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THE KENYA CEREALS ENHANCEMENT PROGRAMME - CLIMATE RESILIENT AGRICULTURAL LIVELIHOODS (KCEP - CRAL) WINDOW

Climate Smart Agriculture Trainer of Trainers Manual

April 2019

KALRO-KCEP - CRAL

CLIMATE SMART AGRICULTURE TRAINER OF TRAINERS' MANUAL

April 2019

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The information presented in this manual is for advisory use only. Readers using the manual should verify details that relate to their agro-climatic zones to their area agricultural extension officers.

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FOREWORD

Kenya Agricultural and Livestock Research Organization (KALRO) is one of the partners in the Kenya Cereals Enhancement Programme - Climate Resilient Agricultural Livelihoods Window (KCEP-CRAL) Programme funded by the European Commission (EC) and implemented by the International Fund for Agricultural Development (IFAD). KALRO participation in this programme is based on proven experience and expertise in agricultural research. Within the programme, KALRO handles the research component, conducting on station and on farm trials, develop farmer recommendations, develop training materials for extension staff and service providers and conduct the training. The implementation of KCEP-CRAL is in thirteen (13) counties namely Nakuru, Nandi, Trans Nzoia, Kakamega, Bungoma, Kitui, Tharaka-Nithi, Embu, Machakos, Makueni, Taita Taveta, Kwale and Kilifi.

KCEP-CRAL focuses on the three leading rain-fed cereals (maize, sorghum and millet) and associated pulses (beans, green grams, cowpeas and pigeon peas). The programme overall objective is to contribute to the reduction of rural poverty and food insecurity of smallholder farmers in these ASALs.

Through this manual, the programme will provide a comprehensive guide to extension officers, service providers and lead farmers on how to successfully produce cereals and pulses in Kenya. The manual is a useful training and reference material for extension officers and other stakeholders seeking to enhance the capacity of farmers, increase commercialization for food security and promote gender inclusion and participation in commodity along the commodity value chains.

Initial lessons learnt in this project indicate that enhancing the capacity of the extension staff and service provides has improved uptake of new technologies for dry land farming. It has opened up more land for dry land farming through use of conservation agriculture in areas that hitherto were not under agriculture.

Besides easing the pressure on previously arable land, farmers in these areas have been trained to use alternative pest management regimes using Integrated Pest Management and Push pull technologies for persistent pests of economic importance.

On Behalf of KALRO, I am grateful to the European Union (EU) for supporting this project through the International Fund for Agricultural Development (IFAD) and the Kenya Cereals Enhancement programme (KCEP-CRAL) of the Ministry of Agriculture, Livestock and Fisheries MoALF. I also appreciate the excellent coordination of the whole process by the KCEP-CRAL Secretariat led by Dr Anthony O. Esilaba, Ministry of Agriculture Livestock, Fisheries and Irrigation and other partners' staff, scientists in participating centres, Knowledge, Information and Outreach Unit team and secretarial staff. It is my hope and desire that in using these manuals, the expectations of all stakeholders will be met.

Eliud K. Kireger (PhD, OGW)
DIRECTOR GENERAL, KALRO

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PART 1

INTRODUCTION

The purpose of this training of trainer's module is to familiarize extension officers, lead farmers and service providers on the Climate Smart Agriculture manual content and empower them to train farmers. This will enable them to impart knowledge on appropriate technologies, innovations and management practices that will help the farmers and other agricultural stakeholders in hedge their agricultural activities against climate change risks.

SECTION 1: BACKGROUND

1.1. Climate change and variability in Kenya

Climate change is real and has become an impediment to sustainable development globally. Climate change has a range of positive and negative impacts in agriculture depending on the regions of the world. The negative impacts are expected to be more adverse in developing countries, particularly those in sub-Saharan Africa such as Kenya which has experienced increasing temperatures from 1960's coupled with increased frequency and intensity of extreme weather events such as El Niño and La Niña. Effects of the negative impacts include declining agricultural productivity; land degradation; loss of crops, livestock and fish due to changing temperatures and precipitation regimes and increased frequency and intensity of extreme weather events.

The country's agriculture sector is predominantly rain-fed and therefore vulnerable to climate change. The sector is not only impacted upon by climate change but also contributes to the problem. It is the largest source of greenhouse gas (GHG) emissions; responsible for one-third of Kenya's total emissions in 2010 and it's envisaged that this is likely to increase from 20 MtCO2e in 2010 to 27 MtCO2e by 2030. Apart from the threat of climatic changes, the agriculture sector in affected by increasing population pressures and demand for natural resources. In their quest to boost incomes, enhance food security, increasing overall productivity and market competitiveness, agricultural households face the challenge of maintaining an efficient natural resource base.

Agricultural production systems should provide adequate food and nutritional requirements; sufficient income for farmers to sustain a comfortable standard of living; and protect ecosystems both now and for future generations, including coping with changing weather patterns. This calls for climate smart agricultural practices that sustainably increases productivity; resilience or adapted to changing climatic conditions; reduces/removes greenhouse gases; and enhances the achievement of national food security and development goals.

1.2. CSA as a response to climate change

Climate-Smart Agriculture (CSA), as defined and presented by FAO at The Hague Conference on Agriculture, Food Security and Climate Change in 2010, contributes to the achievement of sustainable development goals. It integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. It is composed of three main pillars:

- Sustainably increasing agricultural productivity and incomes;
- Adapting and building resilience to climate change;
- Reducing and/or removing greenhouse gases emissions, where possible.

CSA is an approach of developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change. The magnitude, immediacy and broad scope of the effects of climate change on agricultural systems create a compelling need to ensure comprehensive integration of these effects into national agricultural planning, investments and programmes. The CSA approach is designed to identify and operationalize sustainable agricultural development within the explicit parameters of climate change.

Why is CSA needed

There are several reasons that call for the rapid transition of present agricultural production system to a more climate-smart and resilient production system in the backdrop of increasing climatic risks. The following are the six important reasons.

1. The demand for food is increasing and more food has to be produced with the same amount of resources such as the land, water and capital.
2. There is an overall depletion and degradation of natural resource that sustains agriculture production.
3. Subsistence farmers are highly vulnerable to the impacts of climate change and there is urgency for a more sustainable approach for adaptation.
4. There is a need for enhancing food security while mitigating climate change and preserving the natural resource base.
5. Agricultural production systems need to be more productive, efficient, less variable, show greater stability in their outputs and more resilient to risks, shocks and long-term climate variability.
6. Limited awareness and understanding of the farming communities on the potential impacts of climate change on agriculture calls for the urgent need to create awareness and build their capacity for adaptation.

1.3. Objectives of training

Agricultural production in Kenya faces several challenges, including increased climatic risks, with great economic losses. The climatic risks have also continuously degraded the natural resource base that supports agricultural production, affecting their resilience. The aim of this training is to provide trainers with knowledge and skills on the applicability of CSA technologies, innovations and management practices for increased agricultural productivity and resilience. The specific training objectives include: -

1. Help the trainees appreciate the reality of climate change and variability
2. Provide the trainees with relevant knowledge on the application of CSA technologies, innovations and management practices to mitigate climate change risks
3. Provide the trainees with relevant attitude, knowledge and skills for implementing CSA technologies, innovations and management practices
4. Provide the trainees with relevant attitude and knowledge on Gender in CSA for inclusive adaptation to climate change risks

SECTION 2: MODULE TRAINING CONTENT

2.1: Orientation of the module

The first part of this manual is about the training content or modules. It outlines the orientation and outline of the 9 modules which have a total of 32 sessions. The first 2 modules introduce the trainees to the causes of climate change and the concept of CSA. The next 6 modules give details of some of the CSA interventions. The last 1 module shows the importance of gender in implementing CSA interventions.

2.2: Module outline

Each of the 9 modules has the same outline consisting of 8 parts. These parts are:

1. Introduction to the module – context and background to training needs, knowledge and skills gaps being addressed
2. Module learning outcomes – what trainees are expected to learn
3. Module target group-trainee categories
4. Module duration –minimum number of hours of exposure to materials
5. Module summary –sequence of sessions, training methods, materials and duration
6. Facilitators' guideline – detailed sessions, training methods, materials and session guides
7. Participant's handouts – detailed notes and reference materials for trainees.

The table below summarizes the modules, needs being addressed, expected outcomes and duration.

No	Module Name	Need addressed	Expected training outcomes	Duration
1.	Climate change and variability	Inadequate knowledge on climate change and its impacts on agriculture	Appreciation of climate change dynamics	1 hours 30mins
2.	Climate Smart Agriculture	Inadequate knowledge on strategies available to adapt and mitigate the effects of climate change	Enhanced knowledge and skills on available Climate Smart Agriculture technologies	1 hours 45mins
3	Conservation Agriculture (CA)	Limited knowledge and skills on CA technologies and their application	Increased awareness and capacity of farmers to understand and apply CA technologies	2 hours 40mins
4	Soil and water conservation	Limited understanding and utilization of soil and water conservation technologies	Improved utilization of appropriate Soil and water conservation technologies	2 hours 10mins
5	Integrated soil fertility management	Inadequate knowledge and skills on soil fertility management technologies	Improved knowledge on soil fertility management technologies	1 hours 50mins
6.	Agroforestry	Reduced agricultural productivity and land degradation despite the multiple benefits of agroforestry	Increased awareness on the importance of agroforestry	1 hours 30mins
7	Agricultural Insurance	Limited understanding on the role of insurance in minimizing risk in agricultural production	Increased uptake of agricultural insurance in minimizing risk	1 hours 05mins
8	Bio-energy	Limited knowledge on the importance of renewable energy in mitigating climate change	Increased knowledge on the importance of renewable energy to mitigate climate change	1 hours 10mins
9	Gender in CSA	Limited knowledge on gender roles in CSA	Increased appreciation of the gender specific roles in CSA	1 hour 30mins

SECTION 3: TRAINING DESIGN

3.1: Delivery system

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

3.1.1. Training of farmer facilitators

A team of core trainers will be constituted to train farmer facilitators in a training of trainer's course. The course will be done using this CSA training module. The training course will be attended by selected agricultural extension officers from county wards of the targeted sub counties of each selected county. This extension officers will be the farmer facilitators after completing the training course.

3.1.2. Training of farmers

Each of the farmer facilitators will be tasked to train lead farmers and farmer groups in their respective wards. Each facilitator will assist targeted number of farmers to acquire knowledge and skills in CSA using a developed CSA training manual and other appropriate extension materials.

3.2. Partners and their roles

The partners who will work together in this training will be:

3.2.1. Core Trainers: This will be a team of KALRO, FAO and Department of Agriculture master trainers who will train the farmer facilitators sourced from the County Government Department of Agriculture using this training module. They will also backstop the farmer facilitators during the initial stages of their farmer trainings and take part in the evaluations of the trainings.

3.2.2. County government department of Agriculture: This will be the team of farmer facilitators who will train the farmers using the sorghum production training manual.

3.2.3. 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 facilitators training course has 9 modules shall take a total of at least 15 hours and 10 minutes of training materials. This can be done with a 2-day training plan, including official opening, course evaluation, wrap up and closing ceremony. The trainer will need to have a programme with breaks.

3.4: Logic of design and flow of session

The logic of design and flow of each module is that the facilitator, paying attention to the proposed methods and sessions guidelines shall

i) Introduce the module
ii) Draw out the participant's expectations
iii) Relate participants' expectations with module objectives or learning outcomes
iv) Explore the concept and content, switching to different methods of delivery of the content (group exercise, brainstorming, excursions, plenary discussions, role plays) as the session progresses
v) Review the module with the trainees to gauge their understanding at the end session

vi) Distribute the participants hand outs

SECTION 4: FACILITATOR GUIDELINES/NOTES FOR FACILITATOR

4.1: Preparation of training materials

Preparation of training material will include:

i) Adequate training materials as required in the training module. These should be prepared before the actual training course period. They will include LCD projections, flip charts, felt pens, manuals, books, videos tapes, laptop and other materials required by the trainer.
ii) The required stationery which includes name tags, writing materials, paper punch, staplers, box files for participants' handouts filling and any other necessary stationary
iii) Visual aids like field equipment and tools which should be availed and arranged to be used when required
iv) Adequate copies of participants' hand outs (one per participant) for distribution as may be required
v) Enough copies of the training modules to be distributed at the end of the training course
vi) In addition, the core trainer should familiarize themselves and internalize the guidelines provided by this training module early enough.

4.2. Preparation of training venue and sites

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

i) Training Room – should have adequate space for 80 participants seated in a semi-circle or U shape arrangement ensuring access and unobstructed view of the front. There should be adequate space for a desk and seats for 3 trainers preferably at the sides or at the back of the training room. There should also be a desk for the trainer, his /her materials and LCD projector, a flip charts holder and white wall to act as a projector screen.
ii) Demonstration Site – should be a 5 minutes walking distance and that can demonstrate the principles of conservation agriculture well.

4.3. The trainees

The targeted trainees are Sub County and ward agricultural extension officers with elaborate training background in agriculture and extension. The facilitator should not lecturer but draw out and build on their knowledge, skills and experience.

4.4. Training programme

The training programme proposed consists of the actual training modules. Health breaks should be considered when drawing the training programme. The training programme below is just an example and the facilitator can adjust the timings and the modules to be trained depending on the specific circumstances.

Time	Day	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
	DAY 1		
8.30 – 8.45	**Module 1: Climate change and variability** Climate setting and Introduction to the module – programme and objectives	15 mins	The trainees and facilitators know each other
8.45 – 9.05	**Module 1.1** Terminologies used in Climate change and variability	20 mins	
9.05 – 9.25	**Module 1.2** What causes climate change	20 mins	
9.25 – 9.50	**Module 1.3** Impact of climate change on Agriculture	25 mins	
9.50 – 10.00	Module evaluation	10 mins	
10.00 – 10.30	Health Break		
10.30 – 10.45	**Module 2: Climate smart agriculture** Climate setting and Introduction to the module – programme and objectives	15 mins	
10.45 – 10.55	**Module 2.1** What is Climate Smart Agriculture (CSA)	10 mins	
10.55 – 11.15	**Module 2.2** Key pillars of CSA	20 mins	
11.15 – 11.25	**Module 2.3** Key Characteristics of CSA	10 mins	
11.25 – 12.05	**Module 2.4** Examples of CSA practices in Kenya	40 mins	
12.05 – 12.15	Module evaluation	10 mins	
12.15 – 12.30	**Module 3: Conservation agriculture** Climate setting and Introduction to the module – programme and objectives	10 mins	
12.30 – 12.35	**Module 3.1** What is Conservation Agriculture and the terminologies used in conservation agriculture	20 mins	
12.35 – 12.40	**Module 3.2** Guiding principles for productive conservation agriculture	35 mins	
12.40 – 1.15	**Module 3.3** Guiding principles for productive conservation agriculture	35 mins	
1.15 – 2.15	**Lunch Break**		
2.15 – 2.45	**Module 3.4** Weed control under CA farming systems	20mins	
2.45 – 3.05	**Module 3.5** Benefits of CA	20 mins	
3.05 – 3.15	**Module 3.6** Constraints and opportunities to Adoption of CA	10 mins	
3.15 – 3.25	Module evaluation	10 mins	
3.25 – 3.35	**Module 4: Soil and water management** Climate setting and Introduction to the module – programme and objectives	10 mins	
3.35 – 3.55	**Module 4.1** Introduction to the principles and different soil and water conservation technologies.	30 mins	
3.55 – 4.25	Health break		
4.25 – 4.55	**Module 4.2** Steps and principles for design and construction of Soil and Water conservation technology interventions	30 mins	
4.55 – 5.25	**Module 4.3** Appropriate locations for technology application; advantages and disadvantages of each soil and water conservation technologies.	30 mins	
5.25 – 5.45	**Module 4.4** Farmer experiences and Challenges on adoption of SWC.	20 mins	
5.45 – 5.55	Module evaluation	10 mins	
	DAY 2		
8.30 – 8.45	**Module 5: Integrated Soil Fertility Management**	15 mins	

Time	Day	Duration	Remarks/facilitator
	Climate setting and Introduction to the module – programme and objectives		
8.45 – 9.05	**Module 5.1** What is ISFM and the importance of using it	20 mins	
9.05 – 9.25	**Module 5.2** Principles and key considerations in devising ISFM strategies	20 mins	
9.25 – 9.55	**Module 5.3** ISFM practices and their rationale	30 mins	
9.55 – 10.10	**Module 5.4** ISFM guidelines for integrated fertilizer use	15 mins	
10.10 – 10.20	Module evaluation	10 mins	
10.20 – 10.50	Health break		
10.50 – 11.05	**Module 6: Agroforestry** Climate setting and Introduction to the module – programme and objectives	15 mins	
11.05 – 11.20	**Module 6.1** Terminologies used in agroforestry	15 mins	
11.20 – 11.45	**Module 6.2** Agroforestry systems	25 mins	
11.45 – 12.10	**Module 6.3** Adaptation and mitigation benefits of agroforestry	25 mins	
12.10 -12.20	Module evaluation	10 mins	
12.20 – 12.35	**Module 7: Agricultural insurance** Climate setting and Introduction to the module – programme and objectives	15 mins	
12.35 – 12.55	**Module 7.1** What is agricultural insurance and its importance	20 mins	
12.55 – 1.15	**Module 7.2** Benefits of crop insurance	20 mins	
1.15 – 1.25	Module evaluation	10 mins	
1.25 – 2.25	**Lunch break**		
2.25 – 2.40	**Module 8: Bio-energy** Climate setting and Introduction to the module – programme and objectives	15 mins	
2.40 – 2.50	**Module 8.1** What is bio-energy	10 mins	
2.50 – 3.25	**Module 8.2** Benefits and disadvantages of bio-energy	35 mins	
3.25 – 3.35	Module evaluation	10 mins	
3.35 – 3.50	**Module 9: Gender and climate change** Climate setting and Introduction to the module – programme and objectives	15 mins	
3.50 – 4.20	**Module 9.1** Defining the gender concept, terminologies used in gender and role in CSA	30 mins	
4.20 – 4.40	**Module 9.2** Gender equality in the three pillars of CSA	20 mins	
4.40 – 4.55	**Module 9.4** Gender and policy related constraints to uptake of CSA practices	15 mins	
4.55 – 5.05	Module evaluation	10 mins	
5.05 – 5.35	Health break		

4.5. Training methods

The choice of the methods has been informed by the competency issues being addressed, time available and experiences of the author of this manual. In this training module the facilitator can choose to use several non-formal education approaches that are useful for adult learners as listed in the table below. The proposed training methods can be modified to suit the needs of the trainees.

Training Method	Description of Method
Sharing and discussions in plenary	Use of PowerPoint or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Brainstorming/problem Solving Exercise	To be considered where skills are an issue requiring sharing and trying
Small group and big group discussion	Plenary discussions have been considered as training methods where attitude is an issue
On-farm practical demonstration and visits	To be considered where hands-on practical skills are acquired through sharing and demonstration

4.5.1. Sharing and discussions in plenary

This method encourages group participation in which free exchange of knowledge, ideas and opinions on a particular subject among trainees and facilitators is done through plenary presentations. Plenary discussions should occur at strategic moments in the training programme. They should draw together the learning of the whole group and the individual. They summarize and highlight not only what has been learned but also how it has been learned. Discussion need to be planned and linked carefully to the objectives and outcomes of the training module. Sharing and discussions are used to change attitudes and as means of obtaining feedback about the way in which trainees may apply the knowledge learned.

4.5.2. Brainstorming/problem solving exercise

The method is suitable when dealing with issues and problems that need group decision-making. It is helpful when participants are expected to deliberate on an issue fully and share their ideas, experiences and knowledge in small groups or as a big group. All the ideas are accepted then detailed discussion on the issue or problem, leads the group to a consensus as a final output. Sometimes discussions may move away from the topic. As in the small and big group discussion methods, some members of the group may impose on others i.e. insist on their ideas. There is also a danger that some participants may use up much time in presenting their opinions. These situations may lead to others not having the chance to speak. It is the facilitator who should always handle the group members in affair manner by giving each one a chance to be heard and thus a consensus is reached. However, it is important that all opinions be accepted to demonstrate respect for individual group member.

4.5.3. Small group and big group discussion

This method is suitable when provoking participation and sharing of experiences and ideas from individuals in groups. It is easier for an individual to share his ideas with a small group than in a big group. Some participants are not comfortable sharing ideas in a big group. Thus, it is helpful to structure training's in such a way that small group discussions come before a large group work/discussions.

The procedure involves putting the participants into small groups, giving each group a particular task to accomplish and discuss. Every member of the small group is given the chance to share his/her ideas about the assigned task with group leaders leading the discussions. After a certain given time, all groups convene and process their discussion with the bigger group.

4.5.4. On-farm practical demonstrations and visits

The facilitator leads the trainees to demonstration plots for hands on trainees. It is in demonstrations that trainees handle tasks that have been presented in theory and gain useful skills and insights. They see, touch and feel and thus are able to relate theory to actual happenings in the fields in a practical manner.

4.6. Planning and guidance for ToT preparation

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

- **Eight weeks** – Recruit and compose a core/master trainer's team, establish the required Conservation agriculture demonstration plots (eight weeks ensures a mature crop) and identify and establish the list of trainees and other participants.
- **Four weeks** – Send out invitation letters to participants and special guests detailing purpose, venue and programme. Follow up on demonstration sites. Hold a briefing meeting for the master trainers
- **Three weeks** – confirm names of trainees, participants and special guests, prepare training materials for facilitators, confirm preparedness of the field sites to be visited and confirm special guests if any.
- **One week** –Confirm training sites preparedness, brief assistants and service providers in the site.
- **One day** – Move training material to the venue, 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 core trainers and participants
    - Introduction to the project and training course
    - Ground rules

4.7: Evaluation of training

Time should be allocated on the last day of the training course for planning the way forward and evaluation of the training. This is allocated in the training programme prepared by the core trainer. Two evaluations will be performed as follows:

4.7.1. The individual trainee evaluation

Each trainee will fill evaluation forms which will be collected and analyzed by the core trainers' team members.

Sample evaluation form

Aspect / module	**Rating**		
	Very Useful (3 marks)	**Useful (2 marks)**	**Of Limited Use (2 marks)**
1. Training Methodology 2. Facilitation Skills 3. The training module content 4. Climate change and variability 5. Climate Smart Agriculture 6. Conservation Agriculture			

Aspect / module	Rating		
	Very Useful (3 marks)	**Useful (2 marks)**	**Of Limited Use (2 marks)**
7. Soil and water conservation 8. Integrated soil fertility management 9. Agroforestry 10. Agricultural Insurance 11. Bio-energy 12. Gender in CSA 13. Venue arrangements 14. Handouts, 15. Tools and practicals			

4.7.2. Trainee's group evaluation

They trainees divide themselves into groups then objectively and constructively evaluate the training in absence of the trainer. They then present their evaluation to the trainers. The core trainers will 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 training improvement

4.8: Facilitators' reference materials

The facilitator will have copies of:-

- Training modules
- Climate Smart Agriculture training manuals
- Videos
- Other extension material

PART II: TRAINING MODULES

This part consists of nine modules namely:

1. Climate change and variability
2. Climate Smart Agriculture
3. Conservation Agriculture
4. Soil and water conservation
5. Integrated soil fertility management
6. Agroforestry
7. Agricultural Insurance
8. Bio-energy
9. Gender in CSA

Each module comprises of the following components:

1. Introduction to the Module
2. Module Learning Outcomes
3. Module Target Group
4. Module Duration
5. Module Summary
6. Facilitator Guidelines
7. Participants Handouts/References

MODULE 1: CLIMATE CHANGE AND VARIABILITY

1.1. Introduction to the module

The module is an introduction to the science of climate change and variability needed to understand the broad concept of CSA. It aims to increase the trainees understanding and knowledge of climate change and its causes, basics of climate change and various terminologies used in climate change and variability. The module also highlights how climate change affects agriculture and how agricultural sector contribute to climate change through greenhouse gas emissions.

1.2. Module learning outcomes

By the end of the module section trainees should be able to:

1. Explain to the trainees the difference between climate change and climate variability
2. Explain the different terminologies used in climate change and variability
3. Describe the main causes of climate change
4. Explain to farmers the impact of climate change on Agriculture

1.3 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

1.4 Module Duration

The module is estimated to take a minimum of 1 Hour 20 Mins

1.5 Module Summary

Climate change and variability			
Sessions	**Training Methods**	**Training Materials**	**Time**
1. Climate setting and Introduction to the module	Self-introduction Sharing	-Programme - Objectives - Felt pens - Sticky leaf pads -Power Point presentation	15 minutes
2. Terminologies used in Climate change and variability	Plenary discussion Plenary presentation	Power Point presentation, Posters, Flip chart	20minutes
3.What causes climate change	Plenary discussion Plenary presentation Video	-Power Point presentation, Posters, documentaries, flip chart, video clip	20 Mins
4. Impact of climate change on Agriculture	-Plenary discussion -Plenary presentation -Video	Power point presentation, Video documentaries	25 Mins
Total			**1 hour 20 minutes**

1.6 Facilitators' guidelines

1.6.1. Climate Expectations (15 minutes)	**Session guide**
(The facilitator should welcome trainees to the module of climate change and variability and introduce him/herself by stating his/her profile and experience of working with farmers). The facilitator invites the trainees and asks each trainee to state their expectations. This will be written on small stick notes and transferred on flip chats **Module Objectives** (The facilitator presents modules objectives) By the end of the module trainees should be able to; 1. Explain to the trainees the difference between climate change and climate variability 2. Explain the different terminologies used in climate change and variability 3. Describe the main causes of climate change 4. Explain the main impacts of climate change on agriculture I will try to meet your expectation in line with the stated objectives	Each participant should share their expectations Distribute trainees handouts 1.1.1 Module objectives
1.6. 2. Terminologies used in in climate change and variability (10 minutes)	**Session guide**
(The facilitator will start by gauging the participants understanding of the terms climate change and variability before making a presentation on the common terms used in the climate change and variability). **Plenary discussion** In plenary ask the trainees if there have been climatic changes in their region and in their own words they mean by climate change. What shows there have been climatic changes? (Different people perceive climatic changes differently and hence make decisions based on this perceptions)	List the answers on flip charts

Write all the various responses on flip charts Randomly, go through a list of key terms in climate change and see how many terms the trainees know their meanings. These include: - 1. Weather 2. Climate 3. Climate variability 4. Climate change 5. Climatic risks 6. Climate adaptation 7. Climate mitigation **Plenary Presentation** Present Power Point slides on the definition of the common terms used in climate change and variability	
1.6.3. What causes climate change (20 minutes)	**Session guide**
The facilitator explores the causes of climate change, examines the greenhouse effect and help trainees understand the greenhouse effect The facilitator will start by asking the participants (in plenary) their perceptions on what is causing of climate change. This will be a discussion and everyone will be allowed to contribute. All responses will be documented on a flip chart. Since this are perceptions, there are no right and wrong answers. **Plenary presentation** The facilitator will then present using Power Point the Causes of climate change **Video presentation** Video presentation on the causes of climate change. This 10-minute video on climate change produced by Intergovernmental Panel on Climate Change (IPCC) gives a summary on the causes of climate change in a simplified English language.	Participant list possible causes of climate change on a flip chart Distribute handouts on causes of climate change Distribute the video on climate change
1.6. 4. Impact of climate change on Agriculture (25minutes)	**Session guide**
The facilitator and the trainees discusses the impacts of climate change and variability on agriculture The facilitator will have plenary discussion and ask trainees to list impacts of climate change on agriculture in their counties **Plenary presentation** Present Power Point slides on the impacts of climate change on agriculture **Direct impacts** – these are impacts that affect the agricultural commodities of enterprises directly 1. Complete crop failure 2. Reduced crop and livestock yield 3. Decreasing availability of water 4. Loss of pastures or livestock feed supplies 5. Insurgences of new pest and diseases 6. Loss of seeds and planting materials 7. Damages to key infrastructures	Participant lists possible impacts of climate change on agriculture on the flip chart

8. Degradation of natural resources. 9. Loss of agro-biodiversity **Indirect impacts** – these are changes experienced as a result of primary impacts on agriculture 1. Decreased domestic food production 2. Increased imports of food 3. Increase in prices of essential commodities 4. Human and livestock diseases 5. Increased drudgery and workload 6. Increased rural- urban migration 7. Resource related conflicts 8. Lost economic opportunities at the household level and nationally 9. Post-harvest losses **Video presentation** Video presentation on the impacts of climate change on agriculture. This 10-minute video on climate change produced by Intergovernmental Panel on Climate Change (IPCC) gives a summary on the impacts of climate change in a simplified English language.	Distribute handouts on causes of climate change Distribute the video on climate change and impacts on agriculture
1.7. Module evaluation	**Session guide**
Together with the participants review the main points about climate change and variability • What new things did you learn from this Module? • What are some of the problems and issues that you have become more aware of climate change and variability, causes of climate change and impacts on agriculture • What questions do you still have? The facilitator will then summarize the main points of the training	

1.7 Participants handouts (Reference)

- KCEP Climate Smart Agriculture Extension Manual
- Handouts on terminologies used in climate change
- Handouts on causes and impacts of climate change

MODULE 2: CLIMATE SMART AGRICULTURE

2.1. Introduction to the module

This module introduces the concept of climate-smart agriculture as an approach that aims to overcome challenges posed by climate change: maintain or improve food security, to help farmers adapt to climate change, and to reduce the amount of greenhouse gases in the atmosphere. It empathizes why CSA is important, its characteristics and gives practical examples of CSA practices locally. This will help the trainees understand and relate to the applicability of CSA in their circumstances.

2.2. Module learning outcomes

By the end of the module section trainees should be able to:

1. Explain the Climate Smart Agriculture concept
2. Explain why CSA is important in adapting and mitigating climate change
3. Explain key characteristics of CSA
4. Guide farmers in practicing key CSA practices for increased productivity applicable in their locality

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

2.4. Module Duration

The module is estimated to take a minimum of 1 hour 35 minutes

2.5. Module Summary

Climate Smart Agriculture			
Sessions	Training Methods	Training Materials	Time
1. Climate setting and Introduction to the module	Self-introduction Sharing	-Programme - Objectives - Felt pens - Sticky leaf pads -Power Point presentation	15 minutes
2. What is Climate Smart Agriculture (CSA)	Plenary discussion Plenary presentation	Power Point presentation, Poster, Flip chart;	10 minutes
3. Key pillars of CSA	Plenary discussion Plenary presentation	-Power Point presentation, flip chart	20 minutes
4. Key Characteristics of CSA	-Plenary discussion -Plenary presentation	-Power Point presentation, flip chart	10 minutes
5. Examples of CSA practices in Kenya	-Plenary discussion -Plenary presentation -Video	Power point presentation, flip chart, Video documentary	40 minutes
Total			**1 hour 45 minutes**

2.6. Facilitators' guidelines

2.6.1. Climate expectations (15 minutes)	Session guide
(The facilitator should welcome trainees to the module of climate smart agriculture and introduce him/herself by stating his/her profile and experience of working with farmers). The facilitator invites the trainees to state their expectations and write them of flip charts. **Module Objectives** (The facilitator presents modules objectives) 1. By the end of the module trainees should be able to; 2. Explain what is climate smart agriculture and its key pillars 3. Explain the characteristics of CSA 4. Give practical examples of CSA practices that are location specific I will try to meet your expectation in line with the stated objectives	 Each participant should share their expectations Distribute trainees handouts and module objectives
2.6.2. What is Climate Smart Agriculture (CSA) (10 minutes)	**Session guide**
(Introduce climate smart agriculture concept). **Plenary presentation** The facilitator will give a power point presentation on CSA then have plenary discussion with the trainees to have their concurrence	 List the answers on flip charts Distribute handouts on CSA
2.6.3. Key pillars of CSA (20 minutes)	**Session guide**
The facilitator discusses in plenary the key pillars of CSA to gauge trainees level of knowledge **Plenary presentation** This session should start with a Power Point presentation on the pillars of CSA and how their importance in addressing climate change. These pillars are: - 1. Productivity – practices that will sustainably increase agricultural productivity and incomes from crops, livestock and fish, without having a negative impact on the environment 2. Adaptation – practices that reduce the exposure of farmers to short-term risks, while also strengthening their resilience by building their capacity to adapt and prosper in the face of shocks and longer-term stresses 3. Mitigation – practices that help to reduce and/or remove greenhouse gas (GHG) emissions **Plenary discussions** The facilitator will have plenary discussion on key pillars of CSA and the trainees can give examples of such agricultural practices	 Distribute handouts on pillars of CSA
2.6.4. Key Characteristics of CSA (10 minutes)	**Session guide**
The facilitator discusses the key characteristics of CSA and helps the trainees to distinguish between CSA and non-CSA practices **Plenary discussions** The facilitator will have plenary discussion with the trainees on key	 Distribute handouts on

characteristics of CSA 1. Addresses climate change by taking note of its impacts during planning and development of agricultural systems. 2. Integrates multiple goals 3. Aims at conserving natural resources 4. Goes beyond single technologies, innovation and management practices 5. It is context specific 6. Takes into account impacts of climate change on gender	key characteristics of CSA
2.6.5. Examples of CSA practices in Kenya (40 minutes)	**Session guide**
The facilitator discusses in plenary examples of CSA practices in Kenya to gauge trainees level of knowledge and appreciate the efforts already in place in practicing CSA **Plenary discussions** The facilitator will have plenary discussion on examples of CSA practices in the trainees' localities and why they think they are climate smart practices i.e. if they adhere to the pillars of CSA. Examples include 1. Conservation agriculture 2. Integrated soil fertility management 3. Small-scale irrigation 4. Crop diversification 5. Improved livestock feed and feeding practices **Plenary presentation** This 10-minute video presentation highlights some farmers 'practical efforts in practicing CSA and the benefits from their enterprises. This is meant to encourage the trainees to scale up efforts among farmers to be CSA minded	Participant list CSA practices on a flip chart Distribute handouts on CSA practices in Kenya Distribute video on examples of CSA
2.7. Module evaluation	**Session guide**
Together with the participants review the main points about climate smart agriculture • What new things did you learn from this Module? • What are some of the benefits of CSA • What questions do you still have? The facilitator will then summarize the main points of the training.	

2.7 Participants handouts

- KCEP Climate Smart Agriculture Extension Manual
- Handouts on the concept and pillars of CSA

MODULE 3: CONSERVATION AGRICULTURE

3.1. Introduction to the Module

Conservation agriculture (CA) is one of the components of climate smart agriculture. Farmers practicing CA farming practices are able to effectively conserve, improve and make more efficient use of natural resources through sustainable (integration) of the locally available resources. This model is designed for training extension service providers on the meaning of and implementation framework of conservation agriculture for improving land and crop productivity within and beyond KCEP-CRAL sites. The trained extension service providers are expected to extend the lessons learnt to farmers and other land users in their mandate.

3.2. Module learning outcomes

By the end of the module session, the trainers should be able to explain to the trainees:

1. The meaning of conservation agriculture.
2. The key principles of conservation agriculture practices.
3. The different terminologies used when describing conservation agriculture.
4. The constraints and opportunities for Conservation Agriculture adoption
5. The benefits of Conservation agriculture

3.3. Module Target group

This module targets agricultural extension service providers based at sub-counties and wards in KCEP-CRAL Counties.

3.4. Module Duration

The module is estimated to take a minimum of 2 hours

3.5 Module Summary

Climate change and variability			
Sessions	**Training Methods**	**Training Materials**	**Time**
1. Climate setting and introduction to the module	• Self-introduction • Sharing	-Programme - Objectives - Felt pens -Power Point presentation	10 minutes
2. What is Conservation Agriculture and the terminologies used in conservation agriculture	• Plenary discussion • Plenary presentation	Power Point presentation, Flip charts	20 minutes
3. Guiding principles for productive conservation agriculture	• Plenary presentation - Plenary discussion	Power point presentation, Video documentaries	35 minutes
4. Weed control under CA farming systems	• Plenary presentation - Plenary discussion • -Video show	Power point presentation, Video documentaries	20 minutes
5. Benefits of CA	• Plenary presentation -	Power point presentation, Video	20 minutes

	Plenary discussion • Video show	documentaries	
6. Constraints and opportunities to Adoption of CA	• Plenary presentation - Plenary discussion	Power point presentation	15 minutes
Total			**2 hours**

3.6. Facilitators' guidelines

3.6.1 Climate expectations (10 minutes)	**Session guide**
(The facilitator should welcome trainees to the module of conservation agriculture and introduce him/herself by stating his/her profile and experience of working with farmers). The facilitator invites the trainees to state their expectations. **Module objectives** (The facilitator presents modules objectives) 1. By the end of the module trainees should be able to; 2. Explain to the trainees the meaning of conservation agriculture 3. Explain the different terminologies used when implementing conservation agricultures 4. Describe the key principles of conservation agriculture practices 5. Define constraints and opportunities for Conservation Agriculture adoption 6. Explain to the trainees the benefits of conservation agriculture I will try to meet your expectation in line with the stated objectives	Each participant should share their expectations Distribute trainees handouts and module objectives
3.6.2. What is Conservation Agriculture and the terminologies used in conservation agriculture (20 minutes)	**Session guide**
In this sessions the facilitator will introduce the common terms used in conservation agriculture **Plenary presentation** The facilitator will start by introducing the concept of conservation agriculture, through power point presentation and all the relevant terminologies used in conservation agriculture. There will be plenary discussions with the trainees to gauge their understanding of the terminologies 1. Conservation agriculture 2. Minimum soil disturbance 3. Weed control 4. Soil cover 5. Crop diversification 6. Crop rotations 7. Intercropping systems 8. Conservation agriculture adoption **Video presentation** This 8-minute video presentation highlights CA practice in a farmers' field and why we need to adopt CA practices.	Distribute trainees handouts

3.6.3. Principles of conservation agriculture (35 minutes)	Session guide
The facilitator and the trainees discusses principles of conservation agriculture **Plenary presentation** The facilitator will make a plenary presentation on the three principles of CA and the importance/benefit of each principle and discuss with the trainees to gauge their understanding. The three principles are: 1. Minimum soil disturbance 2. Permanent soil cover 3. Crop diversification (rotations and intercropping systems) **Video presentation** This 10-minute video presentation highlights CA practice in a farmers' field and why we need to adopt CA practices. **Practical session (field demos)** Trainees will be guided for a field visit to practically visualize the 3 principles of conservation agriculture. This field demos should be planted or set up at least two months before the training	Participant list the principles of conservation agriculture on flip charts Distribute handouts on conservation agriculture Distribute the video on conservation agriculture
3.6.4. Weed control in CA farming systems (20 minutes)	**Session guide**
The facilitator and the trainees discusses weed control in CA farming systems **Plenary presentation** The facilitator will make a plenary presentation on weed control methods in CA farming systems and discuss with the trainees to gauge their understanding. The weed control methods include: 1. Chemical weed control methods 2. Cultural weed control methods 3. Mechanical weed control methods **Video presentation** Video presentation on weed control methods in CA	Distribute handouts on methods of weed control in CA Distribute the video clip on weed control methods in CA
3.6.5. Benefits of CA (20 minutes)	**Session guide**
The facilitator and the trainees discusses benefits of conservation agriculture. **Plenary presentation** The facilitator will have plenary discussion and ask trainees to list the benefits of conservation agriculture on flip charts. The trainees will be divided into two groups. The benefits will be listed according to the various broad categories as listed below. 1. Environmental benefits 2. Agronomic benefits Present Power Point slides on benefits of conservation agriculture.	Participant list benefits of conservation agriculture. Distribute handouts on benefits of conservation agriculture.
3.6.6. Constraints and opportunities to adoption of conservation agriculture farming practices (10 minutes)	**Session guide**
The facilitator and the trainees discusses constraints and opportunities to adoption of conservation agriculture farming practices	Participant list the constraints and opportunities to adoption of conservation

Plenary discussion The facilitator will have plenary discussion and ask trainees to list constraints and opportunities to adoption of conservation agriculture on a flip chart in their various Counties	agriculture Distribute handouts on constraints and opportunities to adoption of conservation agriculture
3.7 Module evaluation	**Session Guide**
Together with the participants review the main points about conservation agriculture • What new things did you learn from this Module? • What are some of the principles CA • What rea some of the cha • What questions do you still have? The facilitator will then summarize the main points of the training.	

3.7 Participants handouts

- KCEP Climate Smart Agriculture Extension Manual
- Handouts on what is conservation agriculture; principles of conservation agriculture; and benefits of conservation agriculture

MODULE 4: SOIL AND WATER CONSERVATION

4.1. Introduction

This module shows the importance of soil and water conservation; the various soil and water technologies and management practices; and also provides useful information to the ToTs and farmers to make informed decisions on the selection of appropriate soil and water conservation for their farming conditions. Effective soil and water management practices can improve soil fertility and increase yields in the amidst climatic risks. Many of the soil and water conservation measures have existed over a long time, but information to support site specific selection of those that are appropriate for the prevailing ecological and socio-economic conditions, has not been readily available to farmers and field officers.

4.2. Module learning outcomes

This module aims at the following:

1. To understand the principles and the different types of soil and water conservation technologies
2. To provide skills on the design and construction of soil and water conservation measures to enhance agricultural resilience
3. To enhance uptake of appropriate soil and water conservation technologies.

4.3 Module target group

This module targets public and private extension service providers based at the Sub County and ward levels.

4.4. Module duration

The Module is estimated to take a minimum of 2 hours 20 minutes.

4.5. Module Summary

	Soil and water conservation			
	Sessions	**Training methods**	**Training materials**	**Time**
1	Introduction, objectives and expectations	Buzz Presentation	PowerPoint, stickers and flip charts	10 minutes
2	Introduction to the principles and different soil and water conservation technologies.	Plenary presentation Discussions	PowerPoint, photos Flip charts Training handouts	30 minutes
3	Steps and principles for design and construction of Soil and Water conservation technology interventions	Presentation	Power point, Flip charts, Training handouts, Sample layouts of the technologies.	30 minutes
4	Appropriate locations for technology application; advantages and disadvantages of each soil and water conservation technologies.	Presentation Demonstration Discussion	PowerPoint Photos/videos Exhibits Handouts	30 minutes
5	Farmer experiences and challenges of SWC adoption	Presentation Discussions	Power point, Flip charts, handouts	30 minutes

	Soil and water conservation			
	Sessions	**Training methods**	**Training materials**	**Time**
6	Module recarp.	Questions & answers, comments, facilitator summary	Participants' Handouts module review	10 minutes
	Total			**2 hours 40 minutes**

4.6. Facilitators' guide

4.6.1 Introduction, Objectives and Expectations (15 minutes)	**Session Guide**
(The facilitator welcomes participants to the module on Soil and Water conservation (SWC) and introduces him/herself by stating his/her profile and experience of working with farmers. The facilitator invites the participants to state and write down their expectations). **Module objectives** (The facilitator presents modules objectives) By the end of the module participants should be able to: 1. Understand what is land degradation and the signs of a degraded land. 2. Understand principles of SWC and the various soil and water conservation technologies. 3. Understand how to design and construct different soil and water conservation structures and where to locate them. 4. Appreciate the advantages and disadvantages of various SWC technologies and how to increase their uptake 5. List the challenges to adoption of SWC technologies through their experiences.	Summarize Participants' "Expectations" and display. Distribute Participant Handouts; module objectives; session guide
4.6.2 Introduction to land degradation process, principles of SWC and different soil and water conservation technologies (30 minutes)	**Session Guide**
The facilitator should first introduce the cycle of degradation and why SWC is important. **Plenary discussions** The facilitator will have plenary discussion and ask trainees to list causes of land degradation and some of the efforts they have put in place to address the problem. The trainees will be divided into 4 groups and write their discussions on flip charts. **Plenary power point presentation** The facilitator will show a PowerPoint presentation on the causes of land degradation; signs of land degradation; principles of SWC and the different SWC technologies suitable for the various agricultural systems; why SWC matters with changing climate. This will be structured into 1. **Field level practices** - Bench terraces, check dams, Contour bunds and hedgerows, 'Fanya juu' terraces, Planting Pits / Zai pits, Katumani Pits, Stone lines, Trash lines, Grass strips, Grassed waterway, Retention ditches, Cut-off Drains, Mulching and Cover crops. 2. **Landscape level practices** – Agroforestry, Wind breaks/shelter belts, woodlots, Riparian vegetation buffer strips. Large flows are diverted and either used directly or stored for supplementary irrigation During presentation, the facilitator will show photo of degraded areas and how application of SWC has rehabilitated these areas.	Distribute participant handouts on the principles and the why of SWC

Video and presentation This 10-minute video presentation highlights agricultural fields where SWC technologies have been applied, similar fields where no SWC technologies have been applied and the results	Distribute video on SWC technologies
4.6.3 Steps and principles for design and construction of Soil and Water conservation technology interventions (30 minutes)	**Session Guide**
The facilitator will guide the trainees on the design and construction of various SWC technologies **Plenary presentation** Using PowerPoint slides the facilitator will present the trainees on the design and construction of some of the most important SWC that are relevant in their various counties. The presentation will also discuss the advantages and disadvantages of each technologies and appropriate application areas. These technologies include 1. Bench terraces 2. Check dams 3. Contour bunds and hedgerows 4. 'Fanya juu' terraces 5. Planting Pits / Zai pits 6. Katumani Pits 7. Stone lines 8. Trash lines 9. Grass strips 10. Grassed waterway 11. Retention ditches 12. Cut-off Drains	Distribute handouts on the steps and principles for design and construction of SWC
4.6.4 Farmer experiences and challenges of SWC adoption (30 Minutes)	**Session Guide**
The facilitator should be able to guide the participants to come up with a list of challenges of SWC adoption in addition to documented challenges (in literature) and brainstorm through discussions provide and come up workable solution on how to overcome some of these challenges. This challenges will be written on flip charts and discussed in plenary	Distribute participant handouts on challenges and how to address the challenges
4.6.5 Module Recap (15 minutes)	**Session Guide**
4.7. Module evaluation	
• What new things did you learn from this Module? • What are some of the problems and issues that you have become more aware of about SWC? • What questions do you still have on the steps, design, construction and selection of appropriate SWC? The facilitator will then summarize the main points of the training.	

4.7 Participants handouts

- KCEP Climate Smart Agriculture Extension Manual

Handouts on importance of soil and water conservation

MODULE 5: INTEGRATED SOIL FERTILITY MANAGEMENT (ISFM)

5.1. Introduction to the Module

This module is designed for training facilitators of farmers, farmer groups, other service providers and Farmer Field Schools (FFS) on the role of ISFM and its importance for increased crop production and resilient agricultural systems. Crop production amidst climate change requires farmers and other agricultural sector stakeholders to have an understanding of their soil types, soil fertility dynamics, soil fertility management, and the different options/practices of ISFM that are available for use, with the aim of increasing agricultural production per unit area.

5.2. Module learning outcomes

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

1. Explain to the trainees what is ISFM and the importance of practicing ISFM
2. Explain the principles and key considerations in devising ISFM strategies
3. Describe the ISFM practices and their rationale
4. Explain the ISFM guidelines for integrated fertilizer use

5.3. Module Target group

This module targets agricultural extension service providers based at the county, sub county and ward level. It will also be useful for private extension service providers, researchers and farmers

5.4. Module Duration

The module is estimated to take a minimum of 1 hour 50 minutes

5.5. Module Summary

Integrated Soil Fertility Management (ISFM)			
Sessions	Training methods	Training materials	Time
1. Climate setting and introduction to the module	Self-introduction Sharing	-Programme - Objectives - Felt pens - Sticky leaf pads -Power Point presentation	15 minutes
2. What is ISFM and the importance of using it	Plenary discussion Plenary presentation	Power Point presentation, Posters, Flip chart	20minutes
3. Principles and key considerations in devising ISFM strategies	Plenary discussion Plenary presentation	-Power Point presentation, Posters, documentaries, flip chart	20 minutes
4. ISFM practices and their rationale	-Plenary discussion -Plenary presentation	Power point presentation	30 minutes
5. ISFM guidelines for integrated fertilizer use	-Plenary discussion -Plenary presentation	Power point presentation	15 Minutes
Total			**1 Hour 20**

			minutes

1.6 Facilitators' guidelines

5.6.1 Introduction, objectives and expectations (15 minutes)	**Session guide**
(The facilitator should welcome participants to the module of Integrated Soil Fertility Management (ISFM) and introduce him/herself by stating his/her profile and experience of working with farmers). The facilitator invites the participants to state their expectations. **Module objectives** *(The facilitator presents modules objectives)* By the end of the module participants should be able to; 1. Explain to the trainees what is ISFM and the importance of practicing it 2. Explain the principles and key considerations in developing ISFM strategies 3. Describe the main ISFM practices 4. Explain the ISFM guidelines for integrated fertilizer use I will try to meet your expectation in line with the stated objectives	Each participant should share their expectations Distribute trainee handouts on Module objectives
5.6.2. What is ISFM and the importance of using it (20 minutes)	**Session Guide**
(Introduce the common soil fertility deficiency, low uptake of fertilizers by farmers due to cost and lack of knowledge and the alternative ISFM options available) **Plenary presentation** The facilitator will start by introducing the concept of ISFM through power point presentation and the importance of practicing it. This important because it's expected that the trainees may have practiced all or parts of soil fertility management strategies in agriculture. **Plenary discussion** The facilitator should ask the trainees if they have practices that can qualify as ISFM	List the answers on flip charts Distribute trainee handouts
5.6.3 Principles and key considerations in devising ISFM strategies (20 minutes)	
The facilitator will engage the trainees in discussions on the principles and key considerations when they are devising ISFM strategies. This is key for the success if the interventions. **Plenary presentation** The facilitator will explain the principles and key considerations in using ISFM through power point presentation. After the presentation, there will be plenary discussion with the trainees to enhance understanding. Every principle will be discussed separately. Key principles of ISFM strategies 1. Use of mineral fertilizers 2. Use of organic inputs 3. Use of improved germplasm 4. Importance of local adaptation 5. Combination of organic and inorganic fertilizers	List the answers on flip charts Distribute trainee handouts

5.6.4. ISFM practices and their rationale (30 minutes)	
The facilitator will introduce the trainees various ISFM practices and why they are applied or their rationale **Plenary presentation and discussion** The facilitator will use PowerPoint slides to present examples of ISFM practices and their rationale and later discuss with the trainees to level their understanding. The ISFM practices to be presented include Combination of fertilizer and manures 1. Growing of nitrogen fixing legumes 2. Use of crop residues 3. Adoption of soil conservation measures 4. Soil acidity correction 5. Drought Buffering 6. Breaking soil hardpans 7. Water harvesting 8. Composting 9. Use of improved and stress-resilient varieties	Distribute trainee handouts
5.6.5. ISFM guidelines for integrated fertilizer use (15 minutes)	
The facilitator will present to the trainees the ISFM guidelines for integrated fertilizer use. **Plenary presentation and discussion** The facilitator will use PowerPoint slides when presenting ISFM guidelines for integrated fertilizer use. He/she will allow discussion, with the trainees, for each guideline before going to the next. The guidelines to be presented include 1. Optimize micro-dosing and top-dressing of nitrogen fertilizers and conduct campaigns to increase the use and effectiveness of these practices 2. Match different water conservation measures to specific dryland and soil conditions 3. Better management of soil organic matter 4. Promote legume based practices for weed, pest and diseases management 5. Target results per unit input not per unit area	Distribute trainee handouts Capture any notes and concerns raised on flip charts
5.7 Module evaluation	
Together with the participants review the main points about ISFM • What new things did you learn from this Module? • What are some of the key strategies in devising ISFM strategies? • What are some of the guidelines for integrated fertilizer use? • Any questions on seeking further clarification The facilitator will then summarize the main points of the training.	

5.7 Participants handouts

- KCEP Climate Smart Agriculture Extension Manual
- ISFM leaflets – what is ISFM and benefits of ISFM

MODULE 6: AGROFORESTRY

6.1. Introduction to the Module

This module is designed for training facilitators of farmers, farmer groups, other service providers and Farmer Field Schools (FFS) on the role agroforestry plays as an adaptation and climate change mitigation strategy. Successful agroforestry practice requires one to know the aspects to consider based on the system adopted. It is envisaged that training of farmers on agroforestry and adoption of the same will bring multiple benefits in terms of improved livelihoods and ecosystem services that include provisioning, regulating and recreational.

6.2. Module learning outcomes

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

1. Define and describe agroforestry
2. Understand and explain terminologies used in agroforestry
3. Describe the different systems of agroforestry
4. Explain the adaptation and mitigation benefits of agroforestry

6.3 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

6.4 Module Duration

The module is estimated to take a minimum of 1 hour 30 minutes

6.5. Module Summary

Agroforestry in CSA			
Sessions	Training methods	Training materials	Time
1.Climate setting and Introduction to the module	• Self-introduction • Sharing	-Programme - Objectives - Felt pens - Sticky leaf pads -Power Point presentation	15 minutes
2. Terminologies used in agroforestry	• Plenary discussion • Plenary presentation	Power Point presentation, Posters, Flip chart	15 minutes
3.Agroforestry systems	• Plenary discussion • Plenary presentation	-Power Point presentation, Posters, documentaries, flip chart	25 minutes
4.Adaptation and mitigation benefits of agroforestry	-Plenary discussion -Plenary presentation -Video	Power point presentation, Video documentaries	25 minutes
Total			**1 Hour 20 Minutes**

6.6. Facilitators' guidelines

6.6.1. Introduction, objectives and expectations (15 minutes)	Session guide
(The facilitator should welcome participants to the module of agroforestry and introduce him/herself by stating his/her profile and experience of working with farmers) The facilitator invites the participants to state their expectations. **Module objectives** *(The facilitator presents modules objectives)* By the end of the module participants should be able to; 1. Define and describe agroforestry 2. Understand and explain terminologies used in agroforestry 3. Describe the different systems of agroforestry 4. Explain the climate change adaptation and mitigation benefits of agroforestry I will try to meet your expectation in line with the stated objectives	 Each participant should share their expectations Distribute participants handouts Module objectives
6.6.2. Terminologies used in agroforestry (15 minutes)	**Session guide**
(The facilitator will start by gauging the participants understanding of the term agroforestry before making a presentation and the different agroforestry systems). **Plenary presentation and discussion** In plenary ask the trainees if they know what agroforestry is. In plenary, using PowerPoints show the definition of agroforestry and the various terms used in agroforestry. This includes 1. Agro-silvicultural 2. Silvopastoral 3. Entomo-silviculture 4. Aqua-silviculture	 List the answers on flip charts Distribute participants handouts
6.6.3.Agroforestry systems (25 minutes)	**Session Guide**
(The facilitator will introduce the topic on agroforestry systems and define what agroforestry systems are) **Plenary presentation** The facilitator will make PowerPoint presentation on the various agroforestry systems and allowing discussions in plenary. The facilitator should ask the trainees to identify which systems are well adapted for their regions. This is important because of the differences in bio-physical characteristics. The systems to be presented and discussed include Agri-silvicultural systems (crops including shrubs/vine/tree crops and trees 1. Improved fallow 2. Taungya 3. Alley cropping (hedgerow intercropping) 4. Multi-layer tree gardens 5. Multi-purpose tress on crop lands 6. Plantation crop combinations 7. Home gardens 8. Trees in soil conservation and reclamation 9. Shelter breaks and wind breaks, live hedges 10. Fuelwood production	 Distribute participants handouts

Silvo-pastoral systems (trees, pasture and or animals) 1. Trees on rangelands or pastures 2. Protein banks 3. Plantation crops with pastures and animals Agro-silvopastoral systems (trees, crops and pasture or animals) 1. Home gardens involving animals 2. Multipurpose woody hedgerows 3. Apiculture with trees 4. Aquaforestry 5. Multipurpose woodlots	
6.6.4. Adaptation and mitigation benefits of agroforestry (25 minutes)	**Session Guide**
Facilitator to introduce the topic on adaptation and mitigation benefits of agroforestry **Plenary presentation and discussion** The facilitator will make PowerPoint presentation on the adaptation and mitigation benefits of agroforestry, then allow discussions in plenary. The facilitator should ask the trainees to write more benefits on flip charts from their regions. The benefits can be categorized as 1. Economic benefits 2. Environmental/ecological benefits 3. Social benefits **Plenary presentations** Video documentary on agroforestry	Document the responses on flip charts Distribute participants' handouts Distribute training video
6.7. Module evaluation	
Together with the participants review the main points about agroforestry systems • What new things did you learn from this Module? • What are some of the important benefits of agroforestry in climate change adaptation? • Any questions on seeking further clarification.	

6.8 Participants handouts

- KCEP Climate Smart Agriculture Extension Manual
- Handouts on agroforestry benefits in climate change adaptation

MODULE 7: AGRICULTURAL INSURANCE

7.1. Introduction to the module

Agricultural insurance is nevertheless a growing business driven by increasing impact of climatic risks on agriculture and the need to stabilize food security. The changing economic environment has also triggered a renewed interest in crop and agricultural insurance programmes and products among agricultural practitioners. This module discusses which informal methods of insurance have been used in Kenyan society and how risks can be mitigated through formal insurance, as well as discussing the main principles of insurance. This module also provides an introductory overview of agricultural insurance and intends to assist those interested in exploring and exploiting this financial mechanism as a hedge against climatic risks. The module discusses the various insurance products available and the benefits.

7.2. Module learning outcomes

By the end of the module section trainees should be able to:

1. Explain what is agricultural insurance and its importance
2. Explain the various agricultural components that can be insured
3. Explain the benefits of crop insurance

7.3. 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

7.4. Module Duration

The module is estimated to take a minimum of 1 hour 5 minutes

7.5. Module Summary

Agriculture Insurance			
Sessions	Training methods	Training materials	Time
1. Climate setting and Introduction to the module	Self-introduction Sharing	-Programme - Objectives - Felt pens - Sticky leaf pads -Power Point presentation	15 minutes
2. What is agricultural insurance and its importance	Plenary discussion Plenary presentation	Power Point presentation	20minutes
4. Benefits of crop insurance	-Plenary discussion -Plenary presentation	Power point presentation	20 minutes
Total			**55 Minutes**

7.6. Facilitators' guidelines

7.6.1. Climate Expectations (15 minutes)	Session guide
(The facilitator should welcome trainees to the module of agricultural insurance and introduce him/herself by stating his/her profile and experience of working with farmers). The facilitator invites the trainees to state their expectations. **Module objectives** *(The facilitator presents modules objectives)* By the end of the module trainees should be able to; 1. Explain what is agricultural insurance and its importance 2. Explain the benefits of crop insurance I will try to meet your expectation in line with the stated objectives	Each participant should share their expectations Distribute trainees handouts module objectives
7.6.2. What is agricultural insurance and its importance (20 minutes)	**Session guide**
The facilitator discusses in plenary agricultural insurance and its importance to gauge trainees level of knowledge on risk management and appreciate the efforts already in place **Plenary presentation and discussion** The facilitator will start by introducing the concept of agricultural insurance through power point presentation and the importance of practicing it in climate risk management. The facilitator should then allow some discussions to gauge if there is use agricultural insurance in risk mitigation in this region.	Distribute trainees handouts on module
7.6.3. Benefits of crop insurance (20 minutes)	**Session Guide**
The facilitator discusses in plenary examples of benefits of crop insurance to gauge trainees level of knowledge on insurance and appreciate the efforts already in place in the uptake of insurance products **Plenary presentation and discussion** The facilitator will have plenary discussion on the benefits of crop insurance to the farmers. He/she will ask trainees their perceived or realized benefits of agricultural insurance. This is important so that these can be used to enhance upscaling 1. Peace of mind 2. Risk transfer 3. Risk pooling 4. Preservation of source of income 5. Boost access to credit	Participant list possible benefits of crop insurance on a flip chart Distribute handouts on benefits of crop insurance
7.7. Module evaluation	**Session Guide**
Together with the participants review the main points about agricultural insurance • What new things did you learn from this Module? • What are some of the benefits of agricultural insurance? • What are some of the perceived challenges in the use of agricultural insurance? • Any questions on seeking further clarification.	

7.8 Participants handouts

- KCEP Climate Smart Agriculture Extension Manual
- Handouts on agriculture insurance

MODULE 8: BIO-ENERGY IN CLIMATE SMART AGRICULTURE

8.1. Introduction to the module

This module is designed for training facilitators of farmer field schools (FFS) on the role of renewable energy sources as a climate smart agriculture strategy. Energy is a major component of agricultural systems as it is used from input production, processing and marketing. While technologies for making agriculture energy smart are available, most farmers are not aware of their existence and in some cases adoption is very low. Training of farmers on the various sources of renewable energy will go a long way to improving food security and mitigating climate change through reduced GHG emission.

8.2. Module learning outcomes

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

1. Define bioenergy
2. Explain the benefits and disadvantages of renewable energy

8.3. 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

8.4. Module Duration

The module is estimated to take a minimum of 1hour 10 minutes

8.5. Module Summary

Renewable energy and CSA			
Sessions	**Training methods**	**Training mMaterials**	**Time**
1.Climate setting and Introduction to the module	• Self-introduction • Sharing	-Programme - Objectives - Felt pens - Sticky leaf pads -Power Point presentation	15 mins
2. What is bio-energy	• Plenary discussion • Plenary presentation	Power Point presentation, Posters, Flip chart	10 mins
3. Benefits and disadvantages of bio-energy	-Plenary discussion -Plenary presentation	Power point presentation	35 mins
Total			**1 Hour**

1.6 Facilitators' guidelines

8.6.1 Climate expectations (15 minutes)	**Session guide**
(The facilitator should welcome participants to the module of bio-energy in CSA and introduce him/herself by stating his/her profile and experience of working with farmers). The facilitator invites the participants to state their expectations. **Module objectives** (The facilitator presents modules objectives) By the end of the module participants should be able to; 1. Define Bioenergy 2. Explain the advantage and disadvantages of bioenergy	Each participant should share their expectations Distribute participants handouts on module objectives

I will try to meet your expectation in line with the stated objectives	
8.6.2. Define bioenergy (10 minutes)	**Session guide**
(The facilitator introduce what bio-energy is and its importance in climate change adaptation and mitigation) **Plenary presentation** The facilitator will use PowerPoint presentation to show the definition of bio-energy, its importance in climate change adaptation and mitigation, and ask participants if they are aware of any bio-energy sources they have used	- Handout on definition of bio-energy and its importance in climate change adaptation and mitigation
8.6.3. Benefits and disadvantages of bio-energy (35 minutes)	**Session guide**
Facilitator to introduce the topic on sources of renewable energy **Plenary discussion** The facilitator will divide the trainees into two groups and allow them to discuss the benefits and disadvantages of bio-energy. This is will be written on the flip charts and later discussed in plenary	Handouts on the benefits and disadvantages of bio-energy
8.7. Module evaluation	
Together with the participants review the main points about bio-energy • What new things did you learn from this Module? • What are some of the benefits of bio-energy as a climate smart strategy? • Any questions on seeking further clarification.	

8.7 Participants handouts

- KCEP Climate Smart Agriculture Extension Manual
- Handouts on bio-energy systems

MODULE 9: GENDER AND POLICY IN CLIMATE SMART AGRICULTURE

9.1. Introduction to the Module

This module is designed for training facilitators of farmers, farmer groups, other service providers and Farmer Field Schools (FFS) on the role of gender in Climate Smart Agriculture and why we should integrate gender considerations in the three pillars of CSA. Effective implementation of CSA practices requires active involvement of all gender groups. Farmers and other players in the agricultural sector therefore need a better understanding of how climate change affects different gender categories and the gender-specific efforts to address them.
Enabling policies are key to successful implementation of CSA strategies. The policies should be able to address gender related constraints in CSA adoption. This module is designed for training facilitators of farmers, farmer groups, other service providers and Farmer Field Schools (FFS) on the role of gender in CSA, general constraints to its uptake and its importance in building farmers' resilience to the effects of climate change.

9.2. Module learning outcomes

By the end of the module section trainees should be able to:

1. Explain to what gender is all about and why we should integrate it in CSA.
2. Differentiate between gender equity and gender equality
3. Understand why gender matters in CSA pillars
4. Understand the general constraints to uptake of CSA practices and policies

9.3. Module Target group

This module targets agricultural extension service providers based at the county, sub county and ward level. It will also be useful for private extension service providers, researchers and farmers

9.4. Module Duration

The module is estimated to take a minimum of 1 hour 30 minutes

9.5. Module Summary

Integrated Soil Fertility Management (ISFM)			
Sessions	**Training methods**	**Training materials**	**Time**
1. Climate setting and Introduction to the module	Self-introduction Sharing	-Programme - Objectives - Felt pens - Sticky leaf pads -Power Point presentation	15 mins
2. Defining the gender concept, terminologies used in gender and role in CSA	Plenary discussion Plenary presentation	Power Point presentation	30 mins
3. Gender equality in the three pillars of CSA	-Plenary discussion -Plenary presentation	Power point presentation	20 mins
4. Gender and policy related constraints to uptake of CSA practices	-Plenary discussion -Plenary presentation	Power point presentation	15 ins
Total			**1 Hour 20 Minutes**

9.6 Facilitators' guidelines

9.6.1 Climate expectations (15 minutes)	**Session guide**
(The facilitator should welcome participants to the module on Gender in Climate Smart Agriculture and introduce him/herself by stating his/her profile and experience of working with farmers). The facilitator invites the participants to state their expectations. **Module objectives** (The facilitator presents modules objectives) By the end of the module participants should be able to; 1. Explain what gender is and why we should integrate it in CSA. 2. Differentiate between gender equity and gender equality 3. Understand why gender matters in CSA pillars 4. Understand the general constraints to uptake of CSA practices and policies I will try to meet your expectation in line with the stated objectives	Each participant should share their expectations Distribute participants handouts on module objectives
9.6.2. Defining the gender concept, terminologies used in gender and role in CSA (30 minutes)	**Session guide**
(The facilitator will define gender and also introduce the common terminologies used in gender related issues and ask farmers what they know about them). **Plenary presentation and discussion** The facilitator will use PowerPoint slides to define of gender, gender equity and gender equality and its role in CSA. He/she will also have plenary discussions on the definitions with the trainees. The plenary will also discuss ow the trainees think different gender is affected by climatic changes. The common terms to be discussed include 1. Gender 2. Gender equity 3. Gender equality	List the answers on flip charts Presentation hand outs
9.6.3. Gender equality in the three pillars of CSA (20 minutes)	
The facilitator will introduce the trainees on how gender relates to the various pillars of CSA. This is important for planning CSA interventions so that no gender is disadvantaged. **Plenary presentation and discussion** The facilitator will use PowerPoint presentation to show the trainees how gender interacts with the CSA pillars. He/she will allow discussions with the trainees on their perceptions and document the answers. The discussion will focus on 1. Efforts to address gender in the context of Pillar 1: Sustainably increase agricultural productivity and incomes 2. Efforts to address gender in the context of Pillar 2: Adapt to and build resilience to climate change 3. Efforts to address gender in the context of Pillar 3: Reduce and/or remove greenhouse gas emissions, where possible	List the answers on flip charts Presentation hand outs
9.6.4. Gender and policy related constraints to uptake of CSA practices (15 minutes)	
	List the answers on

Plenary discussion The facilitator will lead the trainees in discussing gender and policy related constraints in the uptake of CSA. The answers will be written on a flip chart.	flip charts
9.7. Module evaluation	**Session Guide**
Together with the participants review the main points about gender and climate smart agriculture • What new things did you learn from this Module? • What is the importance of gender in implementing climate smart agriculture strategies? Any questions on seeking further clarification.	

9.7 Participants hand outs

- KCEP Climate Smart Agriculture Extension Manual
- Handouts on gender and CSA

Supplementary Reading Materials

1. Amos Wekesa and Madeleine Jönsson 2014. Sustainable Agriculture Land Management, We Effect and Vi Agroforestry
2. Climate Smart Agriculture: Training manual for Agricultural Extension Agents in Kenya (2015). FAO, MoALF, USDA.
3. Fairhurst, T. (ed.) (2012) Handbook for Integrated Soil Fertility Management. Africa Soil Health Consortium, Nairobi.
4. Food and Agriculture Organization of the United Nations 2011. Climate-Smart Agriculture: Smallholder Adoption and Implications for Climate Change Adaptation and Mitigation. MICCA and CCAFS.
5. FAO. 2018. Climate-smart agriculture training manual − A reference manual for agricultural extension agents. Rome. 106 pp.
6. Food and Agriculture Organization of the United Nations 2013. Climate Smart Agriculture Source Book. Rome.
7. GIZ 2017. ToT Manual for Good Agricultural Practices, Facilitation and Business Skills in Potato Production: Masters Training Manual
8. ICARDA 2012. Conservation agriculture: opportunities for intensified farming and environmental conservation in dry areas: A synthesis of research and trials with smallholder farmers in drylands systems; benefits and constraints to adoption. International Center for Agricultural Research in the Dry Areas
9. Integrated Soil Fertility Management Training Manual for Zambia's Agricultural Extension Workers
10. Sanginga, N and Woomer, PI (Eds) 2009. Integrated Soil Fertility Management in Africa: Principles, Practices and Development Process. Tropical Soil Biology and Fertility, Institute of the International Centre for Tropical Agriculture, Nairobi. 263pp.
11. Stephen Twomlow and Robert Delve 2016. Lessons learned Designing and implementing conservation agriculture in sub-Saharan Africa; Environment and climate change; IFAD
12. SUSTAINET EA 2010. Technical Manual for farmers and Field Extension Service Providers: Conservation Agriculture. Sustainable Agriculture Information Initiative, Nairobi.
13. World Bank, FAO and IFAD. 2015. Gender in climate smart agriculture: module 18 for gender in agriculture source book. Agriculture global practice. Washington, D.C.: World Bank Group
14. World Bank; IFAD and FAO 2015. Gender in Climate-Smart Agriculture: Module 18 for the Gender in Agriculture Sourcebook
15. GoK and GIZ 2012. Agricultural Insurance Training - Manual and Lesson Plans. September 2012
16. ILRI 2011. Training Manual on Index Based Livestock Insurance
17. Mati B, 2009. Design of Soil and Water Conservation Structures for Smallholder Agriculture.
18. Namirembe, S., Nzyoka J.M. & Gathenya, J.M. 2015. A guide for selecting the right soil and water conservation practices for small holder farming in Africa. ICRAF Technical Manual No.24. Nairobi, Kenya: World Agroforestry Centre (ICRAF).

KCEP-CRAL Extension Manuals are well-written and up-to-date publications with basic information that Extension Officers and service providers need in each value chain. The comprehensive manuals cover all areas of the value chain.

Available extension manuals cover basic cereals (maize, millet and sorghum), pulses (beans, cow peas, pigeon peas and green grams), soil climate smart agriculture and Farming as a Business as listed:

1. Common Dry Bean Trainer of Trainers' Manual
2. Cow Pea Trainer of Trainers' Manual
3. Green Grams Trainer of Trainers' Manual
4. Pigeon Pea Trainer of Trainers' Manual
5. Maize Extension Trainer of Trainers' Manual
6. Millet Trainer of Trainers' Manual
7. Sorghum Trainer of Trainers' Manual
8. Climate Smart Trainer of Trainers' Manual
9. Farming As A Business Trainer of Trainers' Manual