a training evaluation have been provided in the manual. Adhering to these guidelines, therefore, enables possibility to replicate the training in several locations without loss of details regardless of whether conducted by different trainers.

It is highly advised that the ToT Manuals should be used in conjunction with the respective value chains’ TIMPs documents and facts sheets in order to provide valuable resource for both public and private extension service providers. The use of this Manual is expected to spur increased productivity and resilience by farmers, while mitigating climate change impacts in the value chains to deliver the envisaged ‘Triple Wins’.

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

Eliud K Kireger, PhD, OGW
Director General, KALRO



PART 1

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



SECTION 1: BACKGROUND

1.1 The Role of Sorghum Value Chain in the Kenyan Economy

Sorghum (*Sorghum bicolor* (L.) Moench) is cultivated as a major food crop in the country with drought and heat tolerance characteristics suitable for growing in areas that are marginal and stress prone. The crop is grown widely at altitudes of up to 2500 metres above sea level with rainfall from 300 mm, but performing best with more than 900 mm annually. Sorghum is a dual-purpose crop, where grain and stover are highly valued for human food and animal feed, respectively. Sorghum plays an important role as a food security crop especially in semi-arid lands of Kenya, and is mainly cultivated by small-scale farmers in the dry land areas of Western, Eastern, and Coast regions. These areas are home to over 35 percent of Kenya's population as well as more than 26 percent of livestock. The crop is grown in an estimated area of 184,654 ha. Sorghum production faces several constraints including bird damage, parasitic weeds, drought, soil infertility, poor management practices, postharvest and poor marketing structures.

In recent years, the Kenya Agricultural Research Institute (KARI), and now Kenya Agricultural and Livestock Research Organisation (KALRO), in collaboration with East African Breweries Limited (EABL), has been promoting the use of high quality sorghum varieties, such as Gadam, in beer production. This development has spurred renewed interest in the production of sorghum, providing a cash crop for farmers in the semi-arid lands, helping them improve livelihoods, increase climate resilience and address food security.

1.2 The Role of Sorghum in Food and Nutrition Security

Most sorghum grain in Kenya is consumed by rural population. Some sorghum grain is also processed into flour by commercial mills and sold in urban markets. In many cases, sorghum flour is used to enrich cassava flour before it is packaged and sold to consumers. The by-products from sorghum processing are typically used for animal feed production.

As part of Kenya government's "Big 4" Agenda, flour blending initiative aims to contribute towards food security, improve nutrition and increase employment opportunities through flour blending based on under-utilised high value foods by 2022. Sorghum will be a key component of the flour blending.

1.3 Sorghum as a Climate Smart Innovation

Successive droughts in Kenya compounded with other socio-economic constraints have led to persistently unstable and declining agricultural productivity in arid and semi-arid lands (ASALs). This coupled with climate change has given rise to the need to find coping strategies that would include growing alternative crops that are drought tolerant and thus suitable for the areas. Research in Kenya and elsewhere has shown that sorghum (*Sorghum bicolor* L. Moench) has the potential to end severe food insecurity in ASALs due to its tolerance to drought and ability to thrive under a wide range of soils.

1.4 Objectives of the Training

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

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

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

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

SECTION 2: TRAINING CONTENT

2.1 Orientation of the Modules

The training content is organized into 13 modules that are targeted and orientated to ensure the technology and innovation management practices (TIMPS) are adopted to improve productivity through improved sorghum value chain competitiveness in a market driven production. The purpose of these modules is to enhance the knowledge and capacities of trainers in understanding and disseminating the climate-smart sorghum practices to the intended beneficiaries, who are primarily the farmers.

2.2 Modules Outline

Each of the 13 modules consist of 8 parts. These parts are:

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

The outline of the 13 sorghum modules is presented in Table 1 below.

Table 1: Summary of 13 module outlines for the sorghum value chain

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
1	Climate change and climate smart agriculture	- The impact of climate crisis to sorghum production - Adoption of climate smart technologies for sorghum value chain to address climate variability and entrance resilience	- Master trainers made aware of the potential impact of climate change on sorghum production - Master trainers updated on climate smart techniques for sorghum	4 hours
2	Farmer Field Business school (FFBS) approach	Skills/technologies for production, processing and marketing	Improved technologies/innovations and agronomic practices for sorghum availed	4 hours 30 minutes
3	Sorghum production niche and climate requirements	Review on what areas are suitable for sorghum production	Master trainers learn of sorghum niche in the respective counties	4 hours
4	Sorghum variety selection	Awareness on improved varieties	Master trainers made aware of the new improved varieties	4 hours
5	Sorghum seed systems	Both formal and informal seed systems operations.	The formal and informal seed supply systems analysed.	4 hours 30 minutes
6	Sorghum climate smart agronomics practices	Options for innovating increased sorghum production	Both water and input manipulations analysed along benefits	4 hours
7	Integrated soil and water management practices for sorghum	Soil water and fertility enhancing techniques availed.	All techniques analysed for possible benefits	5 hours
8	Sorghum crop health	All major pests (invertebrate and vertebrate) and diseases organisms control mechanisms availed to the master trainers.	Reduction of yield loss of sorghum by the major pests and diseases	5 hours

9	Sorghum harvesting and post-harvest management	Storage technologies to reduce losses in quantity and quality	Trainees sensitised on proper harvesting techniques and storage facilities, hygiene and monitoring	3 hours
10	Sorghum value addition	Various sorghum products, for human and animal feeds	Value creation and sorghum products identified for the farming communities and business entities Opportunities identified and prioritized	6 hours 30 minutes
11	Mechanization of sorghum production activities	Adaptation of mechanized operations of sorghum from crop establishment, crop management to post-harvest	Options of mechanization for increased yield availed to farmer groups.	4 hours
12	Sorghum business and Marketing	Review what business options are available in sorghum	The brewery industry options Type of aggregations by farmers availed for considerations. Contract farming	4 hours
13	Sorghum cross cutting issues (i) Innovation Platforms (ii) Gender mainstreaming and social inclusion (iii) Policy	Articulate how Vulnerable and Marginalized Groups (VMGs) can draw benefits from sorghum value chain Options of employment opportunities in sorghum production Sites for information profiled at the county levels	Opportunities for marginalized groups identified and gains made Farmers get access to more information on sorghum production	12 hours
Total Duration				64 hours 30 Minutes

SECTION 3: TRAINING DESIGN

3.1 Delivery System

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

1. Establishment of a team of facilitators

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

2. Up scaling

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

3.2 Partners and their roles

The partners envisioned in this training plan are:

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

3.3. Training duration

The TOT course for Master Trainers for the 13 modules in the sorghum value chain shall take a total of six days of training period. Programs and timetables will be developed and will cater for this.

3.4 Logic Design and flow of sessions

The logic of design and flow of each module is that the facilitator, paying attention to the proposed methods and sessions guidelines, shall: (1) Introduce the module; (2) Draw out the participants' expectations; (3) Relate participants' expectations with module objectives or learning outcomes; (4) Explore the concept and content, switching to different methods of delivery of the content (group exercise, brainstorming, excursions, plenary discussions, role plays) as the session progresses; (5) Review the module at the end using participatory approaches where one participant reads one summary message and its application; and, (6) Distribute the participants handouts.

SECTION 4: FACILITATOR GUIDELINES

4.1. Preparation of Training Materials

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

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

4.2. Preparation of training venues and sites

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

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

4.3. The trainees

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

4.4. Training Program

The facilitator will require a program that consists of the actual training modules and the corresponding days and time allocation (Annex 1).

4.5. Training Methods

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

Table 2: Description of Training Methods

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

4.6 Planning Schedules and Guidelines for ToT Preparation

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

Table 3: Duration of activities to be done before Training

Duration to training	Activities to be done
Three months	At least 5 sorghum demonstration plots planted (staggered)
Six weeks	Recruit Master Trainers, compose CTT.
Four weeks	Send out invitation letters to participants and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members
Two weeks	Confirm names of participants; reproduce training materials for facilitators and package, confirm preparedness of the field sites to be visited. Hold briefing of CTT members to finalize training plan. Confirm special guests if any
Four days	Confirm training sites preparedness, prepare sitting arrangements and stationery, and brief assistants
One day	Arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at residence proposed
On first day	Arrange for reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes: • Registration • Welcoming to venue by host • Elaborate introduction of CTT and participants • Introduction to the project and training course • Ground rules • Groups formation

4.7 Evaluation of the Training

Half day has been allocated for planning for way forward and evaluation of the ToT on the last day of the training. This is as presented in the program in Section 4.4.

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

Table 4: Individual Sample Evaluation Form

Aspect / Module		Rating		
		Very useful (3 marks)	Useful (2 marks)	Of limited use (1 mark)
1	Climate change and climate smart agriculture			
2	Farmer Field Business school (FFBS) approach			
3	Sorghum production niche and climate requirements			
4	Sorghum variety selection			
5	Sorghum seed systems			
6	Sorghum climate smart agronomic practices			
7	Integrated soil and water management practices for sorghum			
8	Sorghum Crop Health			
9	Sorghum harvesting and Post- harvest management			
10	Sorghum value addition			
11	Mechanization of sorghum production activities			
12	Sorghum business and Marketing			
13	Sorghum Cross cutting issues (iv) Innovation Platforms (v) Gender mainstreaming and social inclusion (vi) Policy			

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

CTT members then use the two evaluation results to write a report highlighting aspects that went on well and can be replicated, challenges that were encountered, and opportunities for future ToT's improvement. This one does not need a guided template but the trainees should be allowed to use their own way to present their evaluation points.

4.8 Participants' Reference Materials

4.8.1 List of Publications

Sorghum reference material will consist of the following:

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

4.8.2 Guide on the use of the reference information

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

The list of all individual publications will be stored and made available as electronic copies – mainly PDFs. The service providers are strongly advised to keep these electronic copies on a memory stick, CD or portable hard drive – so that trainees can easily access and if necessary print any of them out at their convenient time.



PART II

Sorghum Training Modules

This part consists of 13 modules of training namely: Climate change and climate smart agriculture, Farmer Field Business school (FFBS) approach, Sorghum production niche and climate requirements, Sorghum variety selection, Sorghum seed systems, Sorghum climate smart agronomics practices, Integrated soil and water management practices for sorghum, Sorghum crop health, Sorghum harvesting and post-harvest management, Sorghum value addition, Mechanization of sorghum production activities, Sorghum business and Marketing, and Sorghum cross cutting issues (innovation platforms, policy, gender main streaming and social inclusion)

All the modules will be divided into the following:

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



MODULE 1

CLIMATE CHANGE AND CLIMATE SMART AGRICULTURE

1.1 Introduction to the Module

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

1.2. Module Learning Outcomes

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

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

1.3. Module Target Group

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

1.4. Module Users

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

1.5. Module Duration

The Module is estimated to take 4 hours

1.6. Module Summary

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

1.7 Trainers Guidelines

1.7.1. Introduction and Levelling Expectations (1 hour)	Session Guide
<i>(The trainer should introduces to this module of climate change and climate smart agriculture and its important linkages in the achievement of KCSAP project objectives.</i> Trainees' expectation (30 minutes) <i>The facilitator organises the trainees into groups to state and list their expectations.</i> Module Objectives (30 minutes) <i>(The trainers presents modules objectives on power point).</i> By the end of the module training 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 sorghum production. • Explain the benefits of selected climate smart crop management practices in sorghum production.	PowerPoint presentation Distribute Participants' Handouts on Module Objectives and expectations.

1.7.2 Introduction to Climate Change and Climate Variability (1 hour) <i>(The trainer proceeds to introduce the module basics.</i> Plenary Presentation • Basic terminologies used in the module (weather, climate, variability, adaptation, coping). • Explain climate change and climate variability. • The causes of climate change. • Climate risks impacting agriculture. • Proposed adaptation measures (captured in TIMPS).	Session guide • PowerPoint presentation • Flip chart sketches • Discussion on the session; Field experiences, coping and adaptation mechanisms adopted by farmers
1.7.3 Concept of Climate Smart Agriculture (CSA) (1 hour) <i>(The trainer presents to the trainees the principles underpinning CSA and the link to deliverable of project objectives).</i> Plenary Presentation • Definition of the CSA approach and their characteristics • The three pillars of CSA (productivity, Adaptation and Mitigation • Why CSA is needed	Session Guide • PowerPoint presentation • Handouts • Plenary discussion.
1.7.4 Projected Future Scenarios that will Impact Productivity (40 minutes) <i>(The trainer leads the trainees in discussing future climatic projections focusing on rainfall and temperature which directly impacts on crop yields).</i> Plenary Presentation Plenary 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 sorghum. • Short Video on showing projections of rainfall and temperature.	Session Guide • PowerPoint PPT • Video presentation • Plenary Discussion
1.7.5 Module Review (20 minutes) <i>(The trainer leads the trainees in summarizing the key points discussed in the module)</i>	Session Guide • Plenary discussion

1.8. Participant's Handouts

- Fact sheet on climate change

References

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

MODULE 2

FARMER FIELD AND BUSINESS SCHOOL (FFBS)

APPROACH IN SORGHUM PRODUCTION

2.1. Introduction to the module

This module is designed for training and exposing trainees to the Farmer Field and Business Schools (FFBS) approach and concepts. In addition, practitioners of FFBS need to have knowledge of this methodology in order to mainstream various Technologies, Innovations and management Practices (TIMPs) in sorghum production. The trainees will thereafter facilitate farmers in the Common Interest Groups (CIGs) to enable them share and learn by doing, try available technologies and innovations as they implement them on their farms. FFBS also empowers the learners with various skills such as leadership, communication and agri-business. Since the methodology is participatory, it improves the learners' observation skills and creates linkages with other value-chain players, thereby making sorghum production profitable and sustainable.

2.2. Module Learning Outcomes

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

- Have a clear understanding of Farmer Field and Business School approach and be able to differentiate between teaching and facilitating.
- Be equipped with practical skills that help them feel informed and confident about their roles and ability to facilitate a participatory learning session.
- Be empowered with knowledge and analytical skills to design simple experiments to test and select the best solution to their (problem) challenges (TIMPs).
- Facilitated the shift from the traditional focus to improving productivity towards farming business proposition.

2.3. Module Target Group

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

2.4. Module Users

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

2.4. Module Duration

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

2.5 Module Summary

Module 2. 5 Farmer Field and Business School Approach			
Sessions	Training Methods	Training Materials	Time
2.5.1 Introduction, objectives and levelling of expectations	- Groups to bring out expectations - Presentation	- Module objectives - Marker pens, flip charts - Projector	1 hour
2.5.2 Overview of FFBS key activities	- Brainstorming - Plenary presentation	- Flip charts - Projector - Pictorials	30 minutes
2.5.3 Designing an FFBS program	- Presentation - Plenary discussion	- Projector - Participants' handouts	1 hour
2.5.4 Communication and facilitation skills	- Presentation - Plenary sessions - Group discussions	- Projector - Flip charts	30 minutes
2.5.5 Facilitation skills	Plenary presentation	- Flip charts - Projector - Plenary discussions and presentations	30 minutes
2.5.6 Organization, management and leadership in FFBS	- Presentation - Plenary sessions - Group discussions - PowerPoint presentation - Plenary sessions - Group discussions	- Projector - Flip charts - Handouts	30 minutes
2.5.7 Module review	- Participants' questions and comments - Facilitator' summary	- Participants' handouts - Projector - Flipchart	30 minutes
TOTAL			4 hours 30 minutes

2.6 Trainers Guidelines to FFBS establishment and operations

2.6.1 Introduction and Levelling Expectations (1 hour)	Session Guide
<i>(The trainer welcomes trainees to the module on FFBS and climate change and introduces him/herself stating his profile and experience of working with farmers).</i> Trainees' introductions and expectations (30 minutes) The facilitator invites the trainees to state their expectations after brainstorming in their respective count group. Module Objectives (30 minutes) The facilitator presents modules objective in power point By the end of the module the trainee should be able to: - Describe the concepts, characteristics, principles and plans of Farmer Field and Business School (FFBS) as a 'learning by doing approach - Identify climate change, risks, hazards, impacts and mitigation measures in potato value chain. - Mainstream gender issues in climate-smart sorghum value chain.	- Summarize trainees' "Expectations" on a flipchart and make displays. - PowerPoint presentation

2.6.2 Overview of FFBS key activities (30 minutes) <i>(The facilitator introduce FFBS by defining it and sharing its benefits with the trainees).</i> Plenary Presentation Overview of Farmer Field and Business Schools. • Principles of FFBS, Characteristics of FFBS. • Sorghum curriculum matrix.	Session Guide List the responses on flip chart • PowerPoint presentation • Participants handouts
2.6.3 Designing an FFBS program (1 hour) <i>(Facilitator should guide discussions on the steps of preparation and establishment of FFBS).</i> Plenary Presentation The classical steps • Ground working. • Training of Facilitators. • Establishing PTDs at the FFBS. • Season long FFBS sessions. • Evaluation of PTDs. • Field days. • Graduation. • Establishment of Lead FFBS. • Follow ups. Group Exercise Steps in establishing FFBS in the community. Within the groups follow facilitator instructions. Plenary presentation	Session Guide • Distribute Participants' Handouts • Procedure of ground working- distribute handout • PowerPoint presentation • Group Exercise
2.6.4 Communication skills (30 minutes) Plenary presentation <i>(The facilitator introduces the topic on communication and why effective communication).</i> Group exercise. • What is effective communication? • Purpose of communication. • Barriers to effective communication. • Maintaining communication within group (FFBS).	Session Guide • Group dynamics on communication-exercise • Distribute flip charts and felt pens to participants • Group Exercise
2.6.5 Facilitation skills (30 minutes) <i>(The facilitator introduces the topic on Facilitating adult learners).</i> Plenary presentation Facilitating sorghum CIGs • Definition of Facilitation, facilitator and effective facilitator. • Qualities of a good facilitator. • Golden rules of facilitator. • Roles and responsibilities of FFBS Facilitators. • Adult Non-formal learning techniques.	Session Guide Distribute flip charts and felt pens to participants Handout on adult learning techniques

2.6.6 Organization, management and Leadership of FFBS (30 minutes)	Session Guide
<i>(The facilitator introduces the topic by asking the trainees how their groups are organized, managed and leadership structures)</i> Plenary Presentation • What is leadership • Leadership continuum- subjects, environment and leader • Existing leadership structure • Roles & responsibilities of leaders • Leadership and sustainability in groups	• Flip charts • PowerPoint presentation • Plenary discussions and presentations
2.6.7 Module Review (30minutes)	Session Guide
<i>(The facilitator leads the trainees in reviewing the module)</i> Review together the main points about FFBS module. • Definition of Facilitation, facilitator and effective facilitator • What new things did you learn from this Module? • What are some of the problems and issues that you have become more aware of? • In FFBS, problems are seen as challenges how would we identify the priority problem in the community? - And how would we address it? - Why farming business proposition? - Any other question?	• Flip charts, felt pens

2.8 Participants' Handouts

References

1. FAO Government Cooperative Programme: Farmer Field And Farm Business Schools. Manual for Preparation and Establishment of Farmer Field and Farm Business Schools
2. Khisa Godrick:(2004) Farmer Field School Methodology: Training of Trainers Manual.
3. Sustained East Africa; (2010) Farmer Field School: A Technical Manual

MODULE 3:

SORGHUM PRODUCTION NICHES AND CLIMATIC REQUIREMENTS

3.1 Introduction

This module exposes service providers, lead farmers and facilitators to the different types of production ecological (altitudes, soils, AEZs and climatic conditions) suitable for sorghum production in the selected counties. Sorghum is adapted to a wide range of ecological conditions such as the dry low lands, dry cold high lands and semi humid and humid areas. Due to the changing climate conditions and the increased demand of sorghum grain for industrial processing in brewing, farmers in wide ecological areas are demanding for sorghum varieties. There is need for the knowledge on the production niches and climatic conditions for the production of the crop in the various target counties.

3.2 Module Learning outcomes

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

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

3.3 Module Target Group

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

3.4 Module users

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

3.5. Module Duration

The Module is estimated to take of 4 hours.

3.6 Module Summary

Module 3: Sorghum production niches and climatic requirements			
Sessions	Training methods	Training materials	Time
3.6.1 Introductions and climate setting Participants expectations Objectives	• Plenary discussions • Plenary presentation	• Flips charts • Felt pens • PowerPoint Presentation • Projector	1 hour
3.6.2 Importance of sorghum in Kenya's economy	• Presentations • Plenary discussions	• Flips charts • Felt pens • PowerPoint presentation • Hand-outs	1 hour
3.6.3 Sorghum production ecological/climatic requirements for optimal yields	• Presentations • Plenary discussions	• Flips charts • Felt pens • Laptop for PowerPoint presentation • Hand-outs (Training notes) • Projector	1 hours
3.6.4 Sorghum production Agro-ecological zones (AEZs)- average yields, and constraints in the target Counties	• Group work • Presentations • Plenary discussions • Field demonstration	• Flips charts • Felt pens • PowerPoint presentation • Projector	1 hour
3.6.5 Module review	• Discussions/conclusion and way forward	• Flip charts • PowerPoint presentations • Projector	30 minutes
Total			4 hours 30 minutes

3.7 Trainers Guidelines

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

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

3.8 Participants' Handouts

1. Sorghum production Guides [manual 2017, Manual, 2019]
2. Sorghum leaflets [2017]

References

1. Karanja, D.R., Kisilu, R.K., Kathuli, P., Mutisya, D.L., Njaimwe, A.N., Keya, G., Ouda, J., and Ayemba, J. (2017). Enhancing Sorghum Production and Marketing in Semi-Arid Kenya www.kalro.org/asal-aprp.
2. Esilaba, A.O. *et al.* (2019). KCEP-CRAL Sorghum Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya.

MODULE 4

SORGHUM VARIETY SELECTION

4.1. Introduction to the Module

This module exposes trainees to the improved sorghum varieties, their uses and target area of production. The various sorghum varieties are released for different ecological areas and different uses. There are varieties for dry low lands, dry cold high lands and semi humid and humid areas. These varieties are also grouped into categories such as malting, consumption by both human and animals, forage and sweet sorghums. Due to the changing climate towards drier conditions and the increased demand of sorghum grain for industrial processing in brewing, farmers in wide ecological areas are demanding for sorghum varieties. However, they are not able to identify the varieties suited to their regions and their needs. There is therefore need for farmer trainers in the sorghum target counties to be trained to understand the different sorghum varieties, their suitable areas of production and their end uses.

4.2 Learning Outcomes

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

- 1) The sorghum crop described
- 2) The various improved sorghum varieties, their ecological areas of cultivation and their attributes and uses identified.
- 3) Appropriate variety for specific regions identified

4.3 Module Target Group

This module targets agricultural extension service providers, public extension services providers 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) and Lead Farmers in the sorghum value chain target Counties. The trainers using this module should thoroughly familiarize themselves with the participant's handouts (training materials).

4.5 Module Duration

The Module is estimated to take 4 hours.

4.6 Module Summary

Module 4. Sorghum Variety Selection			
Sessions	Training Methods	Training Materials	Time
4.6.1. Introduction and Objectives Expectations	• Plenary presentation • Group discussions and presentation of expectations	• Flip charts • PowerPoint	1 hour

4.6.2. Introduction to various improved sorghum varieties, their ecological areas of cultivation and their attributes and uses.	• Group Exercises to identify local sorghums • Plenary Presentations • On-farm practical demonstration	• PowerPoint presentation • Flip charts • Manila papers • Mark pens • Projector	1 hour 30 minutes
4.6.3 Appropriate variety for specific regions	Plenary Presentation Group Exercises	• PowerPoint presentation • Projector	1 hour
4.6.4. Module review	• Group Exercises • Facilitator's summary	• Participants' handouts • Participants' handouts • Sorghum manual	30 minutes
TOTAL			4 hours

4.7. Trainer's Guidelines

Sorghum Variety Selection	
4.7. 1 Introduction and levelling of expectations and objectives (1 hour)	Session Guide
Introduction (30 minutes) <i>(The trainer welcomes trainees to the module on sorghum varieties and introduces himself/herself by stating his/her profile and experience).</i> The trainer invites the trainees to introduce themselves and state their expectations. Module Objectives (30 minutes) (The trainer presents modules objectives). By the end of the module the trainee should be able to: 1. Describe the sorghum crop and its climatic and ecological requirements. 2. Identify the various improved sorghum varieties their ecological areas of cultivation and their uses. 3. Identify the varieties suited to the counties of interest.	• Summarize trainees' "expectations" on cards or flipchart and display. • Distribute participants' handouts • Module Objectives, Program

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

4.7.4 .Module review (30 minutes)	Session Guide
<i>(The trainer should be able to lead the trainees in reviewing the module)</i> Group Exercise Summarize the main points of the training. Together with the trainees review the main points about improved sorghum 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 sorghum varieties? • What questions do you still have about identification of sorghum varieties?	• The last Participants' Handouts. • Summary of the main points from the module.

4.8 Participant's Handouts

- Sorghum production Guides [2017]
- Sorghum leaflets [2017]

References:

1. Karanja, D.R., Kisilu, R.K., Kathuli, P., Mutisya, D.L., Njaimwe, A.N., Keya, G., Ouda, J., and Ayemba, J. (2017) Enhancing Sorghum Production and Marketing in Semi-Arid Kenya www.kalro.org/asal-aprp.
2. Esilaba, A.O. *et al.* (2019). KCEP-CRAL Sorghum Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya.

MODULE 5

SORGHUM SEED SYSTEMS

5.1. Introduction to the Module

Sorghum farmers mostly recycle their own seed or sources from their local market and grain stores with a small percentage purchasing certified seed. Continued use over many years of own saved seed makes production of improved varieties (especially self-pollinated crops) uneconomical, thus undermining the incentives for private sector investment in commercial production and marketing of such seeds. This in turn has limited the dissemination of improved high-quality seed of sorghum. The mode of own-saved 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 subsistence agriculture to commercial grain production. This module exposes service providers, lead farmers and facilitators to the various seed systems in sorghum production. The module also covers the importance of quality seed, how to improve on sorghum seed provision. It also covers community seed production and gives direction on how to interface formal and informal seed production to enable farmers venture into commercial grain production.

5.2 Module Learning outcomes

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

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

5.3. Module Target Group and Categories

This module is intended for service providers, county public extension agents 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). The facilitator using this module should thoroughly familiarize themselves with the participants' handouts.

5.5 Module Duration

The Module is estimated to take 4 hours 30 minutes

5.6. Module Summary

Module 5 Sorghum Seed System			
Sessions	Training methods	Training materials	Time
5.6.1 Introduction, objectives and expectations	• Personal introductions • Presentations • Plenary discussions	• Flips charts • Felt pens • Projector	1 hour
5.6.2 Definition of seed and seed system in Kenya	• Group work • Presentations	• Flips charts • Projector	1 hour
5.6.3 Formal seed system in Kenya	• Presentations • Discussions	• Projector • Flips charts • Felt pens	1 hour
5.6.4 Informal seed system in Kenya	• Presentations • Discussions	• Projector • Flips charts • Felt pens	1 hour
5.6.5 Module review and discussions	• Group work • Discussions • presentation	Flips charts	30 minutes
Total			4 hours 30 minutes

5.7 Trainers Guidelines

Module 5: Sorghum Seed System	
5.7.1. Introduction and levelling of expectations and objectives (1 hour)	Session Guide
Introduction (30 minutes) <i>(The trainer welcomes trainees to the module on main sorghum seed system. They are then invited to introduce themselves and state their expectations)</i> 5.7.2 Module Objectives (30 minutes) <i>(The facilitator presents modules objectives)</i> By the end of the training module the trainee should be able to: • Describe the main sorghum seed systems in Kenya. • Explain and discuss the importance of formal seed system in sorghum production. • Explain and discuss importance of informal seed system, community seed bulking and its interface with formal seed production for enhanced production of quality grain.	• Summarize trainees' "Expectations" on cards or flip chart and display. • PowerPoint presentation • Distribute participants' handouts on Module • Objectives and Training Program

5.7.3 Definition of seed and seed system in Kenya (1hour)	Session Guide
Group work and presentations: (30 Minutes) • What is quality seed? Plenary Presentation (30 Minutes) • What is a seed system and characteristics of main seed systems (formal and informal seed systems)? • Commodity corridors.	• Group work • PowerPoint presentation • Distribute participants' hand-outs • Brochures, Leaflets,
5.7.4 Formal seed system in Kenya (30 minutes)	Session Guide
Plenary presentations highlighting: • Legal requirements for seed certification. • Seed certification process. • Post certification activities for enforcing the Seed Act cap 326. • Post control activities for seed quality assurance. • Seed importation and exportation requirements.	• PowerPoint presentation • Distribute participants' handouts • Brochures, Leaflets
5.7.5 Informal seed system in Kenya (1 hour)	Session Guide
Plenary presentations: (30 Minutes) • Seed multiplication. • Sorghum seed standards and commercial production. • Informal seed system. • Community seed bulking and how is it implemented. • Synergies for formal and informal seed system. Group work and discussions (30 Minutes) Calculate seed requirements for the county/ward/farmer group) and present.	• Group work • PowerPoint presentation • Distribute participants' hand-outs • Brochures, Leaflets,
5.7.6 Module review (30 minutes)	Session Guide
<i>(The trainer leads the trainees in reviewing the module)</i> Summarize the main points of the training and together with the trainees review the main points on: • Sorghum seed systems and their characteristics • Importance of using certified seed • Informal seed <i>(Discuss with trainees' new things learnt from this Module. What are some of the problems and issues that they have become more aware of in the module?)</i>	• The last participants' handouts • Summarize the main points from the module on a flip chart and display

5.8 Participants' Handouts

- Sorghum production Guides [2017]
- Sorghum leaflets [2017]

References

1. Karanja, D.R., Kisilu, R.K., Kathuli, P., Mutisya, D.L., Njaimwe, A.N., Keya, G., Ouda, J., and Ayemba, J. (2017) Enhancing Sorghum Production and Marketing in Semi-Arid Kenya www.kalro.org/asal-aprp
2. Esilaba, A.O. *et al.* (2019). KCEP-CRAL Sorghum Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya

MODULE 6

CLIMATE SMART AGRONOMIC PRACTICES FOR SORGHUM

6.1 Introduction

Within sorghum varieties there are agronomic packages which a farmer should practise in order to reap maximum benefits. The improved sorghum varieties will not reach their yield potential if farmers do not practice the recommended agronomic practices. There is therefore need for farmer master trainer in the sorghum target counties to guide farmers on the sorghum agronomic practices, seed selection techniques, and disease and pest management.

6.2 Module Learning outcomes

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

1. Agronomic practices for sorghums production described and explained.
2. Region specific advice on sorghum production agronomic practices provided.
3. Inputs and their right measurements for sorghums production identified.
4. Timing for operations or inputs application in sorghums production described and explained.

6.3 Module Target Group and Categories

This module is intended for public agricultural extension providers ,service provides and lead farmers in the sorghum value chain target Counties.

6.4 Module users

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

6.5. Module Duration

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

6.6 Module Summary

Module 6: Sorghum climate smart agronomic practices			
Sessions	Training methods	Training materials	Time
6.6.1 Introductions and climate setting	• Presenter introductions • Self-introduction of trainees (incl. individual involvement in sorghums • Plenary discussions	• Flips charts • Felt pens • Laptop for power point presentation	30 minutes
6.6.2 Objectives and expectations	• Presentations (guide on group work) • Group work (trainees enlist expectations) Plenary discussions to share expectations	• Flips charts • Felt pens • Laptop for power point presentation	1 hour

6.6.3 Agronomic practices for sorghum production	• Presentations • Practical work (groups tour nearby farm for possible farm layout) • Plenary discussions resulting from the farm visit	• Flips charts • Felt pens • Laptop for power point presentation	1 hour
6.6.4 Appropriate inputs and their dosages in sorghum optimal production	• Presentations • Group work (trainees enlist inputs and dosage in different counties) • Plenary discussions to share group work results	• Flips charts • Laptop for power point presentation • Participants' handouts	1 hour
6.6.5 Module review and discussion	• Discussions/conclusion and way forward	• Flip charts • Laptop for power point presentations	30 minutes
Total			4 hours

6.7 Trainers Guidelines

Module 6: Climate smart agronomic practices for sorghum	
6.7.1 Introductions, climate setting (30 minutes)	Session Guide
<i>(The facilitator welcomes trainees to the module, Introduces him/herself and then invites to introduce themselves and state their past or current involvement in sorghum production).</i>	• Summarize the facilitator/trainees involvement in sorghums value chains
6.7.2 Objectives and expectations (1 hour)	
Objectives (30 minutes) <i>(The facilitator presents the module objectives).</i> By the end of the module training, the trainee must be able to: 1. Explain and describe agronomic practices for sorghums production. 2. Describe and explain inputs and their right quantities for sorghums production. 3. Provide region specific advice on sorghum production agronomic practices. 4. Specify the right timing for operations or inputs application in sorghums production. Expectations (30 minutes) The trainees go into groups (e.g. county based) and enlist expectations from the module.	• PowerPoint presentations • Group exercise (listing and presenting expectations). • Expectations lists kept for later reviewing compliancy

6.7.3 Agronomic practices for sorghums production (1 hour)	
Plenary Presentation (40 minutes) The trainer presents critical factors on: • Factors for selecting sorghum as an enterprise. • Climate smart land preparation. • Climate smart Planting (Seed rates, plant density) • Thinning. • Weed control. • Pests and disease control. • Rogueing. • Cropping systems. • Spacing (inter-and intra-row spacing) • Conservation agriculture principles/benefits. Discussions (20 minutes) Questions/answers and comments.	• PowerPoint Presentation • Groups discussions • Distribute participants' handouts/training materials
6.7.4 Appropriate inputs for sorghum optimal production and their correct doses (1 hour)	Session Guide
Group work (30 minutes) • The trainer guides trainees to list or/and present the required inputs for use in sorghum production. • The trainees get into county groups to provide lists of sorghum inputs and the rates used by farmers. • The groups present their results in the plenary - opening up for some questions, answers and discussions. Plenary presentation (30minutes) The trainer present PowerPoint presentation on the recommended sorghum inputs (seeds, fertilizers, manures, etc.) and their rates, and their time of application for optimal yields of sorghum.	• PowerPoint Presentation • Distribute participants • Groups discussions handouts/training materials
6.7.5 Module review (30 minutes)	Session Guide
<i>(The facilitator leads the trainees in reviewing the module)</i> Summary for the main points from the training: • Objectives and expectations (review done on basis of the earlier listed objectives and expectations). • Randomly (average of 10 cases), trainees indicate new things learned from the module. The results are recorded per county presented. • Randomly (average of 10 cases) trainees pinpoint the way forward issues.	• The last Participants' Handouts/training materials • Summarize the main points of the module on a flip chart and display

6.8. Participants' Handouts

- Sorghum production Guides [2017]
- Sorghum leaflets
- Brochures 2017

References

1. Karanja, D.R., Kisilu, R.K., Kathuli, P., Mutisya, D.L., Njaimwe, A.N., Keya, G., Ouda, J., and Ayemba, J. (2017) Enhancing Sorghum Production and Marketing in Semi-Arid Kenya www.kalro.org/asal-aprp.
2. Esilaba, A.O. *et al.* (2019). KCEsP-CRAL Sorghum Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya.

MODULE 7

INTEGRATED SOIL AND WATER MANAGEMENT PRACTICES FOR SORGHUM PRODUCTION

7.1 Introduction to the module

The performance of the agriculture sector in Kenya has continued to decline over the years due to increased soil acidity, mining of nutrients not supplied in the applied fertilizers, lowering of the soil organic matter content caused by non-use organic resources. Macronutrients [nitrogen (N), phosphorus (P), potassium (K)) and Sulphur (S)] and micronutrients [zinc (Zn), Molybdenum (Mo) and Boron (B)] have been identified as deficient in Kenyan soils. Additionally, climate change has accelerated the decline of the agricultural sector performance through limited and unpredictable water supply to crop production systems. Integrated Soil Fertility Management (ISFM), which includes conservation agriculture, offers the best options for improving soil fertility while allowing for climate change adaptation.

Sorghum is mostly cultivated by smallholder farmers with minimal inputs. Drought management technologies to mitigate drought effects in the sorghum production are available. However, farmers have not realized the full benefits due to limited integration of the developed integrated natural resource management (INRM) and sustainable intensification practices in their sorghum production systems.

This module introduces service providers, lead farmers and facilitators to the importance of integrated soil and water management practices for enhanced sorghum production

7.2 Module learning outcomes

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

1. Knowledge on soil composition, the 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 by the participants.
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 by the participants.
7. Awareness on the occurrence of problematic soils and their management increased and understood by the participants.

7.3 Module Target Group and Categories

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

7.4 Module Users

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

7.5 Module Duration

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

7.6 Module Summary

Module 7: Integrated soil and water management practices for sorghum production			
Sessions	Training methods	Training materials	Duration
7.6.1 Introduction, objectives and expectations	• Personal introductions • Presentations • Plenary discussions	• Flip charts • Projector • Laptops	30 minutes
7.6.2 Soil composition, properties and health,	• Presentations • Practical's on how to conduct soil sampling and analysis	• Flip charts • Projector • Laptops • Participants' handouts	30 minutes
7.6.3 Soil and plant tissue sampling and analysis	• Presentations • Field demonstrations (Conduct soil and plant tissue sampling and analysis)	• Flip charts • Projector • Laptops • Participants' handouts	1 hour
7.6.4. Soil fertility and plant nutrition	• Presentations • Field demonstrations	• Flip charts • Projector • Laptops • Participants' handouts	30 minutes
7.6.5 Soil health and (ISFM) for climate resilient cropping systems	• Presentations • Field demonstrations	• Flip charts • Projector • Laptops • Participants' handouts	30 minutes

7.6.6 Soil and water management and water harvesting technologies	• Presentations • Field demonstrations	• Flip charts • Projector • Laptops • Participants' handouts	30 minutes
7.6.7 Soil degradation and reclamation	• Presentations • Field demonstrations	• Flip charts • Projector • Laptops • Participants' handouts	30 minutes
7.6.8 Problematic soils and their management	• Presentations • Field demonstrations	• Flip charts • Projector • Laptops • Participants' handouts	30 minutes
7.6.9 Module review and discussion	• Discussions	• Flip charts	30minutes
Total			5 hours

7.7 Trainers Guidelines

Module 7: Integrated soil and water management practices for sorghum production	
7.7.1 Introduction, Objectives and Expectations (30 minutes)	Session Guide
<i>(The trainer welcomes trainees to the module then invites them introduce themselves and state their expectations)</i> Module Objectives (30 minutes) <i>(The facilitator presents modules objectives)</i> By the end of the module 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" on cards or flipchart and display. • PowerPoint presentation • Distribute participants' handouts on Module • Objectives and Training Program

7.7.2 Soil composition, properties and health (30 minutes)	Session Guide
<i>(The trainers presents on soil composition, properties and health).</i> 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 • Brochures, leaflets and manual
7.7.3 Soil and plant tissue sampling and analysis (1 hours)	Session Guide
Plenary Presentation (30 minutes) • Overview of the soil sampling methods. • Soil analysis results and interpretation. • Overview of soil analysis results using available examples. • Soil sampling guidelines. Practical exercise on soil sampling (30 minutes) Demonstration on soil sampling method.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manuals • Practical Demonstration
7.7.4 Soil fertility and plant nutrition (30 minutes)	Session Guide
Plenary Presentation (20 minutes) • Potential role of different soil managements. techniques in addressing soil fertility challenges in sorghum 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 • Brochures, leaflets and manual

7.7.5 Soil health and (ISFM) for climate resilient cropping systems (30 minutes)	Session Guide
Plenary Presentation (20 Minutes) • Soil health. • Introduce integrated soil fertility management (ISFM). • Soil health and ISFM for a climate resilient cropping system. • Manure management, mulching, organic amendments and composting for increased use of organic manure for improving agricultural production. • Conservation agriculture as a climate smart agriculture practice. • Cereal legume intercrops and crop rotation as climate resilient cropping systems. Discussion (10 Minutes) Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
7.7.6 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 • Brochures, leaflets and manual
7.7.7 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.	• Session Guide • PowerPoint presentation • Distribute participants handouts • Brochures, leaflets and manual

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

7.8 Participants' Handouts

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

MODULE 8

CROP PROTECTION AND HEALTH MANAGEMENT FOR SORGHUM

8.1 Introduction to the Module

Various pests and diseases constrain sorghum production. Bird damage is a major sorghum constraint, and it is the reason why farmers shy away from sorghum cultivation. It can lead to over 60% yield loss even with human scares and 100% without scaring. Up to new pests, such as fall armyworm and locusts, are causing new challenge to sorghum. Options for control will cushion farmer production endeavours in the marginalized areas. Both cultural and chemical management are readily available and practical to farmers. Similarly, weeds constrain sorghum production, hence the need to provide necessary control options.

On bird damage control, sorghum grain harvesting at early grain hardening dough stage followed by drying is a new technology recommended for white sorghum varieties. However, harvesting should be done when the grain is physiologically mature. This technology is not widely known by many agricultural extension personnel and farmers. This module is intended to train the extension service on limiting sorghum bird damage to enable them acquire the knowledge and assist sorghum farmers to practise and reduce yield loss from bird damage.

8.2 Module Learning Outcomes

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

- Steps to identification of major pests and diseases described and explained.
- Integrated pest and disease management, including bird damage control in sorghum identified and explained.
- Skills and knowledge on safe use of pesticides acquired.

8.3 Module Target Group

This module targets agricultural extension service providers, private extension service providers and lead farmer.

8.4 Module Users

The module can be used by Master Trainers and ToTs.

8.5 Module Duration

The Module is estimated to take 5 hours.

8.6 Module Summary

Module 8: Crop Health			
Sessions	Training methods	Training materials	Time
8.6.1 Introduction, objectives and expectations	• Personal introductions • Group work • Presentations • Plenary discussions	• Flips charts • Projector • Laptop	30 minutes
8.6.2 Major sorghum pests that cause economic losses and their control methods; emerging/migratory (fall armyworm, locusts, birds) pests. Major weeds in sorghum	• Group work • Presentations • Plenary discussions • Practical's • Group work to bring out major weeds	• Flips charts • Projector • Laptop • Participants' handouts • Handouts	1 hour
8.6.3 Sustainable Integrated sorghum pests management practices; scouting, post-harvest pests and threshold determination	• Presentations • Plenary discussions • Nearby field visit • Presentation	• Flip charts • Projector • Laptops • Participants/ handouts	30 minutes
8.6.4 Major sorghum diseases that cause economic losses, conditions that favour their development and control methods	• Group work • Presentations • Plenary discussions • Practicals	• Flip charts • Projector • Laptop • Participants' handouts	1 hours
8.6.5 Sustainable Integrated sorghum diseases management ; scouting and threshold determination	• Presentations • Plenary discussions • Field demonstration	• Flip charts • Projector • Laptop • Participants' handouts	1 hour
8.6.6 Safe use of pesticides and update source for registered pesticides	• Presentations • Practical • Plenary discussions	• Projector • Laptop • Flip charts • Participants' handouts	30 minutes
8.6.7 Module Review	• Discussions/ Recap of module • Take away messages	• Flip charts • Sharing of presentations	30 minutes
Total			5 hours

8.7 Trainers Guidelines

Module 8: Sorghum crop health	
8.7.1 Introduction and levelling of expectations and objectives	Session Guide
Introduction (15 minutes) <i>(The trainer welcomes trainees to the module on sorghum crop health. They are then invited to introduce themselves and state their expectations through group work).</i> Module Objectives (15 minutes) <i>(The trainer presents modules objectives)</i> By the end of the module the trainee should be able to: • Identify major sorghum pests that cause economic losses. • Explain and describe sustainable Integrated. sorghum pests management (IPM) practices and scouting for threshold determination. • Identify the symptoms for specific diseases common in sorghum producing areas. • Attain skills in Integrated Disease Management (IDM) of sorghum. • Acquire knowledge on safe use of pesticides.	• Summarize trainees’ “Expectations” on cards or flipchart and display • PowerPoint presentation • Distribute participants’ handouts on Module Objectives and Training Program
8.7.2 Major sorghum pests that cause economic losses and their control methods; emerging/migratory pests (1 hour)	Session Guide
<i>(The trainer presents on the commonly known sorghum pests that are of economic importance).</i> Group work (15 minutes) • Trainees avail sorghum pest information from their counties. Plenary Presentation (20 minutes) • Pest names and descriptions. • Symptoms of their infestation/type of damage. • Data on losses caused by the pests. Practical session (15 minutes) • Identification of sorghum pests from provided specimens. • Photographs of major weeds. Discussion (10 minutes) • Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint presentation • Group Work • Practical Session • Distribute participants’ handouts • Brochures, leaflets and manual • Printed photos of various pests, brochures

8.7.3 Sustainable Integrated sorghum pests management practices; scouting, post-harvest pests and threshold determination (30 minutes)	Session Guide
Plenary Presentation (20 minutes) • IPM principles; how to implement the components, including cultural, physical, biological and chemical control. • Critical areas to consider include when scouting. • Threshold determination and detection of weevils at harvest (post-harvest) and when to implement control measures. • Overview of post-harvest pests on cereals (weevils). Discussion (10 minutes) • Let the trainees recall what they learned and seek clarification on the principles of sustainable IPM options.	• PowerPoint presentation by group representatives on information on scouting for pests • Distribute participants' handouts (brochures, • Leaflets and manuals on pest specimens on sorghum
8.7.4 Major sorghum diseases that cause economic losses, conditions that favour their development and their control methods (1 hour)	Session Guide
Group work (15 minutes) • Determine sorghum diseases in specific counties. Plenary Presentation (15 Minutes) • Presentations on sorghum diseases and conditions that favour their development. Practical Exercise (30 Minutes) • Identification of major disease species causing economic damage based on samples presented.	• PowerPoint presentation by representative group leaders • Distribute participants' handouts (brochures, leaflets or printed photos of the major diseases • Disease identification guidelines • Printed photos of the major diseases • Practical Exercise
8.7.5 Sustainable Integrated Diseases Management (IDM) ; scouting and threshold determination (1 hour)	Session Guide
Plenary Presentation (30 minutes) • Critical areas to consider including scouting and when to implement sorghum disease control measures. • Presentation on Integrated Disease Management (IDM) in sorghums. • Overview of Aflatoxins in cereals and the effect of damage from cereal pests (weevils). Field Visit (30 minutes) • Visit nearby field to collect and identify diseased samples.	• PowerPoint presentation by facilitator and representative group leaders on information on scouting for diseases • Distribute participants' Handouts (brochures, leaflets and manuals) • Disease management guidelines

8.7.6 Safe use of pesticides and update source for registered pesticides (30 minutes)	Session Guide
Practical (10 minutes) - Ways used by farmers in mixing of pesticides/ ITK products; and their consideration on safe use of pesticides. Plenary presentation (20 minutes) - Presentation on safe use of pesticides. - Let the trainees ask questions on any of the covered topical issues and critical areas to share with farmers on safe use of pesticides.	- PowerPoint presentation by facilitator and representative group leaders - Demonstration of proper use of knap sack sprayer, protective gear and calibration of pesticides, sourcing for registered pesticide information online: on PCPB website - Distribute participants handouts (brochures, leaflets and manuals) - Disease management guidelines
8.7.7 Module review (30 minutes)	Session Guide
<i>(The facilitator leads the trainees in reviewing the module)</i> Summarize the main points of the training. Together with the trainees review the main points about climatic conditions suitable for sorghum production. - Sorghum major pests and their economic losses. - Sorghum Integrated Pest Management (IPM). - Sorghum major diseases and their economic losses. - Sorghum Integrated Disease Management (IDM.) <i>(Discuss with trainees about new things learnt from this Module. What are some of the issues that need clarification).</i>	- The last Participants' Handouts - Summarize the main points from the module on a flip chart and display

8.8. Participants' handouts

1. Pest identification and control factsheet.
2. Disease identification and control factsheet.
3. KCEP Sorghum Extension Manual.
4. Pamphlets on Bird damage control.

References

1. PCBP (2018) Pest Control product registered for use in Kenya:http://cacafrica.com/Public/Home/xiazai/PCPB%20List%20of%20Registered%20Products%20Version%201_2019.pdf

MODULE 9

SORGHUM HARVESTING AND POST-HARVEST MANAGEMENT

9.1. Introduction to the Module

The traditional way of sorghum harvesting and threshing involves manual cutting of the panicles, drying them on the ground and threshing, involving beating the dried sorghum panicles with sticks. Manual threshing is labour intensive and contaminates grain lowering its quality. High postharvest grain losses are attributed to improper handling, biological spoilage, insects, birds and rodents. Deterioration results from increased moisture levels brought about by improper storage. In order to reduce post-harvest losses facilitators should be equipped with management strategies for controlling postharvest losses to enable them advice farmers adequately to securing high returns from sorghum grain productivity through improved on-farm grain handling to minimize post-harvest losses.

9.2 Module Learning Outcomes

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

- Stage wise harvesting and post-harvest practices for quality sorghum grain described and explained.
- Use of sorghum thresher for adoption to reduce labour demonstrated.

9.3 Module Target Group

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

9.4 Module Users

This module can be used by master Trainers to train ToTs. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts.

9.5 Module Duration

The Module is estimated to take 3 hours

9.6 Module Summary

Module 9 Sorghum harvesting and post-harvest management			
Sessions	Training Methods	Training Materials	Time
9.6. 1 Introduction, Expectations Objectives	• Personal introduction • Discussion on expectations • Plenary presentation	• Flip charts • Projector • Laptop	30 minutes
9.6.2 Sorghum harvesting and drying to maintain quality	• Plenary presentations • Group Exercise	• Projector • Laptop • Participants' handouts • Sorghum manual	30 minutes

9.6.3 Sorghum threshing. Use of sorghum thresher	• Plenary presentation • On-farm practical demonstration	• Projector • Laptop • Thresher	30 minutes
9.6.4 Sorghum grain storage techniques	• Plenary presentation • On-farm practical demonstration	• Projector • Laptop • Hermetic bags • Storage chemicals	1 hour
5. Module review	• Facilitator's summary • Group Exercise	• Module review • The module's handouts	30 minutes
TOTAL			3 hours

9.7 Trainers guidelines

Module 9 Sorghum harvesting and post-harvest management	
9.7.1 Introduction and levelling of expectations and objectives (30 minutes)	Session Guide
Introduction and Module Objectives (15 minutes) <i>(The trainer welcomes trainees to the module on sorghum harvesting post-harvest management and introduces him/herself by stating his/her profile and experience).</i> The facilitator presents module objectives By the end of the module trainees should be able to: • Explain the whole range of harvesting and post-harvest practices for quality sorghum grain. • Introduce and demonstrate the use of sorghum thresher for adoption to reduce labour. Expectations (15 minutes) Assist the trainees to state their expectations based on the objectives.	• Participant Handouts • Program • PowerPoint Presentation • Summarize trainees' "Expectations" and display on flip chart/board.
9.7.2 Sorghum harvesting and drying to maintain quality(30 minutes)	Session Guide
<i>(Discuss sorghum grain quality requirements)</i> Plenary presentation (20 minutes) • Summarize the quality standards for sorghum in Kenya. • Describe the harvesting and drying of sorghum. Group Exercises (10 minutes) Let the trainees recall what they learned, raise issues on harvesting and discuss.	• PowerPoint presentation • Participant Handouts • Sorghum manual • Brochures • Leaflets

9.7.3 Proper Sorghum threshing, cleaning and drying (30 minutes)	Session Guide
<i>(Trainer uses slides to train).</i> Plenary presentation (20 minutes) The processes of threshing sorghum, cleaning and drying. Group Exercises (10 minutes) Let the trainees recall what they learned, raise issues on harvesting and discuss.	• Power point Presentation • Participant Handouts • Sorghum manual • Brochure and Leaflets
9.7.4 Sorghum grain storage techniques (1 hours	Session Guide
Plenary presentation (30 minutes) Make a presentation of the storage methods used to store sorghum. On-farm practical demonstration (30 minutes) Demonstrate to trainees: • The salt method and moisture meter testing of sorghum grain moisture content. • How the grain is stored in Hermetic bags. Discuss any issues on sorghum storage.	• Power point presentation • Participant Handouts • Sorghum manual • Brochures • Leaflets Requirements: • Sorghum grain • Dry salt • Transparent bottle • Moisture meter • Hermetic bags
9.7.5 Training review (30 minutes)	Session Guide
<i>(The trainer should lead the trainees in reviewing the module).</i> Plenary presentation Together with the trainees, summarize the main points of the training. Group Exercise The trainees review the main points about Sorghum harvesting and post harvesting. • What new things did you learn from this module? • What are some of the problems and issues that you have become more aware of in harvesting and post harvesting? • What questions do you still have about harvesting and post harvesting?	Summary of the main points from the Module.

9.8. Participant's Handouts

- Sorghum production Guides [2017].
- Sorghum leaflets.
- Brochures 2017.

References

1. Karanja, D.R., Kisilu, R.K., Kathuli, P., Mutisya, D.L., Njaimwe, A.N., Keya, G., Ouda, J., and Ayemba, J. (2017) Enhancing Sorghum Production and Marketing in Semi-Arid Kenya www.kalro.org/asal-aprp.
2. Esilaba, A.O. *et al.* (2019). KCEP-CRAL Sorghum Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya.

MODULE 10

SORGHUM VALUE ADDITION

10.1 Introduction to the Module

Sorghum utilization at household level is very low due to insufficient knowledge of the various recipes for value addition, products diversification for home consumption and opportunities for small scale businesses. Generally, sorghum traditional recipes are less appealing to youth and children. It is therefore envisaged that promotion of value added products will greatly enhance adoption, production and home consumption. This module is designed for equipping the extension service with sorghum value adding options and skills for training sorghum farmers.

10.2 Module Learning Outcomes

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

- Recipes for sorghum value added products introduced and training provided.
- Value addition opportunities in sorghum value chain identified and prioritized.
- A value addition strategy for the priority opportunities emphasizing on suitability and growth demonstrated.

10.3 Module Target Group

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

10.4 Module Users

The trainer using this module should thoroughly familiarize themselves with the relevant participants' handouts. This module can be used by Master Trainers who are members of the core team trainers.

10.5 Module Duration

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

10.6 Module Summary

Module 10. Sorghum value addition			
Sessions	Training Methods	Training Materials	Time
10.6.1 Introduction, Objectives Expectations	• Introduction Presentation • Plenary Presentation	• Flip charts • PowerPoint presentation	30 minutes
10.6.2 Introduction to recipes for sorghum value added products	• Plenary Presentation • Group Exercise	• PowerPoint presentation • Recipe books, leaflets • Manual	1 hour

10.6.3. making of different sorghum value added products	• Practical demonstration • Group Exercise	• Sorghum flour, whole and dehulled grain and other ingredients	2 hours
10.6.4. Prioritizing opportunities in sorghum value addition	• Group exercise • Plenary Presentations	• List of value added products • Checklist for prioritization • Pair wise ranking tool • Flip charts	1 hours
10.6.5. Value addition strategy development	• Focused group discussion • Plenary presentation	• Flip charts • Participants' handouts (sample charts)	1 hours 30 minutes
6. Module review	• Facilitator's summary • Group Exercises	• Module review • Participants handout	30 minutes
TOTAL			6 hours 30 minutes

10.7 Trainers Guidelines

Module 10: Sorghum value addition	
10.7.1 Introduction and levelling of expectations and objectives (30 minutes)	Session Guide
Introduction and Module Objectives (15 minutes) <i>(The trainer welcomes trainees to the module on value addition opportunities in sorghum and introduces him/herself by stating his/her profile and experience).</i> The trainer presents modules objectives. Module Objectives By the end of the module the trainee should be able to: • Introduce and training on recipes for sorghum value added products. • Identify and prioritize value addition opportunities in sorghum value chain. • Demonstrate how to develop a value addition strategy for the priority opportunities. • Expectations (15 minutes) Assist the trainees to state their expectations based on the objections	Handouts • Program • Note books • pens Use PowerPoint Summarize trainees' "Expectations" and display on flip chart/ board.

10.7.2 Introduction to recipes for sorghum value added products (1 hour)	Session Guide
<i>(Present slides on sorghum recipes for the various products).</i> Plenary Presentation (30 minutes) Sorghum nutritive value and Recipes Make a PowerPoint presentation on nutritive value of sorghum ugali, porridge, milk drink (Beverage), pilau, doughnuts, cupcakes biscuits, cake and chapatti. Group Exercises (30 minutes) Discuss each sorghum recipe you learnt.	• PowerPoint presentation • Participant Handouts • Sorghum manual • Recipe books
10.7.3 Making of different sorghum value added products (2 hours)	Session Guide
Practical demonstration (2 hours) <i>(Trainer guides the trainees to making the various products using the recipes introduced.)</i> • Divide the trainees into groups. Provide necessary equipment. • Let each group choose one recipes to cook. • Put all the trainees together and analyse the products made.	Participant Handouts • Sorghum manual • Recipe books Requirements • Ingredients • Utensils • Cooking facilities The facilitator may require a home economist to backstop
10.7.4 Prioritizing opportunities in sorghum value addition (1 hours)	Session Guide
Group exercise (30 minutes) <i>(Trainer guides the trainees to prioritize the sorghum value added products).</i> • Divide the trainees into groups. • Provide flipcharts, manila papers and felt pens to each group. • Let each group list the products developed in sessions 3 above. • Assist the groups to prioritise 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 sorghum value added products ranking and discuss them.	Participant Handouts • Sorghum manual • Brochures • Leaflets The Requirements · Checklist for prioritization · Pair wise ranking tool

10.7.5 Value addition strategy development (1 hour 30 minutes) Session Guide	
Focused group discussion (1 hour) <i>(Trainer guides the trainees to develop the strategies for the value added products).</i> • Divide the trainees into groups. Provide flip charts, 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.	Participant Handouts • Flip charts • Participants, handouts • sample charts
10.7.6 Training review (30 minutes) Session Guide	
<i>(The trainer should be able to lead the trainees in reviewing the module).</i> Group Exercise (30 minutes) Review the main points about Sorghum Value addition 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 in sorghum value addition? • What questions do you still have about sorghum value addition?	Summary of the main points from the Module.

10.8 Participants' handouts and Training Reference Materials

10.8 Participants' Handouts

- KCEP Sorghum Manual 2019.
- Pamphlets, leaflets.
- Recipe books.

References

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

MODULE 11

MECHANIZATION OF SORGHUM PRODUCTION ACTIVITIES

11.1 Introduction to the module

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

11.2 Module Learning outcomes

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

- Climate smart tillage options identified and explained.
- Calibration of fertilizer and seed rates for planters described and explained.
- Use of pest control implements and tools demonstrated.
- Harvest timing and yield estimation demonstrated.
- Estimation of harvesting losses demonstrated.
- Machine and procedure for sorghum grading demonstrated.

11.3 Module Target Group and Categories

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

11.4 Module Users

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

11.5 Module Duration

The Module is estimated to take 4 hours

11. 6 Module Summary

Module 11: Mechanization of sorghum production activities			
Sessions	Training methods	Training materials	Duration
11.6.1 Introduction, objectives and expectations	• Personal introductions/know your audience • Presentations • Plenary discussions	• Flip charts • Power Point Presentations	30 minutes

11.6.2 Climate smart tillage options	• Presentations • Plenary discussions	• Flip chart • Laptop • Projector • Participants' handouts	30 minutes
11.6.3 Calibration of fertilizer and seed rates for planters	• Presentations • Plenary discussions	• Flip chart • Laptop • Projector • Participants' handouts • Practical	30 minutes
11.6.4 Pest and Weed control equipment and tools usage	• Presentations • Plenary discussions	• Flip chart • Laptop • Projector • Participants' handouts • Practical	30 minutes
11.6.5 Harvest timing, yield estimation machines and tools , Estimation of harvesting losses	• Presentations • Plenary discussions	• Flip chart • Laptop • Projector • Participants' handouts • Practical	1 hour
11.6.6 Machine and procedure for sorghum grading	• Presentations • Plenary discussions • Demonstrations	• Flip chart • Laptop • Projector • Participants. handouts • Practical	30 minutes
11.6.7 Module review	• Presentations	• Laptop • Projector	30 minutes
Total			4 hours

11.7 Trainers Guidelines

Module 11: Mechanization of sorghum production activities

11.7.1 Introduction, Objectives and Expectations (30 minutes)

Session Guide

(The trainer welcomes trainees to the module . They are then invited to introduce themselves and state their expectations).

Module Objectives (30 minutes)

The facilitator presents modules objectives

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

- Identify and explain various climate smart tillage operations.
- Describe and explain calibration of fertilizer and seed rate for planters.
- Demonstrate weed control equipment and tools, usage.
- Demonstration of estimation of pre-harvest and harvesting losses.
- Demonstrate machine and procedure for grain grading.

- Summarize trainees' "Expectations" and display.
- PowerPoint Presentation
- Distribute Participants' Handouts on Module Objectives and Training Program

11.7.2 Sorghum climate smart land preparation tools (30 minutes)

Session Guide

(The trainer presents on climate smart land preparation tools).

Plenary Presentation (20 minutes)

PowerPoint Presentation Highlighting:

- Overview of the sorghum mechanization activities.
- Climate smart tillage options.

Discussion (10 minutes)

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

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

11.7.3 Sorghum calibration of fertilizer and seed rate for planters (30 minutes)

Session Guide

Plenary Presentation(20 minutes)

PowerPoint Presentation Highlighting on:

- Techniques and methods of planter seed and fertilizer rate determination

Discussion (10 Minutes)

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

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

11.7.4 Sorghum Chemical implements and tools operations (30 minutes)	Session Guide
Plenary Presentation (20 minutes) PowerPoint Presentation Highlighting on: • Techniques and methods of using sorghum pest control equipment; knap sack and pheromones. Discussion (10 Minutes) Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
11.7.5 Sorghum harvesting machine operating principles (1 hour)	Session Guide
Plenary Presentation(30 minutes) PowerPoint Presentation Highlighting on: • Harvesting machines. • Harvest timing and estimation of machine harvest yield losses. Discussion (30 Minutes) Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
11.7.6 Machine and procedure for Sorghum grading (30 minutes)	Session Guide
Plenary Presentation (15 minutes) PowerPoint presentation highlighting: • Overview of sorghum grading machine procedure. Practical exercise (15 minutes) Demonstrations on management options.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual

11.7.7 Module review (30 minutes)

Session Guide

The trainer leads the trainees in reviewing the module).

Summarize the main points of the training and together with the trainees:

- Various climate smart tillage operations.
- Calibration of fertilizer and seed rate for planters.
- Chemical implements and tools operations.
- Optimal crop sorghum harvesting stage and yield estimation.
- Harvesting machine operating principles.
- Machine and procedure for sorghum grain grading.
-

(Discuss with trainees about 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

11.8. Participants' Handouts

- KCEP Sorghum Manual
- Pamphlets, leaflets.

MODULE 12

SORGHUM BUSINESS AND MARKETING

12.1 Introduction

This module is designed for training Trainer of Trainers in skills that are useful in marketing of sorghum. Sorghum cultivation has not been profitable but with the use of sorghum in malting and brewing, the East African Breweries Ltd (EABL) has made sorghum production a worthy agribusiness venture. Contracted farmers grow sorghum for EABL to buy at reasonable prices immediately at harvest. This arrangement requires an organized production and marketing system for the benefit of the small scale farmers. In the newly introduced sorghum commercialization counties (in eastern and western Kenya, where EABL is contracting small scale farmers, marketing strategies are not yet in place. The farmers therefore are not well organized into collective production and marketing models to participate in controlling sorghum markets and protecting their interests. It is therefore important to equip farmer facilitators with the skills and knowledge of the Community Production and Marketing System (COPMAS) or aggregation of sorghum model to enable them train farmers with proper marketing strategies.

12.2 Module Learning Outcomes

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

- Importance of proper marketing strategies explained.
- Market opportunities in sorghum value chain identified and prioritized.
- Formation of sorghum community production and marketing/ aggregation models introduced and discussed.
- Training on market contracting and formation of memorandum of understanding in marketing of sorghum grain delivered.

12.3 Module Target Group

This module targets agricultural extension service providers and private extension service providers.

12.4 Module Users

This module is intended for used by Master Trainers who are members of the core team trainers. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts.

12.5 Module Duration

The Module is estimated to take 4 hours

12.6. Module Summary

Module 12. Sorghum Business and Marketing			
Sessions	Training Methods	Training Materials	Time
12.6.1 Introduction, Objectives Expectations	• Personal introduction • Presentation • Plenary presentations	• Flip charts • PowerPoint	1 hour

12.6.2 Introduction to marketing channels and strategies	• Plenary presentations • Group Exercise	• PowerPoint	30 minutes
12.6.3 Identification and prioritization of market opportunities in sorghum value chain	• Group Exercise and • Plenary presentations • Discussion	• Power point • Flip charts, pelt pens	1 hour
12.6.4 Sorghum Community production, aggregation and marketing models (COPMAS)	• Plenary presentations • Group Exercise	• PowerPoint	1 hour
12.6.5 Training review	• Facilitator's summary • Group Exercise	• Module review • Participants Handouts	30 minutes

TOTAL	4 hours
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12.7 Trainers Guidelines

Module 12 Sorghum Business and Marketing

12.7.1 Introduction and levelling of expectations and objectives (1 hour) Session Guide

Introduction and Module Objectives

(The trainer welcomes trainees to the module on sorghum business and marketing and introduces him/herself by stating his/her profile and experience).

Handouts

- Program
- Note books
- pens

The trainer invites the trainees to introduce themselves and state their expectations.

PowerPoint presentation

Expectations (30 minutes)

Ask the trainees to state their expectations by listing on a flip chart. The facilitator presents modules objectives and levels of expectations.

Summarize trainees' "Expectations" and display on flip chart/board.

Objectives (30 minutes)

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

- Explain the importance of proper marketing strategies.
- Identify and prioritize market opportunities in sorghum value chain.
- Introduce and discuss the formation of sorghum community production and marketing/ aggregation models.
- Train on market contracting and formation of memorandum of understanding in marketing of sorghum grain.

12.7.2 Introduction to marketing channels and strategies (30 minutes)	Session Guide
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(Discuss sorghum markets channels with the trainees).

PowerPoint presentation

Plenary Presentation (20 minutes)

Make presentation on the sorghum market networks in Kenya.

Participant Handouts

Group Exercise (10 minutes)

Discuss each sorghum market and let trainees raise issues on markets.

- Sorghum manual
- Brochures
- Leaflets

12.7.3 Identification and prioritization of market opportunities in sorghum value chain (1hour)	Session Guide
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Group exercise and presentations (40 minutes)

(Trainer guides the trainees to identify market opportunities and rank them).

Handouts

- Divide the trainees into groups. Provide flipcharts, manila papers and pelt pens to each group.
- Let each group brainstorm and list the sorghum market opportunities.
- Assist the groups to prioritize the listed markets by pairwise ranking and present.
- Summarize the group work to come up with the most ranked market opportunities.

- Sorghum manual
- Brochures
- Leaflets

Requirements:

- Flip charts, manila papers, pelt pens

Group Exercise (20 minutes)

GO through the market opportunities, let trainees raise issues and discuss them.

12.7.4 Sorghum Community production, and marketing system model (COPMAS) (1 hour)	Session Guide
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Plenary Presentation

Introduce community production and marketing system (COPMAS) to the trainees (40 minutes).

Use power point

Group Exercise (20 minutes)

Allow trainees to raise any issues on sorghum marketing and discuss them.

Participant Handouts

- Sorghum manual
- Brochures
- Leaflets

12.7.5 Training review (30 minutes)

Session Guide

(The trainer lead the trainees in reviewing the module. Conclude by thanking the trainees.)

Summary of the main points from the Module.

Plenary Presentation (15 minutes)

Summarize the main points of the training

Group Exercise (15 minutes)

Review the main points about sorghum marketing channels 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 in sorghum marketing?
- What questions do you still have about marketing of sorghum?

12.8 Participant's Handouts

- Sorghum production Guides [2017]
- Sorghum leaflets
- Brochures 2017

References

1. Karanja, D.R., Kisilu, R.K., Kathuli, P., Mutisya, D.L., Njaimwe, A.N., Keya, G., Ouda, J., and Ayemba, J. (2017) Enhancing Sorghum Production and Marketing in Semi-Arid Kenya www.kalro.org/asal-aprp.
2. Esilaba, A.O. *et al.* (2019). KCEP-CRAL Sorghum Extension Manual. Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya.

MODULE 13

SORGHUM CROSS-CUTTING ISSUES

SUB-MODULE 13.1: AGRICULTURAL INNOVATION PLATFORMS

13.1.1 Introduction to the Sub-Module

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

13.1.2 Sub-module learning Outcomes

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

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

13.1.3 Sub -module Target Group and Categories

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

13.1.4 Sub -module Users

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

13.1.5 Sub-module Duration

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

13.1.6 Sub-module Summary

Sub-Module 13.1 Agricultural Innovation Platforms (AIP)			
Sessions	Training methods	Training materials	Time
13.1.6.1 Introduction, objectives and expectations	• Personal introductions • Presentations • Plenary discussions	• Flips charts • PowerPoint presentation • Projector	30 minutes
13.1.6.2 An overview of attributes of an Agricultural Innovation Platform (The characteristics of an innovation platform)	• Power point Presentations • Plenary discussions	• Flip charts • PowerPoint presentation • Projector • Participants Handouts	1 hour
13.1.6. 3 Pre-formation stages –stakeholder mobilization and sensitization. -AIP Phases (Initiation, Establishment, Management and Sustenance)	• Power point presentations • Plenary discussions • Role plays	• Flips charts • PowerPoint presentation • Projector • Handouts • Roles	1 hour
13.1.6. 4 Module review	• Discussions	• Flip Charts	30 minutes
Total			3 hours

13.1.7 Trainers Guidelines

Sub Module 13.1 Agricultural Innovation Platform (AIP)	
13.1.7.1 Introduction, levelling of expectations and objectives (30 Minutes)	Session Guide
Introduction <i>The trainer welcomes trainees to the module. They are then invited to introduce themselves and state their expectations).</i> Module Objectives <i>(The trainer presents modules objectives and levels out expectations).</i> By the end of the module training the trainee should be able to: • Explain characteristics of an innovation platform. • Mobilize and sensitize stakeholders. • Describe how to initiate and establish Agricultural Innovation Platforms. • Explain how to manage and sustain innovation capacity of actors in Agricultural Innovation Platforms.	• Summarize Trainees’ “Expectations” and display. • PowerPoint Presentation • Module Objectives and Training Program

13.1.7.2 The characteristics of an innovation platform (1hour)	Session Guide
<i>(The trainer should present an overview of innovation platforms and their main characteristics).</i> Plenary Presentation (30 minutes) • 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 (30 minutes) Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Notes Handouts, • Brochures, information leaflets and manuals
13.1.7.3 Preformation and formation phases of the Sorghum AIP (1 hour)	Session Guide
Plenary Presentation (50 Minutes) Initiation or preformation phase • Engagement or mobilization of stakeholders in the sorghum value chain. • Visioning process and rules of engagement mediated by an initiator such as an change agent. Establishment • Assessment of the status of the value chain to clearly identify the compelling agenda or bottleneck - APVC analysis to identify weaknesses in the chains. • Laying out of proper plans to define roles, establish task-based committees, expected milestones and resourcing strategies. Management • Keeping stakeholders focused on the vision and upholding values to ensure an inclusive and transparent process. • Neutral facilitation to ensure joint strategy building and action and the coordination of support activities. • Managing emerging experts taking up leading roles and issues as champions. Sustainability • Guiding in evolving and identifying fresh issues or challenges • Maintaining capacity acquired to address new issues or challenges in subsequent cycles. Discussion (10 minutes) Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Distribute Participants Handouts • Brochures, Leaflets, Manuals • Short video clips

13.1.7.4 Module review (30 minutes)	Session Guide
<i>(The trainer leads the trainees in reviewing the module).</i> 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 Sorghum AIPs. <i>(Discuss with trainees' new things learnt from this Module. What are some of the problems and issues that they have become more aware of in the module?).</i>	• The last Participants' Handouts • Summarize the main points from the module on a flip chart and display

13.1.8 Participants' Handouts

References

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

SUB-MODULE 13.2: SORGHUM GENDER, VULNERABLE AND MARGINALIZED GROUPS (VMGs), SOCIO, ENVIRONMENTAL CONCERNS AND COHESION

13.2.1 Introduction to the Sub-Module

Sorghum is a major agro-enterprise crop therefore all the gender categories (men, women, youth vulnerable marginalized groups (VMGs) are involved in its value chain from production, marketing and consumption. However, women perform most of the crop's production activities such as planting, weeding, harvesting and threshing while men mostly perform the task of marketing. Despite this huge women's contribution, gender inequalities exist in all areas of the value chains. Some of these gender inequalities include: division of labour, access to and control of resources and decision making within and beyond the household. These inequalities limit women, youth and VMGs access to and benefits from the various Technologies Innovations and Management Practices (TIMPs) at different nodes of the value chain At the macro-level, effective participation of women and youth in groups and market activities is constrained by their low decision making power, lack of voice and lack of access to financial resources. Gender analysis examines the productive and reproductive roles of men and women; access, control and ownership of resources; levels of power relations; differential needs, constraints and opportunities; and impact of these differences (positive/ negative) on lives of men, women, youth and the VMGs.

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

The overall objective of this module is to ensure that gender mainstreaming and social inclusion in Sorghum TIMPs is enhanced by field agricultural practitioners and extension officers as an effort geared towards achieving Climate Smart Agriculture “triple wins” in target counties

13.2.2 Sub-module learning outcomes

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

1. The concept of gender main streaming and social inclusion in sorghum value chain understood and appreciated.
2. Youth empowerment in sorghum value chain explained and understood.
3. Women empowerment in sorghum value chain explained and understood.
4. Strategies for inclusion of vulnerable and marginalized groups in sorghum value chain understood and applied.
5. Socio-cultural barriers in sorghum value chain explained and understood.
6. Knowledge on Environmental and social management framework (ESMF) tool enhanced.

13.2.3 Sub-module Target Group

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

13.2.4 Sub-module Users

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

13.2.5 Sub-module Duration

The Module is estimated to take 4 hours.

13.2.6 Sum-module Summary

Module 13.2: Gender mainstreaming and social inclusions in the Sorghum value chain			
Sessions	Training methods	Training materials	Duration
13.2.6.1 Introduction, expectations and objectives	• Personal introductions • Presentations • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentation • Laptop • Participants handouts	30 Minutes
13.2.6.2 Gender mainstreaming in Green value chain	• PowerPoint Presentations • Group discussions • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
13.2.6.3 Youth empowerment in Sorghum value chain	• PowerPoint Presentations • Group discussions • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
13.2.6.4 Women empowerment in Sorghum value chain	• PowerPoint Presentations • Group discussions • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
13.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	• PowerPoint Presentations • Group discussions • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes

13.2.6.6 Environmental and Social Management Framework	• PowerPoint Presentations • Group discussions • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
13.2.6.7 Socio economic and environmental impact of Sorghum activities	• PowerPoint presentations • Group discussions • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
13.2.6.8 Module Review	• Plenary discussions	• Flips charts • Felt pens	30 Minutes
Total			4 hours

13.2.7 Trainers Guidelines

Sub Module 13.2 Gender mainstreaming and social inclusion in Sorghum value	
13.2.7.1 Introduction, Objectives and Expectations (30 Minutes)	Session Guide
<i>(The trainer welcomes trainees to the module. They are then invited to introduce themselves and state their expectations).</i> Module Objectives (30 Minutes) <i>(The trainer presents modules objectives).</i> By the end of the module training the trainee must be to:- • Understand gender main streaming and social inclusion, in Sorghum value chain. • Realize youth empowerment in sorghum value chain. • Appreciate women empowerment in sorghum value chain. • Recognize strategies for inclusion of vulnerable and marginalized groups in sorghum value chain • Appreciate socio-cultural barriers in sorghum value chain. • Understand the environmental and social management framework (ESMF) tool.	• Summarize Trainees “Expectations” and display. • PowerPoint Presentation • Flipcharts • Group exercise • Objectives and Training Program

13.2.7.2 Gender main streaming and social inclusion in Sorghum value chain (30 Minutes)	Session Guide
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(The trainer presents on gender main streaming, who does what activity, and social inclusion in Sorghum 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 Sorghum value chain).
- Who owns what? (access and control of resources & benefits.)
- Who makes which decisions?
- Socio-cultural limitations related to Sorghum value chain.
- Existing policies in support of gender main streaming.

- PowerPoint Presentation, Group exercise
- Plenary discussions
- Distribute Participants Handouts
- Group exercise
- Plenary discussions

Group exercise and discussion (10 Minutes)

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

13.2.7.3 youth empowerment in Sorghum value chain s (30 minutes)	Session Guide
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Plenary Presentation (20 minutes)

- Why agriculture is not attractive to youth.
- Youth's role in the value chain.
- Strategies to empower youth in Sorghum value chain.

- PowerPoint Presentation
- Group exercise
- Plenary discussion

Group work and Discussion (10 Minute)

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

13.2.7.4 Women empowerment in Sorghum value chain (30 minutes)	Session Guide
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Plenary Presentation (20 minutes)

- Women's role in the value chain.
- Challenges facing women in the value chain.
- Strategies for empowering women in the value chain.

- PowerPoint Presentation
- Distribute participants' handouts

Plenary discussion (10 minutes)

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

- Group exercise
- Plenary discussion

13.2.7.5 Strategies for inclusion of vulnerable and marginalized groups in Sorghum value chain (30 minutes)

Session Guide

Plenary Presentation (20 hour)

- Who are vulnerable and marginalized groups (VMGs)
- Why gender inequality exists
- Social inclusion and why
- Strategies of inclusion of VMG.

- PowerPoint Presentation
- Group exercise
- Plenary discussion

Plenary Discussion (10 minutes)

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

13.2.7.6 Environmental and social management framework (ESMF) (30 minutes)

Session Guide

Plenary Presentation (20 minutes)

- Objective of ESMF in sorghum value chain.
- Impacts and action plans for safeguards.
- Environmental and socioeconomic impacts of sorghum value chain activities.

- PowerPoint Presentation
- Plenary discussion

Plenary discussion (10 minutes)

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

13.2.7.7 Module review (30 Minutes)

Session Guide

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

Summarize the main points of the training and together with the trainees:

- What is gender mainstreaming and why it is important?
- Youth empowerment in Sorghum value chain.
- Women empowerment in Sorghum value chain.
- Strategies for inclusion of vulnerable and marginalized groups in Sorghum value chain.
- Socio-cultural barriers in the value chain.
- Environmental and socioeconomic impacts of Sorghum activities.

- Summary of the main points on from the module on a flip chart and display

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

13.2.8 Participants' Handouts

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

SUB-MODULE 13.3 “CLIMATE-SMART AGRICULTURAL POLICY OPTIONS

13.3.1 Introduction to the sub-module

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

This module introduces the national and county governments, service providers, lead farmers, facilitators and relevant stakeholders in the design and implementation of effective climate-smart-sensitive agricultural policy options to promote the transition to climate-smart agriculture at the smallholder level. The policy context of this module is structured around six topics.

13.3.2 Sub-module Learning Outcomes

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

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

13.3.3 Sub-module Target Group

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

13.3.4 Sub-module Users

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

13.3.5 Sub-module Duration

The module is estimated to **5 hours**.

13.3.6 Sub-module Summary

Module 13.3: Climate-Smart Agricultural Policy Options			
Sessions	Training methods	Training materials	Time
13.3.6.1 Introduction, learning expectations and outcomes	• Personal introductions • Group discussions • Plenary discussions • Presentations	• Flips charts • Felt pens • PowerPoint Presentations	30 Minutes
13.3.6.2 Agricultural Policy Frameworks in Kenya	• Presentations • Practical exercises • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentations	30 Minutes
13.3.6.3 Climate-smart agriculture practices, policy options and approaches	• Presentations • Practical exercises • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentations • Participants Handouts	1 hour
13.3.6.4 Climate-smart-sensitive policy cycle	• Presentations • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentations • Participants Handouts	20 minutes
13.3.6.5 Implementation of the climate-smart-sensitive policy at the county level	• Presentations • Practical exercise • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentations • Participants Handouts	50 minutes
13.3.6.6 Financing and Investments for Climate-smart Agriculture	• Presentations • Practical exercise • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentations • Participants Handouts	1 hour
13.3.6.7 Technology Policy	• Presentations • Plenary discussions	• Flips charts • Felt pens • PowerPoint Presentations • Participants Handouts	20 minutes
13.3.6.8 Module Review	• Plenary discussion	• Flip charts • Felt pens	30 minutes
Total			5 hours

13.3.7 Trainers Guidelines

Sub-Module 13.3 Climate-Smart Agricultural Policy Options	
13.3.7.1 Introduction, Expectations and Outcomes (30 Minutes)	Session Guide
<i>(The trainer welcomes trainees to the module on Climate-Smart Agricultural Policy Options. They are then invited to introduce themselves and state their expectations).</i> Trainees Expectations <i>(The trainer requests the participants to form groups and list their expectations).</i> Module Objectives <i>(The trainer presents module learning Objectives)</i> By the end of this module the trainees should be able to: • Appreciate the role of agricultural policy frameworks in Kenya. • Appreciate climate-smart agriculture practices, options and approaches. • Recognise the stages in climate-smart-sensitive policy cycle. • Understand the phases in the implementation of the climate-smart-sensitive policy at the county level. • Be able to evaluate and select financing and investments options for Climate-smart Agriculture. • Be able to understand the need of a technology policy.	• Summarize Participants' "Expectations" and display. • PowerPoint Presentation • Distribute Participants Handouts on Module Objectives and Training Program
13.3.7.2 Agricultural Policy Frameworks in Kenya (30 minutes)	
Plenary Presentation (20 minutes) Presentation highlighting: • The role of agricultural policy frameworks in Kenya Practical Exercise (10 minutes) <i>(The facilitator requests the trainees to form groups and identify the gaps between agricultural policy frameworks and the existing agricultural policies).</i>	• PowerPoint presentation • Distribute participants' handouts • Group Exercise
13.3.7.3 Climate-smart agriculture practices, policy options and approaches (1 hour)	Session guide
Plenary Presentation (30 minutes) • Considerations for climate-smart production systems. • Existing systems, practices and methods suitable for climate-smart agriculture. • Institutional and policy options. • Ensuring farmer organizations for market access. • Gendered approach. Practical Exercise and plenary Discussions (30 minutes) <i>(The trainer requests the trainees to form groups and identify the existing climate-smart agriculture practices and the relevant policy options for implementation).</i>	• PowerPoint presentation • Distribute participants' handouts • Group Exercise

13.3.7.4 Climate-smart-sensitive policy cycle (20 minutes)	Session Guide
Plenary Presentation (10 minutes) Stages in the climate-smart-sensitive policy cycle Plenary Discussions (10 minutes)	- PowerPoint presentation - Distribute participants' handouts
13.3.7.5 Implementation of the climate-smart-sensitive policy at the county level (50 Minutes)	Session Guide
Plenary Presentation (20 minutes) Phases in the implementation of the climate-smart-sensitive policy at the county level. Practical exercise (30 minutes) <i>(The trainer requests the trainees to form groups and develop a programme showing steps, activities and stakeholders for the implementation of climate-smart policies).</i>	- PowerPoint presentation - Distribute participants' handouts - Practical Exercise
13.3.7.6 Policy financing and investments for Climate-smart Agriculture (1 hour)	Session Guide
Plenary Presentation (30 minutes) - Why financing is needed - Financing gaps - Sources of financing - Financing mechanisms - Connecting action to financing - Types of subsidies to farmers Group exercises (30 minutes) <i>(The trainer requests the trainees to form groups and identify potential sources of financing, financing mechanisms and connecting action to financing),</i>	- PowerPoint presentation - Distribute participants' handouts - Practical Exercise
13.3.7.7 Need of Technology Policy (20 minutes)	Session guide
Plenary Presentation (10 minutes) - What is a technology policy? - Why do we need technology policy? - Is technology policy inconsistent with a market oriented economy? - Technology policy in Kenya. Plenary Discussions (10 minutes)	- PowerPoint presentation - Distribute participants' handouts
13.3.7.8 Module review (20 minutes)	Session guide
<i>(The trainer leads the trainees in reviewing the module)</i> - Summarize the main points of the training and together with the trainees. - Trainees lists the main points learnt during the training. - Discuss with trainees new things learnt from this Module. - Ask the trainees what are some of the problems and issues that they have become more aware of in the module.	- Q& A session - Recap the main points - Test understanding - Participatory evaluation of the session

13.3.8 Participants' Handouts

- 1. Hand out on Agricultural Policies in Kenya
- 2. Sorghum production manual

13.9 References

1. Alila, P.O. & Atieno, R. (2006). A paper for the Future Agricultures Consortium workshop, Institute of Development Studies, 20-22 March 2006. Future Agricultures.
2. Chronic Poverty Advisory Network (2012). Agriculture Policy Guide 2. Meeting the challenge of a new Pro-poor agricultural paradigm: The role of agricultural policies and programmes. www.chronicpovertynetwork.org.
3. Chirwa, E.; Dorward, A.; Kathule, R.; Kumwenda, I.; Kydd, J., Poole, N.; Poulton, C. & Stockbridge, M. (undated). Farmer Organization for market access: Principles for policy and practice. Imperial College London. University of Malawi. Agricultural Policy Research Unit. <http://www.imperial.ac.uk/agriculturalsciences/research/sections/aebm/projects/farmerorg.htm>.
4. Food and Agriculture Organization of the United Nations (2016). The Gender in Agricultural Policies Analysis Tool (GAPo).
5. Food and Agriculture Organization of the United Nations (FAO) (2010). "Climate-Smart" Agriculture. Policies, Practices and Financing for Food Security, Adaptation and Mitigation.
6. Ha-Joon Chang (2002). African Technology Policy Studies Network (ATPS). Who needs Technology Policy? Published by The African Technology Policy Studies Network, Nairobi, Kenya.
7. GoK (2007). Kenya Vision 2030.
8. GoK (2010). Kenya Constitution.

ANNEX 1: TRAINING PROGRAM

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

Time	Day 1 (Monday)	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			
8.00am-9.30am	Session 1: Introduction, objectives & expectations - Introduction to KCSAP project - Introduction to the training program (CTT)	30 minutes 30 minutes	The trainees relax and climate set for the ten-day training
9.30 - 10.30 am	Module 1: Climate Change and Climate Smart Agriculture in Sorghum value chain 1.1. Introductions and objectives - Introduction and Levelling of Trainees' expectations - Presentation of module objectives	30 minutes 30 minutes	
10.30 - 11.00 am	Tea Break	30 minutes	
11.00-12.00 pm	1.2 Introduction to Climate Change and Climate Variability (1 hour) Presentations on: - Basic terminologies - Climate change - Climate risks	20 minutes 20 minutes 20 minutes	

12.00-01.00 pm	1.3. Concept of Climate Smart Agriculture (CSA) (1 hour) Presentations on: • Definition of the CSA • The three pillars of CSA • Why CSA is needed	20 minutes 20 minutes 20 minutes	
1.00 -2.00 pm	Lunch Break	1 Hour	
2.00 -2.40 pm	1.4. Projected Future Scenarios that will Impact Productivity (1 hour) Video/power point presentation • Short Video or PP showing projections of rainfall and temperature projections. Plenary discussion • Climate projections impacts on food production and needed adaptation measures for sorghum.	20 minutes 20 minutes	
2.40 -3.00 pm	1.5. Module Review Summary of key points in the module	20 minutes	
	End of Module 1		
3.0 -4.00 pm	Module 2: Farmer Field and Business School Approach 2.1. Introductions and objectives • Introduction and Levelling of Trainees’ Expectations. • Presentation of module objectives.	30 minutes 30 minutes	
4.00 -5.00 pm	2.2 Overview of FFBS key activities Presentation on: • Overview of FFBS. • Principles of FFBS, Sorghum curriculum.	30 minutes	
5.00 -6.00 pm	Teat Break	1 Hour	
Close of Day 1			
Time	Day 2 (Tuesday)	Duration	Remarks / Facilitator
8.00-9.00am	Registration	30 minutes	CTT
	Recap of day 1 activities	30 minutes	

8.00-9.00am	Continuation of Module 2 2.3 Designing an FFBS program Group Exercise	30 minute 30 minutes	
9.00-10.00am	2.4 Communication skills • Group work.	30 minutes	
10.00 - 10.30 am	Tea break	30 minutes	
10.30 - 11.00 am	2.5 Facilitation skills Facilitating of sorghum CIGs	30 minutes	
11.00 - 11.30 am	2.6 Organization, management and Leadership of FFBS	30 minutes	
11.30 - 12.00 pm	2.7 Module Review	30 minutes	
	End of Module 2		
12.00 -01.00 pm	Module 3: Sorghum production and appropriate climatic requirements 3.1 Introductions and objectives • Introduction • Module objectives:	 30 minutes 30 minutes	
1.00- 2.00 pm	Lunch break	1 hour	All
2.00 -3.00 pm	3.2 Importance of sorghum in Kenya's economy Presentation Sorghum and production in Kenya Facilitator's guided discussion	 40 minutes 20 minutes	Faciliator
3.00 -4.00 pm	3.3 Sorghum production ecological/ climatic requirements (1 hour) Presentation on sorghum topics: • Sorghum, Agro-ecological zones • Discussion • Questions/answers/comments	 40 minutes 20 minutes	
4.00 - 4.45 pm	3.4. Sorghum production AEZs (villages), average yields, and constraints in the target Counties Group work (30 mins) Discussions/presentations from the groups	 30 Minutes 15 Minutes	
4.45 - 5.00 pm	3.5. Module review Together discuss and summarize the main points from the module	15 Minutes	

	End of Module 3		
5.00 -6.00 pm	Teat Break	1 Hour	All
Close of day 2			
Time	Day 3 (Wednesday)	Duration	Remarks / Facilitator
8.00-9.00am	Registration	30 minutes	CTT
	Recap of day 2 activities	30 minutes	
9.00 – 10.00 am	Module 4: Sorghum Variety Selection 4.1. Introduction and levelling of expectations and objectives • Introduction • Module objectives	Facilitator 30 minutes 30 minutes	
10.00 - 10.30 pm	Tea break	30 minutes	
10.30 - 11.00 pm	4.2 Introduction to sorghum and the various improved sorghum varieties and their uses Group work • Sorghum, Improved varieties.	10 minutes 20 minutes	Facilitator
11.00 – 1.00 pm	4.3 Recommended sorghum varieties for the target counties Group Exercises Group Exercises -Demo	30 minutes 30 minutes 1 hour	
1.00- 2.00 pm	Lunch break	1 hour	All
2.00 - 2.30 pm	4.4 .Module review	30 minutes	Facilitator
	End of Module 4		
2.30 – 3.30 pm	Module 5. Sorghum Seed System 5.1. Introduction and levelling of expectations and objectives • Introduction • Module objectives	30 minutes 30 minutes	Facilitator

3.30 - 4.30 pm	5.2. Definition of seed and seed system in Kenya Group work and presentations: What is quality seed? Presentation - Seed system and characteristics of main seed systems (formal and informal seed systems) - Commodity corridors	30 minutes 30 minutes	Facilitator
4.30 – 5.30 pm	5.3 Formal seed system in Kenya Presentations highlighting: Formal seed system	30 minutes	Facilitator
5.30 – 6.00 pm	Tea Break	30 minutes	All
Close of day 3			
Time	Day 4(Thursday)	Duration	Remarks / Facilitator
8.00-9.00am	Registration Recap of day 3 activities	30 minutes 30 minutes	CTT
9.00-10.00am	5.4 Informal seed system in Kenya Presentations: (30 Minutes) Group work and discussions	30 minutes 30 minutes	Facilitator
10.00 -10.30 am	Tea Break	30 minutes	
10.30 – 11.00 am	5.5. Module review Summary the main points of the training module	30 minutes	All
	End of Module 5		
11.30 – 12.00 pm	Module 6: Sorghum climate smart agronomic practices 6.1. Introductions, climate setting	30 minutes	Facilitator
12.00 – 1.00 pm	Objectives and expectations - Module objectives. - Expectations	30 minutes 30 minutes	
1.00 -2.00 pm	Lunch Break	1 hour	
2.00 -3.00 pm	6.3. Agronomic practices for sorghums production (1 hour) Presentation of all sorghum GAPS Discussions	30 minutes 30 minutes	

3.00 -4.00 pm	6.4. Appropriate inputs for sorghum optimal production and their correct doses Group work (30 minutes)	30 minutes	
	Presentation Recommended sorghum inputs	30 minutes	
4.00 -5.00 pm	6. 5. Module review	30 minutes	
5.00 – 5.30 pm	Tea Break	30 minutes	
	End of Module 6		
Close of day 4			
Time	Day 5 (Friday)	Duration	Remarks / Facilitator
8.00-9.00 am	Registration Recap of day 4 activities	30 minutes 30 minutes	CTT
9.00-10.00 am	Module 7: Integrated soil and water management practices for sorghum production 7.1. Introduction, Objectives and Expectations • Introduction • Module objectives	30 minutes	
10.00 -10.30 am	Tea Break	30 minutes	
10.30 – 11.00 am	7.2. Soil composition, properties and health Presentation Discussion	20 minutes 10 minutes	
11.00 – 12.00 pm	7.3. Soil and plant tissue sampling and analysis (1 hours) Presentation Practical exercise on soil sampling	30 minutes 30 minutes	
12.00-1.00 pm	Lunch Break	1 hour	
1.00 – 1.30 pm	7.4. Soil fertility and plant nutrition Presentation Discussion	20 minutes 10 minutes	
1.30 – 2.00 pm	7.5 Soil health and (ISFM) for climate resilient cropping systems Discussion	20 minutes 10 Minutes	

2.00 – 2.30 pm	7.6 Soil and water management and water harvesting technologies Presentation Discussion	20 minutes 10 minutes	
2.30 – 3.00 pm	7.7 Soil degradation and reclamation Presentation Discussion	20 minutes 10 minutes	
3.00 – 3.30 pm	7.8 Problematic soils and their management Discussion	30 minutes 10 minutes	
3.30 – 4.00 pm	7.9. Module review Summary of the main points of the training module	30 minutes	
	End of Module 7		
4.30 – 5.00 pm	Module 8: Crop Health 8.1. Introduction, Objectives and Expectations	30 minutes	
5.00 - 5.30 pm	Tea Break	30 minutes	
Close of day 5			
Time	Day 6 (Saturday)	Duration	Remarks / Facilitator
8.00 - 9.00 am	Registration Recap of day 5 activities	30 minutes 30 minutes	CTT
9.00 - 10.00 am	Module 8 continued..... 8.2. Major sorghum pests that cause economic losses and their control Group work Plenary Presentation Practical session Discussion	15 minutes 20 Minutes 15 minutes 10 minutes	
10.30 -10.30 am	Tea Break	30 minutes	
10.30 – 11.00am	8.3. Sustainable Integrated sorghum pests management practices; scouting, post-harvest pests and threshold determination Presentation Discussion	20 minutes 10 minutes	

11.00 – 12.00pm	8.4. Major sorghum diseases that cause economic losses, conditions that favour their development and their control methods Group work (15 minutes) Presentation (15 Minutes) Practical Exercise (30 Minutes)	 15 minutes 15 minutes 30 minutes	
12.00 – 1.00pm	8.5. Sustainable Integrated Diseases Management (IDM); scouting and threshold determination Presentation (30 minutes) Field Visit	 30 minutes 30 minutes	
1.00 - 2.00 pm	Lunch Break	1 hour	
2.00 - 2.30 pm	8.6. Safe use of pesticides and update source for registered pesticides Practical - Mixing of pesticides Presentation - Safe use of pesticides	 10 minutes 20 minutes	
2.30 - 3.30 pm	8.7. Module review	30 minutes	
	End of Module 8		
4.00 – 4.30 pm	Module 9. Sorghum harvesting and post-harvest management 9. 1 Introduction and levelling of expectations and objectives	30 minutes	
4.30 – 5.00 pm	Module 9 continued..... 9. 2 Sorghum harvesting and drying to maintain quality(1 hour) Dissuasion	 20 minutes 10 minutes	
5.00 – 5.30 pm	Tea Break	30 minutes	
Close of day 6			
Time	Day 7 (Sunday)	Duration	Remarks / Facilitator
8.00 – 9.00 am	Registration Recap of day 6 activities	30 minutes 30 minutes	CTT
9.00 – 9.30 am	9.3 Proper Sorghum threshing, cleaning and drying Dissuasion	 20 minutes 10 minutes	

9.30 – 10.30 am	9.4 Sorghum grain storage techniques Field Trip: Travel to Egerton Njoro Campus sorghum breeding field Presentation Sorghum storage methods On-farm practical demonstration	30 minutes 30 minutes	
10.30 -11.00 am	Tea Break	30 minutes	
11.00 -11.30 am	9.5 Training review Summary of the main points of the training	30 minutes	
	End of Module 9		
12.00 -1.00 pm	Module 10. Sorghum value addition 10.1 Introduction and levelling of expectations and objective	30 minutes	
1.30 - 2.00 pm	Lunch Break	1 hour	
2.00 – 3.00 pm	10. 2 Introduction to recipes for sorghum value added products Presentation Group Exercises	30 minutes 30 minutes	Facilitator
3.00- 5.00 pm	10. 3. Making of different sorghum value added products Practical's	2 hours	
5.00 – 5.30 pm	Tea Break	30 minutes	
Close of day 7			
Time	Day 8 (Monday)	Duration	Remarks / Facilitator
8.00 - 9.00 am	Registration Recap of day 7 activities	30 minutes 30 minutes	CTT
9.00 - 10.00 am	10.4 Prioritizing opportunities in sorghum value addition Group exercise Discussion Ranked recipes.	30 minutes 30 minutes	
10.00 -10.30 am	Tea Break	30 minutes	
10.30 -12.00 pm	10.5 Value addition strategy development Focused group discussion Presentation Summary of market strategies	1 hour 30 minutes	

12.00 -12.30 pm	10.6 Training review	30 minutes	
	End of Module 10		
1.00 - 2.00 pm	Lunch break	1 hour	All
2.00 – 2.30 pm	Module 11: Mechanization of sorghum production activities		
	11.1 Introduction, Objectives and Expectations	30 minutes	
2.30 – 3.00 pm	11.2. Sorghum climate smart land preparation tools		
	Presentation	20 minutes	
	Discussion Discuss any issue that may arise	10 minutes	
3.00 – 3.30 pm	11.3. Sorghum calibration of fertilizer and seed rate for planters		
	Discussion Discuss any issue that may arise.	20 minutes 10 minutes	
3.30 – 4.00 pm	11. 4. Sorghum Chemical implements and tools operations		
	Presentation : Sorghum pest control equipment;	20 minutes	
	Discussion Discuss any issues that may arise	10 minutes	
4.00 – 5.00 pm	11.5. Sorghum harvesting machine operating principles		
	Presentation	30 minutes	
	Discussion Discuss any issues that may arise	30 minutes	
5.00 – 5.30 pm	Tea Break	30 minutes	
Close of Day 8			
Time	Day 9 (Tuesday)	Duration	Remarks / Facilitator
8.00 - 9.00 am	Registration day 9 participation Recap of day 8 activities	30 minutes 30 minutes	CTT

9.00 – 9.30 am	11.6 Machine procedure for Sorghum grading	15 minutes	
	Practical exercise	15 minutes	
9.30 -10.00 am	11.7 Module review Review the main points about Sorghum mechanization	30 minutes	
	End of Module 11		
10.00 -10.30 am	Tea Break	30 minutes	
10.30 -11.30 am	Module 12. Sorghum Business and Marketing 12.1 Introduction and levelling of expectations and objectives	30 minutes	
	Expectations and Objectives Trainees to state their expectations • Present objectives	20 minutes	
11.30 -12.00 pm	12.7.2 Introduction to marketing channels and strategies	20 minutes	
	Discussion • Issues on markets	10 minutes	
12.00 -1.30 pm	12.3 Identification and prioritization of market opportunities in sorghum value chain Group exercise and presentations	40 minutes	
	Group discussion	20 minutes	
1.30 - 2.30 pm	Lunch break	1 hour	All
2.30 – 3.30 pm	12.4 Sorghum Community production, aggregation and marketing models (COPMAS) Presentation	40 minutes	
	Group Exercise	20 minutes	
3.30 – 4.30 pm	12.5 Training review Summary and discussion of the main points of the training	30 minutes	
4.30 – 5.00 pm	Tea Break	30 minutes	All
	End of module 12		
Close of day 9			
Time	Day 10 (Wednesday)	Duration	Remarks / Facilitator

8.00 - 9.00 am	Registration Recap of day 9 activities	30 minutes 30 minutes	CTT
9.00 - 9.30 am	Sub-Module 13.1 Agricultural Innovation Platforms (AIP) 13.1.1 Introduction, Objectives and Expectations	30 minutes	
9.30 - 10.30 am	13.1.2. The characteristics of an innovation platform Presentation Discussion	30 minutes 30 minutes	
10.30 - 11.00 am	Tea break	30 minutes	All
11.00 - 12.00 pm	13.1.3 Preformation and formation phases of the Sorghum AIP Discussion (10 minutes)	50 Minutes 10 minutes	
12.00 - 12.30 pm	13.1.4. Module review	30 minutes	
	End of sub module 13.1		
1.00 - 2.00 pm	Lunch break	1 hour	All
1.00 - 1.30 pm	Module 13.2: Gender mainstreaming and social inclusions in the Sorghum value chain 13.2.1 Introduction, Objectives and Expectations	30 minutes	
1.30 - 2.00 pm	13.2.2 Gender mainstreaming and social inclusion in Sorghum value chain (30 minutes) Presentation Group exercise	20 minutes 10 minutes	
2.00 - 2.30 pm	13.2.3 youth empowerment in Sorghum value chain s (1hour) PowerPoint presentation Group work and Discussion	20 minutes 10 minutes	
2.30 - 3.00 pm	13.2.4 Women empowerment in Sorghum value chain PowerPoint presentation Strategies to empower women in Sorghum value chain Group work and Discussion	20 minutes 10 minutes	

3.00 - 3.30 pm	13.2.5. Strategies for inclusion of vulnerable and marginalized groups in Sorghum value chain PowerPoint presentation Group work and Discussion	20 minutes 10 minutes	
3.30 - 4.00 pm	13.2.7.6. Environmental and social management framework (ESMF) Presentation Plenary discussion (10 minutes)	20 minutes 10 minutes	
4.00 - 4.30 pm	13.2.7. Module review (30 Minutes) Plenary summary of the module	30 minutes	
4.30 – 5.00 pm	Tea Break	30 minutes	All
	End of module 13.2		
Close of day 10			
Time	Day 11 (Thursday)	Duration	Remarks / Facilitator
8.00 - 9.00 am	Registration day 11 participation Recap of day 10 activities	30 minutes 30 minutes	CTT
9.00 - 9.30 am	Module 13.3: Climate-Smart Agricultural Policy Options 13.3.1 Introduction, Objectives and Expectations	30 minutes	
9.30 - 10.00 am	13.3.2 Agricultural Policy Frameworks in Kenya Presentation highlighting: Practical Exercise	20 minutes 10 minutes	
10.00 - 10.30 am	Tea break	30 minutes	All
10.30 - 11.30 am	13.3.3 Climate-smart agriculture practices, policy options and approaches Presentation highlighting: Practical Exercise and plenary Discussions	30 minutes 30 minutes	
11.30 - 11.50 am	13.3.7.4 Climate-smart-sensitive policy cycle Plenary Presentation Plenary Discussions	10 minutes 10 minutes	

11.50 - 12.40 pm	13.3.7.5 Implementation of the climate-smart-sensitive policy at the county level Plenary Presentation (20 minutes) Practical exercise (30 minutes)	20 minutes 30 minutes	
12.40 - 2.00 pm	Lunch break	1 hour	All
2.00 - 3.00 pm	13.3.6 Policy financing and investments for Climate-smart Agriculture Presentation (30 minutes) • Policy financing of CSA Group exercises (30 minutes)	30 minutes 30 minutes	
3.00 - 3.20 pm	13.3.7 Need of Technology Policy Presentation • Technology policy Plenary Discussions	10 minutes 10 minutes	
3.20 - 3.40 pm	13.3.8 Module review Summary of module main points	20 minutes	
	End of module 13.3		
3.40 - 4.00 pm	• Course Evaluation	20 minutes	All
4.00 - 4.30 pm	Announcements Way Forward Closing remarks	30 minutes	CCT
4.30 - 5.00 pm	Tea Break	30 minutes	
Close of day 10			
Time	Day 12 (Friday)	Duration	Remarks / Facilitator
	• Departure to various destinations		All





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