KALRO
Kenya Agricultural & Livestock Research Organization

NAVCDP
NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

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

TRAINING OF TRAINERS' MANUAL

Musila R.N., Ngari B.M., Muthoni L., Wambua J.M., Kimani S.K., Ndubi J., Wefwila W.K., Otieno M.J., Ndambuki J.M., Otipa.M.J., Wayua F.O., Makelo M., Kirigua V.O. and Wasilwa L.A

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FOREWORD

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

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

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

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

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

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

PREFACE

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

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

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

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

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

Samuel Guto, PhD

National Project Coordinator

National Agricultural Value Chain Development Project

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Abbreviations and Acronyms

AEZ	Agro ecological zone
AIP	Agricultural Innovation Platform
AWD	Alternate Wetting and Drying
CCP	Critical Control Point
CF	Continuous Flooding
CIG	Common Interest Group
CL	Critical limit
CTT	Core Team of Trainers
ESMF	Environmental and Social Management Framework
FFBS	Farmer Field Business School
FSMS	Food Safety Management System
GAP	Good Agricultural Practice
GHG	Green House Gas
ha	Hectare
HACCP	Hazard Analysis Critical Control Points
IDM	Integrated Disease Management
INRM	Integrated Natural Resource Management
IPM	Integrated Pest Management
ISFM	Integrated Soil Fertility Management
ISWM	Integrated Soil and Waste Management
IWM	Integrated Weed Management
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	Kenya Climate Smart Agriculture Project
LF	Lead Farmers
MOALD	Ministry of Agriculture and Livestock Development
NARIGP	National Agricultural and Rural Inclusive Growth Project
NAVCDP	National Agricultural Value Chain Development Project
NRDS	National Rice Development Strategy II
RAP	Rice Agronomic Practices
SMART	Specific, Measurable, Achievable Realistic and Time Bound
TIMPs	Technologies, Innovations and Management Practices
ToT	Training of Trainers
VMG	Vulnerable and Marginalized Group

INTRODUCTION

About this manual

This training of trainers' manual consist of two parts; part 1 and part II. Part I comprises notes for the facilitators while part II is made up of training modules in the value chain.

PART I

This part consists of four sections including the background of the rice value chain, content of the Training, Training Design and Facilitators Guidelines.

SECTION 1: BACKGROUND

1.1 The Role of rice in the Kenyan economy

Rice is the third most important staple crop in Kenya after maize and wheat. Rice can be used as food, feed for animals, biofuel and as a source of industrial raw material. The per capita consumption has been increasing steadily from 12 kg in 2016 to 28 kg in 2022 attributed to change in food habits especially among the youth, increase in population and urbanization. Although the government has envisioned to be self-sufficiency in rice production by 2030, as of 2021 rice imports accounted for about 89% of the milled rice demand with an import bill of KES 31.1 billion (Economic Survey, 2022).

The rice crop is grown under irrigated, rainfed lowland and rainfed upland ecologies both for subsistence and as a commercial crop by over 300,000 small scale farmers. The irrigated ecology account for about 80% of the total rice produced in Kenya. Suitable area for rice production in the country is about 26% (1.5 million ha) of the total arable land out of which 0.5 million hectares is suitable for irrigated rice production while one million hectares can support rainfed production. On average, rice farm sizes range from 0.25 - 4.0 acres (0.1-1.6 Ha). The average yields under irrigated system is 4.0 t ha^{-1}, rainfed lowland is 2.0 t ha^{-1} and upland is 1.4 t ha^{-1} against potential of 7.5 t ha^{-1}, 3.5 t ha^{-1} and 2.5 t ha^{-1} respectively.

Despite the importance of rice in Kenya, the upgrading of the value chain to commercialization thresholds is constrained by low adoption of best bet technologies, innovations and management practices, inadequate supply of quality seed, high costs of inputs, inadequate irrigation water, low and declining productivity of land, unfavourable weather conditions, unregulated transboundary trade, unorganized marketing systems, lack of adequate milling machinery and poor post-harvest management of the paddy among others.

1.2 Role of rice in food and nutrition security

Whole grain rice contains approximately 94% starch, 11% protein and 1% lipids and can be processed and consumed as white rice, brown rice and parboiled rice. White rice is stripped of its bran and germ and therefore a major source of carbohydrates. In contrast brown rice is highly nutritious and is rich in vitamins and minerals such as vitamins B1, B3 and B6, manganese, phosphorus, and iron. It contains as much as four times the amount of insoluble fiber as white rice. Parboiled rice is higher in fiber and protein than white rice but is less nutritious than brown rice. Rice bran has a high nutritive value and is rich in proteins, vitamins B and E, and anti-oxidants. It contains 10−23% bran oil and once stabilized and extracted, is a high quality vegetable oil for cooking or eating.

1.3 Rice value chain as climate innovation

Despite being a staple grain, rice is a contributor to climate change. Anaerobic rice is responsible for over 48% of croplands' greenhouse gas (GHG) emissions. The most significant factor influencing nitrous oxide (N2O) emissions in paddy fields is the rate at which fertiliser N is applied, whereas the application of organic matter and continuous flooding both accelerate methane (CH4) emissions. Improved crop varieties and management practices can reduce greenhouse gas emissions. In particular, GHG emissions could be reduced by adopting innovations such as; water-use-efficient rice varieties ; the use of urea deep placement as opposed to integrated plant nutrition systems or broadcasting as a traditional technique of managing nitrogen; direct seeded rice as opposed to transplanted rice and alternate wet and drying (AWD) irrigation technique as opposed to continuous flooding (CF) irrigation

1.4 Objectives of the training

The purpose of the training is to provide farmer trainers with knowledge and skills on facilitating and supporting farmers, for increased productivity and commercialisation of rice through adoption of best bet technologies innovations and management practices (TIMPs). Specifically, the objectives of this training are to provide farmer trainers with:

a) Relevant attitude, knowledge and skill in farming as a business and market assessment techniques for market led production including establishment and management of rice fields.

b) Knowledge, skills and information on rice technologies, innovations and management practices within the rice value chain.

c) Knowledge and skills in participatory techniques for effective facilitation of adult learning processes through FFBS's and developing inclusive stakeholder partnership development for sustainable up scaling of rice.

After the training, the Trainer of Trainers as facilitators will train lead farmers (LF) in various aspects of rice value chain. The training will involve providing the LF with techniques in participatory preparation, mobilization, planning, implementation, monitoring and evaluation of training sessions. The lead farmers and county extension personnel will thereafter up scale the adoption of GAPs through farmer groups in their villages and those in the neighbourhood.

SECTION 2: TRAINING CONTENT

2.1 Orientation of the module

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

2.2 Module outline

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

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

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

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

d) **Module users** –facilitators

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

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

g) **Facilitators guideline** –detailed sessions, Training methods, materials and Session guides

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

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

Table 1: Summary modules outline for the rice value chain

No.	Module Name	Need addressed	Expected training outcomes	Duration
1	Climate change and climate smart agriculture	• The impact of climate crisis to rice production • The climate smart technologies for Rice value chain	• Master trainers made aware of the potential impact of climate change on Rice production • Master trainers updated on climate smart techniques for Rice	3 hours
2	Farmer Field Business School (FFBS) approach	• Skills/ technologies for production, processing and marketing	• Improved technologies, innovations and agronomic practices for rice availed	6 hours
3	Good Agricultural Practices (GAP) and Food Safety Management System (FSMS)	• Enhance food safety through lowering presence of hazardous solids organisms and pollutants pathogens	• Techniques for determining pollutants in food material explored for adoption in Rice value chain	4 hours 35 minutes
4	Rice production niches and climate requirements	• Identify areas suitable for rice production	• Master trainers learn rice production niches in their respective counties	5 hours 15 minutes
5	Rice variety selection	• Awareness on improved rice varieties	• Master trainers made aware of the new improved varieties	4 hours
6	Rice seed systems	• Awareness of seed systems operations.	• The seed supply systems analyzed.	4 hours

7	Rice climate smart agronomics practices	• Agronomic options for increased rice production	• Agronomic practices for rice production validated and upscaled	3 hours 20 minutes
8	Integrated soil and water management practices for rice production	• Soil water and fertility enhancing techniques availed	• All techniques validated and upscaled for increased production	5 hours
9	Rice crop health	• Mechanisms for control of major pests, diseases and weeds	• Reduction of yield loss of rice by the major pests, diseases and weeds	7 hours 15 minutes
10	Rice harvesting and Post- harvest management	• Storage technologies to reduce losses in quantity and quality	• Trainees sensitized on proper harvesting techniques and storage facilities, hygiene and monitoring	3 hours
11	Rice Nutrition	• Nutrition improvement in rice based diets	• Trainees sensitized on importance of rice to the people with special conditions and the general public and its effect on food and nutrition security status of Kenya.	7 hours 15 minutes
12	Rice value addition	• Various rice products, for human and animal feeds	• Rice products identified and prioritized for the farming communities and business entities	4 hours 15 minutes

13	• Rice mechanization and precision agriculture	• Adaptation of mechanized operations of rice from crop establishment, crop management to post-harvest	• Options of mechanization for increased yield availed to farmers.	4 hours
14	Rice Business and Marketing	• Implement business and marketing options are available in rice value chain	• Different business and marketing options analyzed and proposed for use by farmers	2 hours 20 minutes
15	Cross cutting Issues in rice Agricultural Innovation Platforms Gender mainstreaming and social inclusion Agricultural policy options for supporting smallholder farmers' rice production and marketing	• Articulate how voluntary marketing groups can draw benefits from rice value chain • Options of employment opportunities in rice production • Sites for information profiled at the county levels	• Opportunities for marginalized groups identified and gains made • Farmers get access to more information on Rice production	7 hours 10 minutes
Total Duration				**70 hours 25 minutes**

SECTION 3: TRAINING DESIGN

3.1 Delivery system

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

a) **Establishment of a team of facilitators -** A Core Team of Trainers (CTT) to train farmer trainers (service providers) as facilitators of a ToT course will be established. This will be done using this manual and modules contained therein. Each of the Master trainers will facilitate trainers of farmers and other stakeholders to acquire knowledge and skills for facilitating Farmer-led Field and Business Schools through practical demonstrations.

b) **Upscaling –**This will be done by selecting Lead Farmers (LF) to be trained in facilitation skills.

3.2 Partners and their roles

The partners envisioned in this training plan are:

a) **Core Team of Trainers** – Master trainers drawn from KALRO, Universities, and Tertiary Institutions offering crop sciences and State Department of Agriculture, MoALD will facilitate initial training of trainers of farmers and other stakeholders. They will also provide mentorship to farmers' trainers during the first year of LF trainings. They should also be available in the evaluation of the first round of LF trainings.

b) **County Government Department for Crops and Livestock** - County Coordination Teams (CCT) including technical departments and service providers will play specific roles of LF trainers, mentors and coordinators at sub-county level. They will assist FFBS to form partnership with stakeholders for sustainability. They will also support LF to establish their upscaling networks.

c) **Lead Farmer Networks**-association of LFs in the counties to take up farmer trainings and upscaling in the future. Lead farmer networks and groups will conduct exchange visits to learn best practices in other project implementing counties.

d) **Private Sector Service Providers** – Inputs suppliers, financial and business development service providers, market players and processors will partner and support growth of individual or Rice farmer groups.

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

3.3 Training duration

The proposed ToT course for Master trainers for 15 modules in the Rice value chain shall take a total of 60 hours 25 minutes of training period. This does not include break hours of mid-morning, afternoon and lunch breaks

3.4 Logic of design and flow of session

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

SECTION 4: Facilitator's guidelines

4.1 Preparation of Training materials

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

1. The facilitators should familiarize themselves and internalize the guidelines provided by this manual prior to the training.

2. The stationery required should be available within the training institution 3 days be- fore the training. These include name tags, writing materials, paper punch and medium size box files for participants' handouts filing.

3. Flip charts and good quality felt pens could be used interchangeably with projections. Each participant will require one felt pen while the trainers will require two sets of felt pens.

4. Visual aids such as field equipment and tools should also be arranged in time before the sessions start.

5. There should be adequate copies of participants' handouts (one per participant) to be distributed at the end of each session or as may be suitable.

6. Copies of the modules are distributed at the end of each module.

4.2 Preparation of training venue and sites

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

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

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

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

4.3 The trainees

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

4.4 Training program

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

4.5 Training methods

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

Table 2: Description of Training methods

Training method	Description of method
Plenary presentations	Use of PowerPoint or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Group exercises, visits and brainstorming sessions	To be considered where skills are an issue requiring sharing and trying
Role plays and problem-solving exercises	Plenary discussions have been considered as Training methods where attitude is an issue
On-farm practical demonstration and exchange visits	To be considered where hands-on practical skills are acquired through sharing and demonstration

4.6 Planning schedule and guideline for ToT preparation

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

1. **Six weeks** – recruit master trainers, compose CTT, have at least 5 Rice demonstration plots near training venue where possible

2. **Four weeks** – send out invitation letters to participants and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members

3. **Two weeks** – confirm names of participants; reproduce Training materials for facilitators and package, confirm preparedness of the field sites to be visited. Hold briefing of CTT members to finalize training plan. Confirm special guests if any

4. **Four days** –Confirm training sites preparedness, prepare sitting arrangements, and brief assistants

5. **One day** - arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at residence proposed

6. **On first day** – arrange for reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes:

    - Registration
    - Welcoming to venue by host
    - Elaborate introduction of CTT and participants
    - Introduction to the project and training course
    - Ground rules
    - Groups formation

4.7 Evaluation of the training

Half a day has been allocated for planning 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 the first being the individual trainees evaluate through evaluation forms without conferring or refereeing to each other. The evaluation forms are then collected and analysed by the CTT members.

The second evaluation approach is trainees' 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 do so, the CTT members should only give points of clarifications if any misunderstanding occurred but should

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

Table 3: Sample evaluation form

	Rating		
Aspect / Module	**Very Useful (3 marks)**	**Useful (2 marks)**	**Of Limited Use (1 marks)**
1. Climate change and Climate smart Agriculture			
2. Farmer Field and Business School Approach in Rice Production			
3. Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			
4. Rice production ecologies and Climatic Requirements			
5. Rice variety selection and access to quality seeds.			
6. Rice Seed Systems			
7. Climate Smart Agronomic Practices			
8. Integrated Soil and Water Management Practices for Rice			
9. Rice Crop Health			
10. Rice Harvesting and Post-harvest Management			
11. Rice Nutrition			
12. Rice Value Addition			
13. Mechanization of Rice production Activities			
14. Rice Business and Marketing			
15. 15.1. Cross-Cutting Issues (Agricultural Innovation Platforms)			
15.2. Cross-Cutting Issues (Gender, VMGs, Social, Environmental Concerns and Cohesion)			
15.3. Cross-Cutting Issues (Agricultural Policy Options for Supporting Smallholder farmers' rice production and marketing)			

4.8 Facilitator's training notes and Reference materials

4.8.1 Key Further reading

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

4.8.2 Guide on the use of the information

The trainers will be advised to issue farmers with utmost two publications for each of the training sessions. This is because if they go away with 10 publications in one visit, they may be over- whelmed with the material load and thus limit knowledge uptake. Also, some will just take away as many as they can if allowed. The list of all individual publications will be stored and available as electronic copies – mainly PDFs. The service providers are strongly advised to keep these electronic copies on a memory stick, CD or portable hard drive to enable farmers easily access and if necessary, print any of them out at a local internet café. Trainers will be advised to issue one General Rice farming manual to be accompanied by two other publications e.g. information sheets, brochures, factsheets and poster. With subsequent training modules, they can develop their collection of publications

PART II: TRAINING MODULES

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

1.1 Introduction to the module

Climate change is the long-term alteration in average weather patterns either globally or regionally. Potential negative impact of climate change and variability in agriculture, food systems and food security is a serious concern in Kenya. Agricultural production systems are likely expected to be highly impacted by climate change due to the low adaptive capacity and the high exposure to climate related risks. Major agricultural activities are prone to risks and uncertainties of nature which is affected by climate change either in intensity, scope or frequency. Climate change is expected to modify risks, vulnerabilities and the conditions that shape the resilience of agriculture systems as well as introducing new uncertainties. In paddy rice for instance, increased temperatures will lead to a reduction in photosynthesis, thereby reducing rice yields. Decreased rainfall will result in low volumes of irrigation water, thereby reducing rice productivity. Adoption of climate smart agriculture (CSA) through application of tools and technologies and effective communications of weather information will reduce the negative impacts of climate change and enhances access to food security in a changing environment. Thus, there is need to create awareness and mainstream suitable climate resilient technologies, innovations and management practices (TIMPs) to increase productivity, resilience to climatic shocks and mitigate the causes of climate change.

This module explains the concept of climate change, variability, adaptation and mitigation, as well as how climate smart agriculture practices can be used to improve rice productivity

1.2 Module learning outcomes

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

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

1.3 Module target group

This module targets agricultural extension service providers and agripreneurs dealing directly with farmer groups at community level or community facilitators.

1.4 Module users

The module is intended for use by master trainers who are members of the Core Team of Trainers (CTT), agripreneurs and Lead Farmers in the rice value chain target Counties.The facilitator using this module should thoroughly familiarize him/herself with the participant's Handouts (Training materials).

1.5 Module duration

The module is estimated to take about 3 hours

1.6. Module summary

Module 1: Climate Change and Climate Smart Agriculture in Rice Production			
Sessions	**Training methods**	**Training materials**	**Time**
1.6.1. Introduction to climate change and variability	• Plenary presentation • Group discussions • Plenary presentations	• Laptop • Projector • PowerPoint presentation • Flip charts • Participants' handouts	40 minutes

1.6.2. Impacts of climate change and variability on agriculture and food security	• Presentation • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts • Participants' handouts	1 hour
1.6.3. Concept of Climate smart agriculture (CSA) in rice	• Plenary presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts • Participants' handouts	40 minutes
1.6.4. Projected future climate scenarios affecting rice and how to manage	• Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts • Participants' handouts	30 minutes
1.6.5. Module review	• Participants' questions and comments • Facilitator's summary	• Flip charts • Laptop • Projector	10 minutes
TOTAL			**3 hours**

1.7 Facilitator's guidelines

1.7.1. Introduction and levelling expectations (1 hour)	**Session guide**
(The facilitator introduces the trainees to the module on climate change and climate smart agriculture and its important linkages. Thereafter, presents the Module objectives) **Trainees' expectation (30 minutes)** *The facilitator organizes the trainees into groups to come up with their expectations.*	• PowerPoint presentation • Distribute participants' handouts.

Module objectives (30 minutes) (The facilitator presents modules objectives) By the end of the training module the trainee should be able to: • Explain climate change and adaptations. • Define 'climate smart agriculture.' • Describe and explain available climate smart crop management practices in rice production. • Explain the benefits of selected climate smart crop management practices in rice production.	
1.7.2. Introduction to climate change and climate variability (30 minutes)	**Session guide**
Plenary presentation and discussion • 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	• PowerPoint presentation • Plenary discussion
1.7.3. Concept of Climate Smart Agriculture (CSA) (1 hour)	**Session guide**
(The facilitator presents to the trainees the principles underpinning CSA and the link to deliverable of project objectives) **Plenary presentation** • Definition of the CSA approach • The three pillars of CSA (productivity, Adaptation and **Mitigation** • Why CSA is needed • Group discussions on understanding of CSA	• PowerPoint presentation • Participants' handouts • Group discussion

1.7.4. Projected future scenarios that will impact productivity (40 minutes)	Session guide
(The facilitator leads the trainees in discussing future climatic projections focusing on rainfall and temperature, which directly impacts on crop yields) **Plenary presentation and discussion** • Long-term rainfall and temperature projections as impacted by climate change • Project impacts on food production and adaptation measures especially for rice • Short Video on showing projections of rainfall and temperature.	• PowerPoint presentation • Plenary discussion • Case study videos
1.7.5. Module review (20 minutes)	**Session guide**
(The facilitator leads the trainees in summarizing the key points discussed in the module)	Plenary discussion

1.8 Reference materials

1.8.1 Participants' handouts

- Fact sheet on climate change
- Climate change training notes

1.8.2 Further reading

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

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

2.1 Introduction to the module

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

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

2.2 Module learning outcomes

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

1. Concept of Farmer Field and Business School approach in the rice value chain, teaching and facilitating described.
2. Approaches on facilitating FFBS participatory learning process and developing FFBS curriculum demonstrated and explained
3. Knowledge and analytical skills to design simple experiments for testing and selecting the best option to mitigate the constraints of the Rice value chain mapped identified and explained.
4. Knowledge on engaging FFBS to shift from the subsistence production and focus on improving productivity towards farming business described and demonstrated.
5. Dissemination of TIMPs through a well-defined action plan that is specific, measurable, achievable realistic and time bound (SMART) identified and explained.

2.3 Module target group

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

2.4 Module users

This module is intended for use by Master trainers who are members of the Core Teamof Trainers (CTT), Lead Farmers and agripreneurs in the Rice value chain target counties. Thetrainers using this module should thoroughly familiarize themselves with the participants'Handouts (Training materials).

2.5 Module duration

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

2.6 Module summary

Module 2: Farmer Field and Business School Approach in the Rice Value chain			
Sessions	**Training methods**	**Training materials**	**Time**
2.6.1 Introduction, Climate setting, leveling of expectations and objectives.	• Group discussion • Plenary presentation	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	1 hour

2.6.2 Overview of FFBS key activities	• Plenary presentations • Plenary discussion	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	30 minutes
2.6.3 Introduction to Communication and communication skills	• Plenary presentation • Group discussions	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	40 minutes
2.6.4 Facilitation andleadership skills	• Plenary presentation	• Laptop • Projector • PowerPoint presentation, • Flip charts • Marker pens	30 minutes
2.6.5 Organization and Management in FFBS	• Plenary presentation • Group discussion	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	30 minutes
2.6.6 Developing FFBS Curriculum for the rice value chain	• Plenary presentation • Group discussion	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	1 hour
2.6.7 FFBS marketing tools	• Plenary presentation • Group discussion	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	50 minutes
2.6.8 SMART county action plan of rice value chain on the transfer of TIMPs	• Plenary presentation • Group discussion	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	1 hour

2.6.9 Module review	• Plenary presentation • Group discussion	• Laptop • Projector • PowerPoint presentation • Flip charts • Marker pens	30 minutes
TOTAL			**6 hours**

2.7 Facilitator's guidelines

2.7.1 Introduction, climate setting Leveling Expectations and Objectives (1 hour)	**Session guide**
*(Introduction of participants, setting training norms, formation of FFBS sub groups (Working groups) and trainees to share their expectations)**(40 Minutes)*** *The facilitator presents modules objectives **(20 Minutes)*** By the end of the module the trainee should be able to: • Describe and explain the concept, characteristics, principles of Farmer Field and Business School (FFBS) • Demonstrate and explain approaches to effective facilitation and participatory learning for FFBS. • Identify and demonstrate knowledge and analytical skills to design simple experiments for testing options. • Describe and explain the shift from the traditional focus on subsistence farming to improving productivity for enhanced farming business • Identify and explain a well-defined action plan for TIMPs dissemination that is specific, measurable, achievable, realistic and time bound (SMART)	• Summarize and display trainees expectations • Assign roles to the sub-groups • Set norms and nominate leaders • PowerPoint presentation
2.7.2 Overview of FFBS key activities (30 minutes)	**Session guide**
Plenary presentation The facilitator takes the trainees through the main concepts and pillars of FFBS which includes: • Concept, characteristics, principles of Farmer Field and Business School (FFBS) • Participatory technology development (PTD) for the Rice value chain TIMPs	• PowerPoint presentation

• Agro ecosystems Analysis (AESA) of the rice value chain • FFBS principle of Integrated production and pest management (IPPM) • FFBS Business concept and opportunities in the rice value chain stages	
2.7.3 Introduction to Communication andCommunication skills (40 minutes)	**Session guide**
Group exercise (20 minutes) **Gauge the understanding of trainees on:** • Communication channels • Barriers to effective communication • How to effectively communicate. **Plenary presentation (20 minutes)** • Communication and communication skills	• Group exercise and presentations • PowerPoint presentation • Participants' handouts
2.7.4 Facilitation and leadership skills (30 minutes)	**Session guide**
Plenary presentation • Qualities of a good facilitator • Golden rules of facilitation • Roles and responsibilities of FFBS facilitators • Difference between facilitation and teaching • Elements, types and characteristics of leadership	• PowerPoint presentation • Participants' handouts
2.7.5 Organization and management in FFBS (30 minutes)	**Session guide**
Plenary presentation on FFBS implementation and framework (30 minutes) • Ground working • Training of facilitators • Establishing PTDs at the FFBS • Season long FFBS sessions • Evaluation of PTDs • Field days • Graduation • Establishment of Lead Farmers' FFBS • Follow-ups.	• PowerPoint presentation • Participants' handouts

2.7.6 Developing FFBS Curriculum for the Rice value chain (1 hour)	Session guide
Plenary presentation (20 minutes) Steps of participatory technology development on the Rice value chain production • Identify the major constraints to increased yields of rice • Ranking of constraints. • Identify list of TIMPs to address the constraints • Rank the TIMPs in order from the most preferred • Develop PTD on the most preferred • Decide on the parameters for AESA • Develop FFBS curriculum using crop growth stage • Calendar for the rice production and marketing **Group exercises (20 minutes)** • Pair wise matrix ranking of constraints and TIMPs in Rice value chain • Curriculum development based on the value chain growth stages • Presentations of the Group exercises on flip charts **Plenary presentation (20 minutes)** • Constraint identification and ranking • TIMPs options identification and ranking • Identification of the growth stages of the value chain • Crop and development of FFBS training curriculum	• PowerPoint presentation • Group exercises
2.7.7 FFBS Marketing tools (50 minutes)	**Session guide**
Plenary presentation and group discussion (20 minutes) • Introduction to marketing concept • Marketing planning • Market survey **Group exercise (30 minutes)** • Profitability determination	• PowerPoint presentation, • Group exercise

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

2.8 Reference materials

2.8.1 Participants' handouts

- FFBS factsheets
- FFBS Training notes

2.8.2 Further reading

1. Ferris, S., Kaganzi, E., Best, R., Ostertag, C., Lundy, M. and Wandschneider, T (2008) A Market Facilitation Guide to Participatory Agroenterprise Development International Centre for Tropical Agriculture (CIAT), Cali, Colombia. https://www.crs.org/sites/default/files/tools-research/market-facilitators-guide-to-participatory-agroenterprise-development.pdf
2. FAO (2006) Farmer Field school guidance document planning for quality programmes

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

3.1 Introduction to the module

Good Agricultural Practices (GAPs) are based on the principles of risk prevention, risk analysis, and sustainable agriculture by means of integrated Pest Management (IPM) and Integrated Crop Management (ICM) to continuously improve farming systems. The rice value chain is faced with declining food safety, reduced food quality, requirements for sustainable farming practices. Worker safety and health issues and traceability requirements have become a common feature in the market place where the consumer requires assurance. Good Agricultural Practices are of utmost importance in protecting consumer health by ensuring safety throughout the food chain.

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

of effective Food Safety Management Systems (FSMS) through Hazard Analysis Critical Control Points (HACCP). Hazard Analysis Critical Control Points is a seven-step management system which provides the framework for monitoring the total food chain to reduce the risk of foodborne illness and, consequently, death. The system is designed to identify and control potential problems before they occur.

This module is designed for training and exposing trainees to food safety management systems along the rice value chain.

3.2 Module learning outcomes

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

1. The role of GAPs on matters of food safety and quality described.
2. Utilization of resources, environmental protection and conservation described.
3. Worker safety and health within the production system discussed.
4. Traceability in food safety and quality mapped and described.
5. Need for legal safe food production as a moral market requirement explained.
6. Risks /hazards of food safety within crop production chain identified.
7. Critical control point (CCPs) at different levels of crop production mapped and determined.

3.3 Module target group

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

3.4 Module users

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

3.5 Module duration

The module is estimated to take a minimum of 4 hours 35 minutes

3.6 Module summary

Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS)			
Sessions	**Training methods**	**Training materials**	**Time**
3.6.1 Introduction, objectives and levelling of expectations	• Groups exercise • Plenary presentation	• Marker pens • Flip chats • PowerPoint Presentation • Laptop • projector	20 minutes
3.6.2 Understanding GAP and its application in the rice value chain	• Plenary presentations • Group exercise • Plenary discussion	• Marker pens • Flip chats • PowerPoint Presentation • Laptop • Projector	20 minutes
3.6.3 Factors to consider when selecting a site for agricultural activities through risk assessment	• Group exercise • Farm visit within training site • Group presentations	• Flip charts • PowerPoint presentation • Laptop • Projector • Pictorials • Data sheets	30 minutes
3.6.4 Review of GAP requirements for auditand types of protocols possible	• Group work • Plenary presentations • Mock audit	• Flip charts • PowerPoint presntation • Laptop • Projector • Pictorials • Data sheets	30 minutes
3.6.5 Safe use of Pesticides and calibration of sprayersand nozzles	• Group work on nozzles and rate of discharge • Safety guidelines	• Pictorials • Knapsacks • Measuring cylinders • Tape measure • Nozzles • Empty clean Pesticide containers	30 minutes

3.6.6 Understanding of food safety management system in rice value chains	• Brain storming • Plenary presentation • Group discussions	• Flip charts • PowerPoint presentation • Laptop • Projector	20 minutes
3.6.7 Determination of food safety risk hazards in rice value chain (hazard analysis)	• Plenary presentation • Group discussions	• PowerPoint presentation • Participants' handouts	25 minutes
3.6.8 Determination of critical control points (CCP) in rice value chain	• Plenary presentation • Group discussions	• Power point • Laptop • Projector • Flip charts	1 hour
3.6.9 Prevention and corrective measures for CCP in rice value chains	• Plenary presentation • Group discussions	• Flip charts • PowerPoint presentation • Plenary discussion	20 minutes
3.6.10 Module review	• Participants' questions and comments • Facilitator's summary	• Participants' handouts • Module review	20 minutes
TOTAL			**4 hours 35 minutes**

3.7 Facilitator's guidelines

Module 3: Good Agricultural Practices (GAPs) and Food Safety ManagementSystems (FSMS)	
3.7.1 Introduction and Levelling Expectations (30 minutes)	**Session guide**
The facilitator welcomes trainees to the module on FSMS and introduces him/herself stating profile and experience of working with farmers. **Trainees' introductions and expectations (30 minutes)** The facilitator invites the trainees to state their expectations after discuss in their respective county groups *The facilitator presents modules objectives*	• Summarize trainees' "Expectations" on a flipchart and make displays • PowerPoint presentation

Module objectives (30 minutes) **By the end of the module the trainee should be able to:** • Describe the role of GAPs on matters of food safety and quality. • Explain utilisation of resources (water, soil, manure, fertilizers, and other inputs), environmental protection and conservation. • Discuss worker safety and health within the production system. • Describe and explain traceability in food safety and quality. • Explain the need for legal safe food production as a moral market requirement. • Identify risks /hazards of food safety within crop production chain. • Describe the Critical Control Point (CCPs) at different levels of crop production.	
3.7.2 Understanding what is GAP and its application in the rice value chains	**30 minutes**
Facilitator leads discussions on understanding of GAPs and its relevance to actors in the rice value chain **Plenary presentation** Understanding GAP in the context of rice production • Explain the role of GAPs in safe and sustainable food production system for growers and consumers. • Understanding GAPs as the key to high commodity market destinations	• PowerPoint presentation • Participants' handouts • Group exercise
3.7.3 Discussion of what factors to consider when selecting a site for agricultural activities through Risk assessment	**1 hour**
(Facilitator guides discussions on the key determinants of site suitability for agricultural activities). **Plenary discussion** • Factors to be considered in an agricultural site selection(Site history, Slope of land, type of soil versus crop, water sources and physical quality, soil and water analysis) • The Need for documentation in a farm assurance system • Types of Mandatory farm records	• PowerPoint presentation • Participants' handouts

3.7.4 Review of GAP requirements for audit and types of protocols possible	1 hour
(The facilitator leads the trainees in summarizing the key points discussed in the module) **Plenary presentation** • Methods and procedures required at on-farm level to obtain GAP certification in rice production. • Good soil management practices (appropriate crop rotations, manure application) • Careful management of water resources and efficient use of water for rain-fed rice crop production via irrigation. • Selection of crop types and varieties to meet local consumer needs. • Adoption of IPM practices to minimize the potential impact of pest control actions on workers, food, and environmental and health safety. • Minimizing contamination at Harvest, On-farm Processing and Storage.	• Group work • PowerPoint presentation • Participants' handouts
3.7.5 Introduction to site selection (1 hour)	**Session guide**
(The facilitator introduces the various factors involved in site selection) **Plenary presentation** • Factors to be considered in an agricultural site selection • The Need for documentation in a farm assurance system • Types of Mandatory farm records • General guidelines to Conservation Agriculture	• Group work and presentation by groups • PowerPoint presentation • Participants' handouts
3.7.6 GAP checklists and audit (1 hour)	**Session guide**
Facilitator guides the trainees on self-assessment (Internalaudit and corrective measures for non-compliance) **Plenary presentation** • Need for mandatory records in GAPs • Internal Audit procedures • Practical on Mock Audits • Interpretation of audit reports • Compliance and Corrective action **Group exercise** • Groups Audit a farm or a process within the training site • Present Audit results and verdict and Corrective ion	• PowerPoint presentation • Global GAP Checklists • Participants' handouts • Group Exercise

3.7.7 Safe use of pesticides and calibration of sprayers and nozzles (1 hour 30 minutes)	Session guide
The facilitator organizes the trainees into groups to identify level of knowledge on pesticide use and safety knowledge. Determination of pesticide quantities to use and PHI **Plenary presentation** • Formation of groups and for practical activities • Guided Knapsack calibration • Different types of nozzles and their use • Pesticide safety **Group Exercise** • Practical session on calibration of pesticides, different types of pesticides and their handling	• PowerPoint presentation • Pesticide containers • Knapsack sprayers • Nozzles • Participants' handouts • Group exercise
3.7.8 Understanding food safety (30 minutes)	**Session guide**
The facilitator introduces the topic on food safety system by defining it and sharing its benefits with the trainees). **Plenary presentation** • Overview of Food safety management systems • Why food safety is important in crops production systems • Risks to human/animal health due to chemical, biological and physical hazards exposure • Legal and market requirements for food safety practice • Food safety practices that reduce risks/hazards • Use of HACCP tool/system for monitoring crop production	• List the responses on flip chart • PowerPoint presentation • Participants' handouts
3.7.9 Determination of food safety risks/hazards (30 minutes)	**Session guide**
Facilitator should guide discussions on the steps of identification of food safety hazards FSMS **Plenary presentation** • Explain the concept of risk identification (Hazard analysis) • Listing the types of hazards that cause illness or death • Determine factors influencing likely occurrence/ severity of hazards identified • List hazards alongside the possible control	• PowerPoint presentation • Participants' handouts • Group exercise .

• measures • Explain the concept in a flow diagram **Group Exercise** • Groups to identify major risk/hazards at points of crop production for rice • Produce flow diagrams for each crop	
3.7.10 Determination of critical control points (CCP)in rice value chains (1 hour)	**Session guide**
The facilitator introduces the topic on determination ofcritical control points (CCP) **Plenary presentation** • Why it is important to determine CCP in production • chain (preventing, eliminating or reducing risks) • How to monitor and measure the CCP (point, step or procedure) • How to document the CCP • How to establish critical limits (from standards/ guideline) for each CCP **Group Exercise** • Groups to identify and establish critical controlpoints and critical limits for rice.	• PowerPoint presentation • Participants' handouts • Group exercise
3.7.11 Prevention and corrective measures for CCP in rice value chains (1 hour)	**Session guide**
The facilitator introduces the topic on prevention andcontrol of possible hazards **Plenary presentation** • Establishment of corrective actions against CCP • Establish verification procedures for CCP • Establish record-keeping and documentation • procedures • How to develop HACCP plan and Food safety kit **Group Exercise** • Groups to identify and establish corrective actions and verification procedures for rice.	• PowerPoint presentation • Participants handouts' • Group exercise

3.7.13 Module Review (30 minutes)	Session guide
The facilitator leads the trainees in summarizing the key points discussed in the module **Discuss with trainees about new lessons learnt from this module:** • What are some of the problems and issues that they have become more aware of in the module	• Plenary discussion

3.8 Reference materials

3.8.1 Participants' handouts

- Good Agricultural Practices (GAP) training notes
- Good Agricultural Practices (GAP) pamphlets and leaflets

3.8.1 Further reading

1. Hazard Analysis Critical Control Point Principles and Application Guidelines (2018). National Advisory Committee on Hazards Criteria for Foods.

MODULE 4: RICE PRODUCTION NICHES AND CLIMATIC REQUIREMENTS

4.1 Introduction to the module

Rice is currently the third most important cereal crop after maize and wheat. It is grown mainly by small-scale farmers in 23 counties in Central (Mwea), Western (Bunyala), Coast (Tana delta, Msambweni) and Nyanza provinces (Ahero, West Kano, Migori and Kuria as a commercial and food crop. About 80% of the rice grown in Kenya is from irrigation schemes established by Government while the remaining 20% is produced under rain-fed conditions. Several areas are suitable for rice growing but low moisture and temperatures limit production (L-LM4 Zones). The current production of rice only meets about 10% of the demand, which has been increasing at 12% per annum. The increase in demand is attributable to the changing eating habits coupled with a growing population with high consumption by the youth. By the year 2030, the demand for milled rice is expected to reach 1200MT. This module is designed to train farmer facilitators' and expose them to the different types of production ecological (altitudes, soils, AEZs and climatic conditions) suitable for rice production in the selected Counties. Rice is adapted to a wide range of ecological conditions such as the, dry, warm and hot areas from lowland to lower midland zones. Due to the changing climate conditions and its increased demand farmers are requesting high

yielding varieties that are draught. There is need for the knowledge on the production niches and climatic conditions for the production of the crop in the various target counties.

4.2 Module learning outcomes

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

- Importance of rice in Kenya's economy as food security crop discussed and appreciated.
- Altitudes and soil types/characteristics for rice production identified and explained.
- Climatic conditions (temperature, rainfall and humidity) required for rice production explained and described.
- County agro-ecological zones for rice production described.

4.3 Module target group and categories

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

4.4 Module users

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

4.5. Module duration

The module is estimated to take a minimum of 5 hours and 15 minutes

4.6 Module summary

Module 4: Rice production niches and climatic requirements			
Sessions	**Training methods**	**Trainingmaterials**	**Time**
4.6.1 Introduction and Climate Setting	• Self-introduction • Plenary presentation • Plenary discussions to share expectations	• Flips charts • Felt pens • Laptop for PowerPoint presentation • Projector	60 minutes

4.6.2 Importance of rice in Kenya's economy	• Plenary presentation • Plenary discussion	• Flips charts • Felt pens • Laptop for PowerPoint presentation • Projector • Participants' handouts	60 minutes
4.6.3 Rice production ecological and climatic requirements for optimal yields	• Plenary presentations • Plenary discussions	• Flips charts • Felt pens • Laptop for PowerPoint presentation • Projector • Participants' handouts	60 minutes
4.6.4 Rice production Agro-ecological zones (AEZs)- average yields, and constraints in the target Counties	• Group exercise • Plenary presentations • Plenary discussions • Field demonstration	• Flips charts • Felt pens • Laptop for PowerPoint presentation • Projector	120 minutes
4.6.5 Module review	• Discussions/ conclusion and way forward	• Flip charts • Laptop for PowerPoint presentations	15 minutes
Total			**5 hours 15 minutes**

4.7 Facilitator's guidelines

Module 4: Rice production and appropriate climatic requirements	
4.7.1 Introductions and climate setting (1 hour)	**Session guide**
(The facilitator welcomes trainees to the module on Rice Production and Appropriate Climatic Requirements) **Module objectives (30 minutes)** By the end of this training module, the trainee should be able to: • Explain the importance of rice in Kenya's economy.	• PowerPoint presentation • Group exercise (listing and presenting expectations).

• Identify and describe altitudes and soil types/ characteristics for rice production. • Describe climatic conditions (temperatures, rainfall and humidity) required for rice production. • Describe specific county agro-ecological zones for Garden pea production. **Expectations (30 minutes)** The trainees go into groups (e.g., county-based) and list their expectations from the module.	
4.7.2 Importance of Rice in Kenya's Economy(1 hour)	**Session guide**
Plenary presentation (40 minutes) • Origin and place of rice as a crop • Importance of rice in Kenyan households • Key counties producing rice in Kenya • General rice production in Kenya **Facilitator's guided discussion (20 minutes)** • Importance of Rice in Kenya's Economy	• PowerPoint presentation • Participants' handouts
4.7.3 Rice production ecological/climatic requirements (1 hour)	**Session guide**
Plenary presentation (40 minutes): Presentation on • Importance of rice in Kenya's economy • Altitude and Agro-ecological zones • Climatic conditions (Rainfall, Temperature and humidity) • Soils (soil types, pH, general fertility for rice **Facilitator's guided discussion (20 minutes)** Questions/answers/comments	• PowerPoint Presentation • Distribute to participants Handouts (Training materials)

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

4.8 Reference materials

4.8.1 Participants' handouts

- Rice production handouts
- Rice production leaflets /Brochure

4.8.2 Further reading

1. Musila, R., Gichuhi, E., Menge, D., Ngari, B., Kega, V., Oyange, W., Koskei, V., Gichuru, M., Kimathi, H., Aleri, D., Mwaura, N., Mwangi, M., and Murage, A. (2022). Handbook of Paddy Rice cultivation in Mwea, Kenya. https://www.kalro.org/crops-propagation-e-books/rice-handbook

2. Kega, V.M. Esther W. Gikonyo, Catherine W. Muriithi, Julius M. K. Macharia and Lucy Muthoni (2015). Rice cultivation manual

MODULE 5: RICE VARIETY SELECTION

5.1. Introduction to the module

Rice varieties are bred for either irrigated rainfed lowland or upland ecologies. The varieties are selected based on ecological requirements, and other attributes such as resistance to biotic and tolerance to abiotic stresses and also grain quality. The quality of the seed and grain characteristics are essential. Use good quality seeds with no insect damage and no contaminants (weed seeds, stones, other seed types) with high percentage of viability (>80%) give optimum yield under right conditions. The rice variety selection module is designed for introducing Master trainers to all improved rice varieties, their attributes, uses and target area of production. The rice varieties are released for different ecological areas either for being under irrigation and or upland conditions. Due to the changing climate towards drier conditions and the increased demand of rice wide ecological areas, farmers are demanding for new rice varieties. However, farmers are not able to identify varieties suited to their regions and their needs therefore making it necessary for farmer trainers in the rice target counties to be trained on the different rice varieties, their suitable areas of production and their value-added traits.

5.2 Learning outcomes

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

- The rice crop described
- Improved rice varieties, their ecological areas of cultivation and attributes and uses described and identified.
- Appropriate varieties for specific ecologies and regions identified.

5.3 Module target group

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

5.4. Module users

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

5.5 Module duration

The module is estimated to take 4 hours

5.6 Module summary

Module 5: Rice Variety Selection			
Sessions	**Training methods**	**Training materials**	**Time**
5.6.1. Introduction and Objectives Expectations	• Plenary presentation • Group discussions and presentation of expectations	• Flip charts • PowerPoint presentation • Laptop • Projector	60 minutes
5.6.2. Introduction to various improved rice varieties, their ecological areas of cultivation and their attributes and uses.	• Group exercises to identify rice improved varieties • Plenary presentation • On-farm practical demonstration	• PowerPoint presentation • Laptop • Projector • Flip charts • Manila papers • Mark pens	40 minutes

5.6.3 Appropriate variety for specific regions	• Plenary presentation • Group exercises	• PowerPoint • Laptop • Projector	2 hours
5.6.4. Module review	• Group Exercise • Facilitator's summary	• Participants' handouts • Rice manual	20 minutes
TOTAL			**4 hours**

5.7 Facilitator's guidelines

5.7 Rice Variety Selection	
5.7. 1 Introduction and levelling of expectations and objectives (1 hour)	**Session guide**
Introduction (30 minutes) (*The facilitator welcomes trainees to the module on rice varieties and introduces himself/herself by stating his/her profile and experience)* The facilitator invites the trainees to introduce themselves and state their expectations. **Module objectives (30 minutes)** *(The facilitator presents modules objectives)* By the end of the module the trainee should be able to: • Describe the rice crop and its climatic and ecological requirements. • Identify improved rice varieties their ecological areas of cultivation and their uses. • Identify the varieties suited to the counties of interest.	• Summarize trainees' "expectations" and display. • Distribute participants' handouts • Program
5.7.2 Introduction to rice and the various improved rice varieties an their uses (30 minutes)	**Session guide**
(The facilitator should describe the rice crop; The facilitator should be able to guide the trainees in identifying the various rice improved varieties and their uses). **Group work (10 minutes)** Ask trainees highlight and describe some of the rice varieties they know.	• Participants' handouts • Rice varieties samples

Plenary presentation (10 minutes) • Improved rice varieties. • Categories of rice varieties. **Demonstration** Demonstrate to the trainees the various rice varieties	
5.7.3 Recommended rice varieties for the target counties (2 hours)	**Session guide**
Plenary presentation **Varieties for the target counties (30 minutes)** • Rice growing regions and the new regions which are being targeted for rice cultivation in Kenya. • Rice varieties suited for each county • County climate conditions for target county (semi- arid, hot dry low land, cold dry highlands,) **Group exercises (30 minutes)** Trainees discuss and come up with a list of rice varieties in their area **Group exercises (1 hour)** *(Ensure there is an established plot of all the varieties or rice plant samples).* • Visit the rice 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 rice plant samples for the various varieties)	• Distribute participants' handouts. • PowerPoint presentation • Group exercise
5.7.4. Module review (20 minutes)	**Session guide**
The facilitator leads the trainees in reviewing the module) Summarize the main points of the training together with the trainees: • Discuss with trainees about new lessons learnt from this module • Issues that need clarification	• Participants' handouts • Summary of the main points from the module.

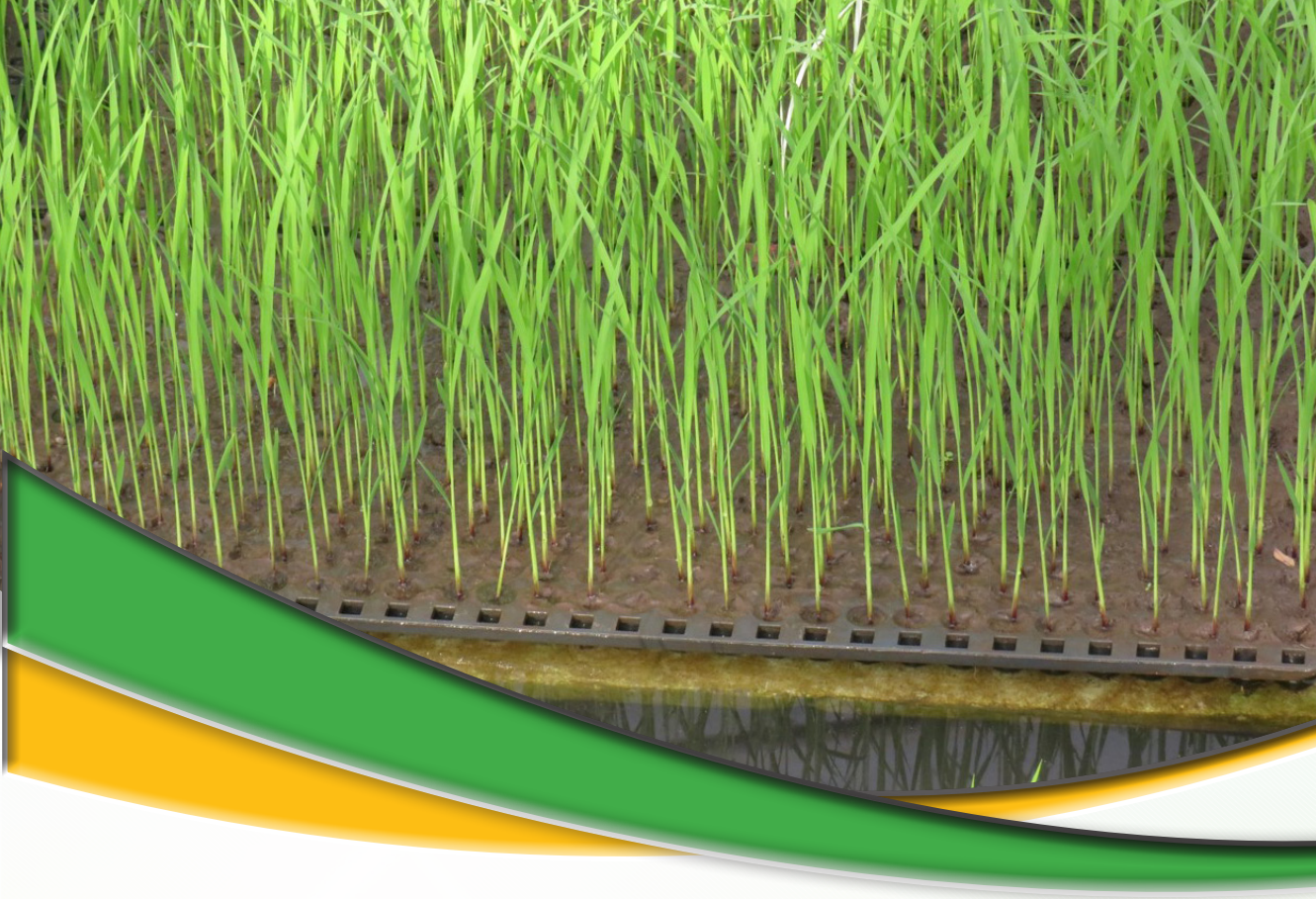
5.8 Reference materials

5.8.1 Participants' handouts

- Rice brochures and leaflets
- Rice harvesting and Post-harvest management factsheets
- Training notes on rice variety selection

5.8.2 Further reading

1. Musila, R., Gichuhi, E., Menge, D., Ngari, B., Kega, V., Oyange, W., Koskei, V., Gichuru, M., Kimathi, H., Aleri, D., Mwaura, N., Mwangi, M., and Murage, A. (2022). Handbook of Paddy Rice cultivation in Mwea, Kenya. https://www.kalro.org/crops-propagation-e-books/rice-handbook
2. Kega V. M. Esther W. Gikonyo, Catherine W. Muriithi, Julius M. K. Macharia and Lucy Muthoni (2015). Rice cultivation manual.



MODULE 6: RICE SEED SYSTEMS

6.1. Introduction to the module

There are two rice seed systems in Kenya. The formal and informal system. The formal system supplies certified seed for commercial production while the informal farmers use farm saved seed or they can obtain from neighbours or buy grain from the market. The current use of certified seed for rice is at 15 % and the target is to increase its use to 75% by 2030. The Continued overuse of own saved seed for many years makes production of seed of improved varieties 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 rice. The practice of using own-saved seed system is only suited for subsistence production which is commonly practiced on upland rice cultivars. As agricultural production increasingly becomes commercialized and global food markets become more competitive, farmers need to invest in certified seed of improved high yielding rice seed varieties for sustainability and profitability. This module exposes service providers, lead farmers, agripreneurs and facilitators to the various seed systems in rice production. The module also covers the importance of quality seed, how to improve on rice 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 seed production.

6.2 Module learning outcomes

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

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

6.3 Module target group

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

6.4 Module users

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

6.5 Module duration

The module is estimated to take a minimum of 4 hours

6.6. Module summary

Module 6: Rice seed system			
Sessions	**Training methods**	**Training materials**	**Time**
6.6.1 Introduction, objectives and expectations	• Personal introductions • Plenary presentation • Plenary discussions	• Flips charts • Felt pens • PowerPoint presentation	60 minutes
6.6.2 Definition of seed and seed system in Kenya	• Group work • Plenary presentation	• Flips charts • PowerPoint Presentation	60 minutes
6.6.3 Formal seed system in Kenya	• Plenary presentation • Plenary discussions	• PowerPoint Presentation • Flips charts • Felt pens	30 minutes

6.6.4 Informal seed system in Kenya	• Plenary presentation • Plenary discussions	• PowerPoint Presentation Flips charts • Felt pens	60 minutes
6.6.5 Module review and discussions	• Group work • Plenary discussion • Plenary presentation	• Flips charts	30 minutes
Total			**4 hours**

6.7 Facilitator's guidelines

Module 6: Rice seed system	
6.7.1. Introduction and levelling of expectations and objectives (1 hour)	**Session guide**
Introduction (30 minutes) *(The facilitator welcomes trainees to the module on rice seed system. They are then invited to introduce themselves and state their expectations)* **Module objectives (30 minutes)** *(The facilitator presents modules objectives)* By the end of the training module the trainee should be able to: • Describe the main rice seed systems in Kenya. • Explain and discuss the importance of formal seed system in rice production. • Explain and discuss importance of informal seed system, community seed bulking and its interface with formal seed production for enhanced production ofquality seeds.	• Summarize trainees' "Expectations" and display. • PowerPoint presentation • Distribute participants' handouts
6.7.2. 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)** • Seed system and characteristics of main seed systems (formal and informal seed systems) • Commodity corridors	• Group work • PowerPoint presentation • Distribute participants' handouts

6.7.3 Formal seed system in Kenya (30 minutes)	Session guide
Plenary presentations highlighting: • Legal requirements for seed certification • Seed certification process • Post certification activities for enforcing the SeedAct cap 326 • Post control activities for seed quality assurance • Seed importation and exportation requirements	• PowerPoint presentation • Distribute participants' handouts
6.7.4 Informal seed system in Kenya (1 hour)	**Session guide**
Plenary presentations (30 Minutes) • Seed multiplication at farm level • Synergies for formal and informal seed system **Group work and discussion (30 Minutes)** Calculate seed requirements for the county/ward/ farmergroup) and present	• Group work • PowerPoint presentation • Distribute participants' handouts
6.7.5 Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training and together withthe trainees review the main points	• The last participants' handouts • Summarize the main points from the module on a flip chart and display

6.8 Reference materials

6.8.1 Participants' handouts

- Rice seed systems training notes

6.8.2 Further reading

1. Musila R., Gichuhi E., Musyoki R., Kagito S., Njinju S., Menge D., Kiprono B., Oyange W., Koskei V. (2023) Certified rice seed production handbook for Kenya.

MODULE 7: CLIMATE SMART RICE AGRONOMIC PRACTICES

7.1 Introduction

Climate smart Rice Agronomic Practices (RAPs) are a set of integrated crop, soil, water, weed, disease, and pest management practices that have been shown to improve rice yields compared to farmers' practices. Rice varieties have agronomic packages, which a farmer should practice in order to reap maximum benefits from the variety. Improved varieties will not reach their genetic yield potential if farmers do not practice the recommended agronomic practices. It is therefore imperative for farmer Master trainers, public/private extension service providers, Agripreneurs and lead farmers in the rice target counties to be facilitated to guide rice farmers on the appropriate RAPs. This way, farmers will realize full genetic potential for the respective varieties in terms of higher yields and better-quality produce and thus contribute towards increased food security and incomes.

7.2 Module learning outcomes

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

1. Agronomic practices for rice production described and explained
2. Specific advice on rice production agronomic practicesprovided
3. Inputs and their right measurements for rice production identified

4. Timing for operations or inputs application in rice production described and explained.

7.3 Module target group and categories

This module is intended for lead farmers, public/private agricultural extension providers and Agripreneurs in the rice value chain target counties.

7.4 Module users

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

7.5 Module duration

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

7.6 Module summary

Module 7: Rice climate smart agronomic Practices			
Sessions	**Training methods**	**Training materials**	**Time**
7.6.1 Introductions and climate setting	• Presenter introduction • Self-introductionof trainees (incl. individual involvementin rice • Plenary discussions	• Flips charts • Felt pens • Laptop and projector for PowerPoint presentation	30 minutes
7.6.2 Objectives and expectations	• Presentations (guide on group work) • Group work (trainees enlist expectations) Plenary discussions to share expectations	• Flips charts • Felt pens • Laptop and projector for PowerPoint presentation	45 minutes
7.6.3 Agronomic practices for rice production	• Presentations • Practical work • Plenary discussions	• Flips charts • Felt pens • Laptop and projector for PowerPoint presentation	45 minutes
7.6.4 Appropriate inputs and their dosages in rice optimal production	• Presentations • Group work • Plenary discussions	• Flips charts • Laptop and projector for PowerPoint presentation • Participants' handouts	45 minutes

7.6.5 Module review and discussion	• Discussions/ conclusion and way forward	• Flip charts • Laptop and projector for PowerPoint presentations	30 minutes
Total			**3 hours 15 minutes**

7.7 Facilitator's guidelines

Module 7: Climate smart agronomic practices for rice	
7.7.1. Introductions, climate setting(30 minutes)	**Session guide**
(The facilitator welcomes trainees to the module on main rice seed system. They are then invited to introduce themselves and state their expectations)	• Summarize the facilitator/trainees involvement in rice value chains
7.7.2 Objectives and expectations (1 hour)	
Facilitator introduces Module objectives. **Objectives (30 minutes)** The facilitator presents the Module objectives. By the end of the training module, the trainee must be able to: 1. Explain and describe agronomic practices forrice production. 2. Describe and explain inputs and the right rates for rice production. 3. Provide region specific advice on rice production agronomic practices. 4. Specify the right timing for operations or inputsapplication in rice production.	• PowerPoint presentation • Group exercise • Expectations lists kept for later reviewing for compliancy
7.7.3.Agronomic practices for rice production (1 hour)	

Plenary presentation (40 minutes) The facilitator presents on: • Factors to consider in selecting rice as an enterprise • Climate smart land preparation • Climate smart seed selection • Climate smart Planting (Seed rates, plant density) • Water management • Nutrient management • Thinning and weed control • Pests and disease control • Cropping systems e.g. ratooning • Harvesting **Discussions (20 minutes)** Questions/answers and comments	• PowerPoint Presentation • Groups discussions • Distribute participants handouts/Training materials
7.7.4. Group work on selected RAPs (Nutrient management, water management, pest/disease control. Harvesting) (1 hour)	**Session guide**
Group work (30 minutes) • The facilitator guides trainees to list or/and present the requirements for each of the RAPs • The groups present their results in the plenary opening up for some questions, answers and discussions. **Plenary presentation (30minutes)** The facilitator present PowerPoint presentation from each of the RAPs discussed by the groups.	• PowerPoint Presentation • Distribute participants' handouts • Groups discussions
7.7.5. Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) Summary for the main points from the training • Review the trainees' expectations to gauge whether they were met by the training. • Randomly (average of 10 cases), trainees indicate new lessons learned from the module. The results are recorded per county presented.	• The last Participants' handouts/Training materials • Summarize the mainpoints of the moduleon a flip chart and display

7.8 Reference materials

7.8.1 Participants' handouts

- Climate Smart Rice Agronomic Practices training notes

7.8.2 Further reading

1. Kega, V.M., Gikonyo, E.W., Muiithi, C.W., Macharia, J.K. and Muthoni, L. (2015). Rice cultivation manual. Rural Development Administration (RDA) and Kenya Agricultural and Livestock Research Organization (KALRO).
2. Gikonyo, E.W., Kimani. S.K. Kibunja, C.N. Esilaba, A.O. and Mbuthia, L.W. (2018). Rice Response to Potassium Fertilization in Mwea, Kenya.
3. Ministry of Agriculture, Livestock and Fisheries (2016). Roadmap for rice seed development 2016 - 2026. Published by Agricultural Information Resource Centre (AIRC)

MODULE 8: INTEGRATED SOIL AND WATER MANAGEMENT PRACTICES FOR RICE PRODUCTION

8.1 Introduction to the module

Integrated Soil and Water Management (ISWM) refers to managing land and water resources to satisfy human needs while maintaining the integrity of ecosystems. It integrates soil, water, and nutrient management practices to improve agricultural productivity, reduce soil erosion, and protect water quality. The performance of the agricultural sector in Kenya has continued to decline over the years, due to poor application of ISWM, which has resulted in increased soil acidity, mining of nutrients, and lowering of the soil organic matter content caused by non-use organic resources. Consequently, macronutrients such as nitrogen (N), phosphorus (P), potassium (K), and sulphur (S) and micronutrients such as zinc (Zn), molybdenum (Mo), and boron (B) have been identified as deficient in Kenyan soils. Additionally, climate change has accelerated the decline of the agricultural sector performance through limited and unpredictable water supply to crop production systems. Integrated Soil and Water Management (ISWM) offers the best options for improving soil fertility and moisture while allowing for climate change adaptation.

Clay loams or riverine alluvial soils are the best for rice production, although it can still be grown in regular top soil. However, the overriding factor for rice production

is water, since it is mostly grown in flooded paddies. The optimal growth pH is 5–7.5. Although nitrogen (N) and potassium (K) are the most needed nutrients in rice, other macro and micro-nutrients are also required in adequate quantities to optimize productivity. In Kenya, rice is mostly cultivated by smallholder farms, characterised by continuous cultivation over time with inadequate replenishment of soil nutrients. While TIMPs to mitigate low rice production are available, farmers, however, have not realised the full benefits due to the limited adoption of ISWM. This module introduces service providers, lead farmers, and facilitators to the importance of integrated soil and water management practices for enhanced rice production.

8.2 Module learning outcomes

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

1. Soil composition, the various physical, chemical and biological properties and soil classification described and explained.
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 discussed and understood.
4. Soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping systems described.
5. Water harvesting technologies, soil and water management described.

8.3 Module target group and categories

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

8.4 Module users

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

8.5 Module duration

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

8.6 Module summary

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

8.6.2 Soil composition, properties and health	• Presentations • Practical's on soil sampling and analysis	• Flip charts • PowerPoint presentation • Participants' handouts • Laptop • Projector	30 minutes
8.6.3 Soil and plant tissue sampling and analysis	• Presentations • Field demonstrations (Conduct soil and plant tissuesampling and analysis)	• Flip charts • PowerPoint presentation • Participants' handouts • Laptop • Projector	1 hour
8.6.4 Soil fertility and plant nutrition	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Participants' handouts • Laptop • Projector	30 minutes
8.6.5 Soil health and (ISFM) for climate resilient cropping systems	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes
8.6.6 Soil and water management and water harvesting technologies	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes
8.6.7 Soil degradationand reclamation	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes
8.6.8 Problematic Soils and their management	• Presentations • Field demonstrations	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes

8.6.9 Module review and discussion	• Discussions	• Flip charts	30 minutes
Total			**5 hours**

8.7 Facilitator's guidelines

Module 7: Integrated soil and water management practices for rice production	
8.7.1. Introduction, objectives and expectations (30 minutes)	**Session guide**
(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations) **Module objectives (30 minutes)** *(The facilitator presents modules objectives)* By the end of the module the trainee should be able to: • Describe and explain soil composition and what constitutes a healthy soil, including soil classification. • 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). • Describe soil health and Integrated Soil Fertility Management (ISFM) for climate resilient cropping systems. • Describe and explain water harvesting technologies, soil and water management.	• Summarize trainees' "expectations" and display. • PowerPoint presentation • Distribute participants' handouts • Training Program
8.7.2. Soil composition, properties and health (30 minutes)	**Session guide**
(The facilitator presents on soil composition, properties and health). **Plenary presentation (20 minutes)** Soil composition, properties and health • Description of soil composition • Description of soil properties • Describe what soil health is all about	• PowerPoint presentation • Distribute participants' handouts

Discussion (10 minutes) • Let the trainees recall what they learnt and discuss anyissues that may arise.	
8.7.3. Soil and plant tissue sampling and analysis (1 hours)	**Session guide**
Plenary presentation (30 minutes) • Overview of the soil sampling methods • Soil analysis results and interpretation • Overview of soil analysis results using available examples • Soil sampling guidelines **Practical exercise on soil sampling (30 minutes)** • Demonstration on soil sampling method	• PowerPoint presentation • Distribute participants' handouts • Practical demonstration
8.7.4. Soil fertility and plant nutrition (30 minutes)	**Session guide**
Plenary presentation (20 minutes) • Potential role of different soil managements techniques in addressing soil fertility challenges in rice hum smallholder farming systems • Integrated Soil Fertility Management techniques • Soil management guidelines **Discussion (10 Minutes**) • Let the trainees recall what they learnt and discuss any issuesthat may arise.	• PowerPoint presentation • Distribute participants' handouts • Brochures, leaflets and manual
8.7.5 Soil health and (ISFM) for climate resilient cropping systems (30 minutes)	**Session guide**
Plenary presentation (20 minutes) • 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 • Rice crop rotation • Conservation agriculture as a climate smart agriculture practice **Discussion (10 Minutes**) • Let the trainees recall what they learnt and discuss anyissues that may arise.	• PowerPoint presentation • Distribute participants' handouts

8.7.6 Soil and water management and water harvesting technologies (30 minutes)	Session guide
Plenary presentation (20 minutes) • Principles of soil management for increased crop productivity • Methods of tillage systems that conserve water for crop use. • Principles of soil fertility management for increased crop productivity • Methods of soil fertility management for increased crop productivity • Discussion (10 Minutes) • Let the trainees recall what they learnt and discuss anyissues that may arise.	• PowerPoint presentation • Distribute participants' handouts
8.7.7 Soil degradation and reclamation (30 minutes)	**Session guide**
Plenary presentation (20 minutes) • Overview of soil degradation and reclamation. • Reclamation measures of degraded soil • Identification of the causes of soil degradation • Identification of Reclamation measures of degraded soil **Discussion (10 Minutes)** • Let the trainees recall what they learnt and discuss any issuesthat may arise.	• PowerPoint presentation • Distribute participants' handouts
8.7.8 Problematic soils and their management (30 minutes)	**Session guide**
Plenary presentation (20 minutes) • Problematic soils and their management • Soils with unsuitable biological properties • Soils with unsuitable chemical properties • Soils with unsuitable physical properties **Discussion (10 minutes)** • Let the trainees recall what they learnt and discuss anyissues that may arise.	• PowerPoint presentation • Distribute participants' handouts

8.7.9. Module review (30 minutes)	Session guide
The facilitator leads the trainees in reviewing the module) Summarize the main points of the module together with the Trainees. • Discuss with trainees about new things learnt from this Module. • Ask them to identify some of the problems and issues that they have become more aware of in the module.	• The last participants' handouts • Summary of the main points from the module on a flip chart and display

8.8 Reference materials

8.8.1 Participants handouts

- Integrated Soil and Water Management Practices for Rice Production training notes
- Integrated Soil and Water Management Practices brochures and leaflets

8.8.2 Further reading

1. KALRO-KCEP-CRAL (2021) Soil Management Extension Manual
2. OFRA Technical Training Manual

MODULE 9: CROP PROTECTION AND HEALTH MANAGEMENT FOR RICE

9.1 Introduction to the module

Rice pests, diseases, and weeds are key hindrances to optimum productivity of rice. The major rice pests include invasive golden apple snails, rice stem borer, whorf maggots, grain-sucking bugs, storage pests, rodents, birds, and soil-borne insects. The major diseases of rice are rice blast, brown spot, rice yellow virus, bacteria blight, and soil-borne nematodes. The combined effects of pests, diseases, and weeds range from 10% to 100% rice yield loss.

Integrated Pests, Diseases and Weed Management (IPDWM) practices includes cultural, biological, mechanical, and chemical methods that are addressed in this module. There is a need to understand IPDWM practices, which reduces production costs through reduced levels of chemical use. Proper rice storage is needed to reduce post-harvest losses due to storage pests such as rice weevils and storage moths; thus, including a session on seed storage pest management. This module is intended for training farmer facilitators', who are expected to provide backstopping and capacity building for farmers.

9.2 Module learning outcomes

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

1. Major pests, diseases and weeds identified and described
2. Integrated pest, diseases and weeds management of rice described
3. Symptoms for specific diseases common in rice producing areas identified
4. Safe use of pesticides described and explained.

9.3 Module target group

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

9.4 Module users

This module is intended for use by Master trainers who are members of the Core Team of Trainers (CTT), Lead Farmers and agripreneurs in the rice value chain in target Counties. The facilitator using this module should thoroughly familiarize themselves with the Participants' handouts (Training materials).

9.5 Module duration

The module is estimated to take 7 hours 15 minutes

9.6 Module summary

MODULE 9: CROP PROTECTION AND HEALTH MANAGEMENT FOR RICE			
Sessions	**Training methods**	**Training materials**	**Time**
9.6.1 Introduction, objectives and expectations	• Personal Introduction • Group exercise • Plenary presentation • Plenary discussion	• Flips charts • PowerPoint Presentation • Laptop • Projector	30 minutes
9.6.2 Major rice pests that cause economic losses and their control methods	• Group work • Plenary presentation • Plenary discussion • Practical session	• Flips charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	1 hour 30 minutes

9.6.3 Sustainable Integrated rice pests' management practices; scouting, pests threshold determination	• Plenary presentation • Plenary discussion • Practical demonstration	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants handouts	30 minutes
9.6.4 Major rice diseases that cause economic losses	• Group work • Plenary presentation • Plenary discussions • Practical Session	• Flip charts • PowerPoint presentation • Participants' handouts	1 hour 30 minutes
9.7.5. Sustainable Integrated Diseases Management (IDM); scouting and threshold determination	• Plenary presentation • Plenary discussion • Field demonstration	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	45 minutes
9.6.6 Major rice weeds that causes economic losses	• Group work • Plenary presentation • Practical session	• Flip charts • PowerPoint presentation • Participants' handout	1 hour
9.6.7. Sustainable Integrated weed Management (IWM); scouting and threshold determination	• Plenary presentation • Plenary discussion • Field demonstration	• Flip charts • PowerPoint presentation • Participants' handouts	30 minutes
9.6.8 Safe use of pesticides and updated source for registered pesticides	• Plenary presentation • Practical session • Plenary discussion	• PowerPoint presentation • Flip charts • Laptop • Projector • Participants' handouts	30 minutes
9.6.9 Module Review	• Plenary Discussion • Recap of module	• Flip charts • Sharing of presentations	30 minutes
Total			**7 hours 15 minutes**

9.7 Facilitator's guidelines

Module 9: Rice crop health	
9.7.1. Introduction and levelling of expectationsand objectives (30 minutes)	**Session guide**
Introduction (15 minutes) *(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations)* **Module objectives (15 minutes)** *(The facilitator presents modules objectives)* By the end of the module training the trainee should be able to: • Identify major rice pests that cause economic losses. • Describe and explain and sustainable Integratedrice pests management (IPM) practices and scouting for threshold determination. • Identify the symptoms for specific diseases common in rice producing areas. • Describe Integrated Disease Management (IDM) of rice • Explain safe use of pesticides.	• Summarize trainees' "Expectations" and display • PowerPoint presentation • Distribute participants' handouts
9.7.2 Major rice pests that cause economiclosses and their control methods. (1 hour 30 minutes)	**Session guide**
(The facilitator presents on the commonly known rice pests that are of economic importance) **Group work (30 minutes)** • Trainees collects rice pest information from their counties. **Plenary presentation (30 minutes)** • Pest names and descriptions, symptoms of their infestation/type of damage • Data on losses caused by the pests **Practical session (30 minutes)** • Identification of rice pests from provided specimens • Practical: show 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

9.7.3. Sustainable Integrated rice pests management practices; scouting, and threshold determination (30 minutes)	Session guide
Plenary presentation (20 minutes) • IPM principles; how to implement the components, including cultural, physical, biological and chemical • Critical areas to consider include when scouting • Threshold determination and when to implement control measures **Discussion (10 minutes)** Let the trainees recall what they learned and seek clarification on the principles of sustainable IPM options	• PowerPoint presentation • Plenary discussion • Distribute participants' handouts
9.7.4. Major rice diseases that causeeconomic losses, conditions that favour theirdevelopment and their control methods (1 hour 30 minutes)	**Session guide**
Group work (30 minutes) • Determine rice diseases in specific counties **Plenary presentation (30 minutes)** • Presentations on rice 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 • Distribute participants' handouts • Disease identification guidelines • Printed photos of the major diseases • Practical exercise
9.7.5. Sustainable Integrated Diseases Management (IDM); scouting and threshold determination (45 minutes)	**Session guide**
Plenary presentation (15 minutes) • Critical areas to consider including scouting and when to implement rice disease control measures) • Presentation on Integrated Disease Management (IDM) in rice **Field visit (30 minutes)** • Visit Nearby field to collect and identify diseased samples	• PowerPoint presentation • Distribute participants' handouts • Disease management guidelines

9.7.6 Major rice weeds economic losses and control (1 hour minutes)	Session guide
(The facilitator presents on the commonly known garden pea pests that are of economic importance) **Group work (25 minutes)** • Trainees' collects rice weeds information from their counties. **Plenary presentation and discussion (15 minutes)** • Weed names and descriptions • Symptoms of their infestation/type of damage • Data on losses caused by the weeds **Practical session (20 minutes)** • Identification of weeds from provided specimens • Practical: show photographs of major weeds	• PowerPoint presentation • Group Work • Practical Session • Distribute participants' handouts • Printed photos of various weeds.
9.7.7. Sustainable Integrated Weed Management (IWM); scouting and threshold determination (30 minutes)	**Session guide**
Plenary presentation (15 minutes) • Define weeds and integrated weed management. • Explain the harmful effects of weeds on rice plants. • Differentiate the general types of weeds based on their morphology, life cycle and habitat • IPM principles; how to implement the components, including cultural, physical, biological and chemical • Critical areas to consider include when scouting • Threshold determination and when to implement control measures **Discussion (15 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 • Participants' handouts

9.7.8. Safe use of pesticides and update source for registered pesticides (30 minutes)	Session guide
Group exercise (15 minutes) • Ways used by farmers in mixing of pesticides/ ITK products; and their consideration on safe use of pesticides **Plenary presentation (15 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 • Group exercise
9.7.9 Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training together with the trainees: • Discuss with trainees about new lessons learnt from this Module • Issues that need clarification	• Participants' handouts • Summarize the main points from the module on a flip chart and display

9.8. Reference materials

9.8.1. Participants' handouts

- Training notes on rice pest identification and control
- Training notes on rice disease identification and their control
- Training notes on rice weeds identification and their management

MODULE 10: RICE HARVESTING AND POST-HARVEST MANAGEMENT

10.1 Introduction to the module

Inappropriate harvesting and postharvest handling methods are major rice production constraints that cause postharvest loss and waste along the rice value chain. Low-quality paddy rice and high food losses are attributed to improper handling during harvesting and improper storage, leading to increased moisture levels, spoilage, and insect and rodent damage. Farmer facilitators should be equipped with management strategies for controlling harvesting and postharvest losses to enable them to support farmers with the required information to secure high returns from investments in paddy rice through adopting improved on-farm and storage paddy handling practices. Widespread dissemination of the available climate smart TIMPs through farmer awareness, training and demonstrations can reduce the losses. This module is designed to train farmer facilitators' in rice harvesting methodologies and post-harvest handling to reduce losses and enhance the quality of the rice.

10.2 Module learning outcomes

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

1. Appropriate harvesting and post-harvest technologies for quality paddy rice identified.

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

10.3 Module target group

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

10.4 Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT), Lead Farmers and agripreneurs in the rice value chain target county. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts (Training materials).

10.5 Module duration

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

10.6 Module summary

Rice Harvesting and Postharvest Management			
Sessions	**Training methods**	**Training materials**	**Time**
10.6.1 Introduction, expectations and objectives	• Personal introduction • Plenary presentation • Plenary discussion	• Flip charts • PowerPoint presentation • Participants' handouts	20 minutes
10.6.2 Constraints and opportunities in post-harvest management of rice	• Group exercise • Plenary presentation	• Flip charts • Videos • Participants' handouts	40 minutes

10.6.3 Rice postharvest TIMPs • Maturity indices • Harvesting • Drying • Threshing • Sorting and grading • Storage-hermetic bags • Parboiling equipment	• Group work • Brainstorming sessions • Plenary presentation • Practical demonstration	• Projector • Laptop • Participants' handouts • Materials for practical demonstration (Rice, tarpaulin, moisture meter, salt, hermetic bags, parboiling equipment etc.)	1 hour 30 minutes
10.6.4 Module review	• Facilitator's summary • Group exercise	• Flip charts • Projector • Laptop • Module evaluation forms	30 minutes
Total			**3 hours**

10.7. Facilitator's guidelines

Rice harvesting and post-harvest management	
10.7.1 Introduction and levelling of expectations and objectives (20 minutes)	**Session guide**
(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations) **Introduction and Module objectives (10 minutes)** *(The facilitator presents the module's objectives)* By the end of the module trainees should be able to: • Explain the correct maturity indices and harvesting practices for rice. • Explain the whole range of postharvest practices for rice. • Explain the constraints and opportunities in rice postharvest value chain. • Explain climate-smart and gender-friendly postharvest TIMPs for minimizing the losses and enhancing the quality of rice.	• Participants' handouts • Training Program • PowerPoint presentation • Summarize trainees' "Expectations" and display them on flip chart/ board.

Expectations (10 minutes) • Assist the trainees to state their expectations based on the objectives	
10.7.2 Constraints and opportunities in postharvest handling of rice (40 minutes)	**Session guide**
(Highlight the rice postharvest value chain – harvesting, field drying, threshing and winnowing, drying-greenhouse dryers, sorting, grading and packaging, storage-hermetic bags, metal silo, parboiling equipment) **Group work (30 minutes)** • Trainees discuss constraints in the postharvest handling of rice, and suggest solution **Group presentation (10 minutes)** Trainees present results of group work in plenary	• PowerPoint presentation • Participants' handouts
10.7.3 Rice harvest and postharvest value chain TIMPs (1 hour 30 minutes)	**Session guide**
Plenary presentation (1 hour) • Maturity indices and harvesting of rice (importance of harvesting at the right maturity index, advantages and disadvantages of harvesting too early or too late) • Preparations farmers need to make prior to harvesting • Rice harvesting methods • Field drying • Threshing and winnowing • Sorting and grading • Drying before storage • Storage-hermetic bags, metal silos etc. • Parboiling equipment **Practical demonstrations (30 minutes)** • Determination of moisture content using moisture meter and subjective methods for storage • Drying using tarpaulin • Threshing using a motorized thresher and winnower • Storage of rice using hermetic bags	• PowerPoint presentation • Participants' handouts • Practical demonstration

10.7.4 Module review (30 minutes)	Session guide
(The facilitator leads the trainees in reviewing the module) **Plenary presentation (10 minutes)** Together with the trainees, summarize the main points of the training. **Group Exercise (20 minutes)** Together with the trainees review the main points about rice harvesting and post-harvest handling	• Summary of the main points from the Module • PowerPoint Presentation

10.8 Reference materials

10.8.1 Participants' handouts

- Rice brochures and leaflets
- Rice harvesting and Post-harvest management factsheets
- Training notes on rice harvesting and post-harvest management

10.8.2 Further reading

1. Kega, M.V. et al. (2015). Rice Cultivation Manual: Module on Harvest and Postharvest Management of Rice. KALRO/RRD Project
2. Wayua F.O., Otipa J. and Wasilwa L. (2017). Pre-harvest Rice Management. Factsheet , KALRO E-mimea Plant Clinics

MODULE 11: RICE NUTRITION

11.1 Introduction to the module

Rice is an important cereal crop and a staple food for over half of the world's population. There are many rice varieties based on size, thickness, colour, aroma, and nutritive value. In terms of nutritional value, the rice varieties are further divided into whole grains and refined or polished grains. Whole rice is brown in colour and has three edible components: bran, germ, and endosperm. The whole grain means that the fibrous bran layer and nutrient-rich germ remain intact, while the bran and germ in polished rice are removed through milling to ensure longer shelf life but reduced nutrition, thus rice fortification. Rice is one of the main food crops advocated to alleviate malnutrition in the country due to its high caloric level. It is also a nutrient-dense food crop that contains many nutrients vital to ensuring good health and well-being, like carbohydrates, protein, minerals, vitamins, and lipids. To further its usefulness, value addition has been incorporated in the processing stage to increase the nutritional value of rice and its products. The existing evidence on the awareness of the nutritional importance of rice and value addition is minimal, thus calling for further evaluation of the level of awareness and factors influencing this level of awareness among households to provide a strong basis for carrying out targeted nutrition programs.

This module is designed to train facilitators' on the nutrition importance of rice to the people with special conditions and the general public and its effect on food and nutrition security status of Kenya.

11.2 Module learning outcomes

1. The concept of nutritional composition of rice described
2. The role of rice in ensuring food and nutrition security discussed
3. Nutritional importance of rice and its health benefits articulated
4. Dietary diversification and complementary foods to rice identified and explained
5. Nutrition-based value addition and product development of rice described and explained.

11.3 Module target group

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

11.4 Module users

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

11.5 Module duration

The module is estimated to take 7 hours 15 minutes

11.6 Module summary

Module 11.0 Nutrition of rice			
Sessions	**Training methods**	**Training materials**	**Time**
11.6.1 Introduction, objectives and expectations	• Participatory introduction • Group exercise	• Projector • Laptop • Flip charts	30 minutes
11.6.2 Nutrition composition of rice	• Group exercise • PowerPoint presentation	• Flip charts • Marker pens • Projector • Laptop	40 minutes

11.6.3 The role of rice in food and nutrition security	• Power point presentation • Pictorials • Group exercise • Plenary presentation	• Laptop • Projector • Flip charts • Marker pens • Leaflets	45 minutes
11.6.4 Nutritional importance of rice and its health benefits	• Group exercise • Plenary presentation	• Flip charts • Felt pens • Projector • Laptop	50 minutes
11.6.5 Dietary diversification and complementary feeding	• Plenary presentation • Group exercise	• Projector • Laptop • Flip charts • Felt pen • Pictorials	50 minutes
11.6.6 Nutrition based Value addition and product development of rice	• Plenary presentation • Practical demonstrations • Sensory evaluation	• Projector • Laptop • Participants' handouts • Pictorials • Assorted value added cooking equipment's and ingredients • Sensory evaluation forms	3 hours 20 minutes
11.6.7 Module review	• Plenary presentations	• Flip charts • PowerPoint presentation • Module evaluation forms	30 minutes
Total duration			**7 hours 15 minutes**

11.7 Facilitator's guidelines

Module 11: Rice Nutrition	
11.7.1 Introduction and leveling of expectations (30 minutes)	**Session guide**
(*The trainer introduces the trainees to this module on nutrition of rice)* **Trainee's expectations (20 minutes)** • The facilitator organizes the trainees into groups to state and list their expectations **Module objectives (10 minutes)** **(***The trainer presents Module objectives on power point)* By the end of the module training, the trainee will be able to: • To understand the nutrition composition of rice. • Define food and nutrition security; understand the food and nutrition security status in Kenya and the role of rice in ensuring food and nutrition security. • To understand the nutrition importance of rice and its health benefits. • Identify and explain diversification and complimentary foods to rice. • Describe and explain how to make value added products and product development of rice.	• Participants' handouts • PowerPoint presentation • Summarize the trainees expectations and display on the flip chart
11.7.2 Nutrition composition of rice (40 minutes)	**Session guide**
(The facilitator leads the trainees in discussing the known nutrition aspects of rice and do a Plenary presentation on the nutrition composition and fortification of rice). **Group exercise (10 minutes)** • Nutrition awareness of rice **Plenary presentation(30 minutes)** • Documented nutrition composition of rice based on (brown and white) • Rice fortification • Arsenic in rice	• Group exercise • Flip charts • PowerPoint presentation

11.7.3 The role of rice in ensuring improved nutrition status nutrition status (45 minutes)	**Session guide**
(The facilitator will define food and nutrition security, explain food security status in terms of malnutrition and outline the role of rice in ensuring improved nutritional status thus ensuring food and nutrition security) **Plenary presentations (45 minutes)** • Define Food and nutrition security • The current food security status in Kenya • Role of rice in ensuring food security in Kenya	• PowerPoint presentation • Plenary presentation • Participants' handouts
11.7.4 Nutritional importance of rice and its health benefits (50 minutes)	**Session guide**
Group exercise (30 minutes) *(The facilitators will divide the trainees into groups to discuss nutrition importance of rice at different stages in lifetime)* **Plenary presentation (20 minutes)** *(The facilitators present the nutrition importance of rice and its health benefits among people with special conditions like people living with HIV/AIDS, diabetes and hypertensive persons and in weaning children)* • Nutrition importance of rice and its benefits to people with special conditions • Nutrition importance of rice and its benefits throughout the life cycle	• Participants' handouts • PowerPoint presentation • Group exercise
11.7.5 Dietary diversification and complimentary foods (50 minutes0	**Session guide**
(The facilitator will define dietary diversification and complimentary feeds. Later on lead the discussion on types of foods that can be eaten with rice and finally define portion size and servings and do demonstration of each in ensuring healthy living) **Plenary presentation (10minutes)** • Defining dietary diversification and complementary feeding (*local nutrient dense foods*)	• Participants' handouts • PowerPoint presentation • Group exercise

Group exercise (20 minutes) • Group discuss on types of food eaten with rice (My plate, *SHARP diets, Balanced diets and DASH diets)* **Plenary presentation (20 minutes)** • Portion size and servings	
11.7.6 Nutrition based value addition and product development of rice (3 hours 20 minutes	**Session guide**
Plenary presentation (20 minutes) *(The facilitator will define value addition and product development and later on assemble Assorted value addition equipment's and ingredients and guide the group through cooking demonstration and sensory evaluation*) • Meaning of value addition and product development in relation to nutrition • Effect of value addition in nutritional composition of rice **Group exercise (3 hours)** • Requirements for value addition of rice • Practices that reduce arsenic in rice • Rice based value addition cooking demonstration and sensory evaluation	• Participants' handouts • PowerPoint presentation • Group exercise • Recipes • Pictorials • Sensory evaluation forms • Assorted value addition equipment's and ingredients
11.7.7 Module summary (30 minutes0	**Session guide**
Group exercise (30 minutes) *(The facilitator will lead a group exercise on reviewing the trainees expectations and question and answer session from the trainees)* • Review the trainees expectations to gauge whether they were met • What are the new things learnt from the module • Any question on rice nutrition	• Summary of the main points from the module

11.8 Reference materials

11.8.1 Participants handouts

- Rice manuals and leaflets
- Recipe handouts

11.8.2 Further reading

1. FAO (2022). The state of food security and nutrition in the world.
2. IPC (2022) Integrated food security Phase Classification report. (2022). IPC Acute Malnutrition Scale.

MODULE 12: VALUE ADDITION

12.1 Introduction to the module

This module introduces farmer trainers to the importance of rice in addressing food and nutrition security at the household, community and industrial levels. The module covers the value-added products, constraints in value addition and their suggested solutions. It is anticipated that developments in processing and value addition will enhance the production and commercialization of this crop.

12.2 Module learning outcomes

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

1. The role of rice as a food and nutrition security crop explained and appreciated.
2. Nutritional composition of rice, health benefits, food security and income described.
3. Constraints and opportunities in value addition of rice discussed and the solutions suggested.
4. Rice value-added products identified and explained.

12.3 Module target group

This module targets public and private agricultural extension agents, service providers, lead farmers and agripreneurs based at the sub-county and ward levels.

12.4 Module users

This module is intended for use by Master trainers who are members of the Core Team of Trainers (CTT), Lead Farmers and agripreneurs in the rice value chain target county. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts (Training materials).

12.5 Module duration

The module is estimated to take a minimum of 4 hours 15 minutes.

12.6 Module summary

Rice Value Addition			
Sessions	**Training methods**	**Training materials**	**Time**
12.6.1. Introductions, expectations and objectives	• Personal introduction Presentation • Group work • Plenary discussions	• Flip charts • PowerPoint presentations • Participants handouts	30 minutes
12.6.2 Constraints in value addition and consumption of rice	• Group exercise • Plenary presentation	• Constraints in value addition • Checklist for Prioritization • Pair wise ranking tool • Flip charts • Felt pens • Participants' handouts • Projector • Laptop	45 minutes
12.6.3 Rice based value added products	• Presentations • Plenary discussion • Practical demonstration • Sensory evaluation of value added rice products	• Projector • Laptop • Participant handouts • Assorted value addition equipment and ingredients (parboiled rice, brown rice, paddy rice, among others)	2 hours 30 minutes

	• Field visit to processing firms / groups	• Sensory evaluation forms	
12.6.4. Module review	• Facilitator's summary • Group exercise	• Flip charts • Projector • Laptop • Module evaluation forms	30 minutes
Total			**4 hours 15 minutes**

12.7. Facilitator's guidelines

Module 12. Rice value addition	
12.7.1 Introduction and levelling of expectations and objectives (30 minutes)	**Session guide**
Introduction and expectations (15 minutes) *(The facilitator welcomes trainees to the module on the value addition of rice. They are then invited to introduce themselves and state their expectations)* **Module objectives (15 minutes)** *(The facilitator presents Module objectives)* By the end of the module, the trainee should be able to • Explain the role of rice as a food and nutrition security crop • Describe nutritional composition of rice, health benefits, food security and income • Identify constraints in value addition and consumption of rice, and suggest solutions. • Explain how to make rice-based value-added products.	• Participants' handouts • Training Program • PowerPoint presentation • Summarize trainees' "Expectations" and display them on a flip chart/ board.
12.7.2 Constraints in value addition and consumption of rice, and suggested solutions (45 minutes)	**Session guide**
Group exercise (30 min) Groups discuss the constraints in rice value addition and consumption **Plenary presentation (15 min)** • Overview of constraints in value addition and consumption of rice	• PowerPoint presentation • Group exercise

12.7.3 Rice based value added products (2 hours 30 minutes)	Session guide
Plenary presentation (30 minutes) • Overview of rice-based value-added products • Meaning of value addition • Requirements for value addition of Rice • Rice-based value added products; sensory evaluation of the products **Practical exercise (2 hours)** • Demonstration on formulation of rice-based products, including complementary foods for children • Practical session on sensory evaluation of value-added rice products	• Participants' handouts • PowerPoint presentation • Recipes • Sensory evaluation forms • Assorted value addition equipment and ingredients
12.7.4 Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) Review the main points about rice value addition together with the trainees.	• Summary of the main points from the module.

12.8 Reference materials

12.8.1 Participants' handouts

- Rice value addition brochures and leaflets
- Recipe book
- Training notes on rice value addition

MODULE 13: MECHANIZATION OF RICE PRODUCTION ACTIVITIES

13.1 Introduction to the module

Agricultural mechanization serves to enhance production, productivity, and profitability in agriculture by ensuring timeliness in farm operations. It encompasses tasks such as land preparation, nursery setup, transplanting, and direct planting of rice. It also involves precision in the metering and placement of inputs, reducing losses of available inputs, increasing the efficiency of costly inputs like seeds, chemicals, fertilizers, irrigation, and water, reducing the unit cost of production, and thus enhancing profitability and competitiveness in operational costs. Further, it aids in the preservation of agricultural produce and by-products by preventing both qualitative and quantitative damage. It enables value addition and the establishment of agro-processing enterprises, contributing to additional income and employment generation from farm produce. During harvesting, mechanical reapers and combine harvesters offer alternatives to manual harvesting, thereby reducing both time and costs. Agricultural mechanization stands as one of the crucial inputs with the potential to revolutionize rice farming in Kenya, particularly when applied in planting, weeding, pest control, harvesting, and post-harvest activities.

This module is designed to sensitize and increase the capacity of master trainers, lead farmers, and relevant stakeholders on available mechanization options for rice production activities.

13.2 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 and transplanters 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 rice grading at processing, demonstrated

13.3 Module target group

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

13.4 Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT), Lead Farmers, and agripreneurs in the crop value chain target counties. Facilitators using this module should thoroughly familiarize themselves with the participants' handouts (Training materials).

13.5 Module duration

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

13.6 Module summary

Module 13. Mechanization of rice production activities			
Sessions	**Training methods**	**Training materials**	**Duration**
13.6.1 Introduction, objectives and expectations	• Personal introductions/know your audience • Plenary presentation • Plenary discussions	• Flip charts • PowerPoint Presentation • Laptop • Projector	30 minutes

13.6.2 Climate smart tillage options	• Plenary presentation • Plenary discussions • Practical demonstration	• Flip chart • Power Point presentation • Laptop • Projector • Participants' handouts	30 minutes
13.6.3 Calibration of fertilizer and rice seed planter and rice transplanters	• Plenary presentation • Plenary discussions • Practical demonstration	• Flip chart • Power Point presentation • Laptop • Projector • Participants' handouts	30 minutes
13.6.4 Pest and Weed control equipment and tools usage	• Plenary presentation • Plenary discussions • Practical demonstration	• Flip chart • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes
13.6.5 Harvest timing, yield estimation machines and tools, Estimation of harvesting losses	• Presentations • Plenary discussions • Practical demonstration	• Flip chart • PowerPoint presentation • Laptop • Projector • Participants' handouts	60 minutes
13.6.6 Machine and procedure for rice grading at milling	• Presentations • Plenary discussions • Practical demonstrations	• Flip chart • PowerPoint presentation • Laptop • Projector • Participants' handouts	30 minutes

13.6.7 Module review	• Plenary presentation	• PowerPoint presentation • Laptop • Projector	30 minutes
Total			**4 hours**

13.7 Facilitator's guidelines

Module 13: Mechanization of rice production activities	
13.7.1 Introduction, objectives and expectations (30 minutes)	**Session guide**
(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations). **Module objectives (30 minutes)** *The facilitator presents the module's 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 and rice seedling trans-planters. • Demonstrate the use of weed control equipment and tools. • Demonstrate their ability to estimate pre-harvest and harvesting losses. • Describe the machine and procedure for grain grading at milling.	• Summarize trainees' "Expectations"and display. • PowerPoint Presentation • Distribute Participants' handouts • Training program
13.7.2. Rice climate smart land preparation tools (30 minutes)	**Session guide**
(The facilitator presents on the 80 hp tractor, which is of economic importance). **Plenary presentation (20 minutes)** • Overview of the rice mechanization activities • Climate smart tillage options **Discussion (10 minutes)** Let the trainees recall what they have learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts

13.7.3. Rice calibration of fertilizer and seed rate for planters and trans-planters (30 minutes)	Session guide
Plenary presentation (20 minutes) • Techniques and methods of seed planter, trans-planter and fertilizer rate determination **Discussion (10 minutes)** Let the trainees recall what they have learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' handouts • Rice trans-planters.
13.7.4. Rice chemical implements and tools operations (30 minutes)	**Session guide**
Plenary presentation (20 minutes) • Techniques and methods of using pest control equipment such as knapsack spray **Discussion (10 minutes)** • Let the trainees recall what they have learnt and discuss any issues that may arise	• PowerPoint presentation • Distribute participants' handouts
13.7.5. Rice harvesting machine operating principles (1 hour)	**Session guide**
Plenary presentation (30 minutes) • Harvesting machines • Harvest timing and estimation of yield • Machine harvest yield losses **Discussion (30 minutes)** Let the trainees recall what they have learnt and discuss any issues that may arise	• PowerPoint presentation • Distribute participants' handouts
13.7.6 Machine and procedure for rice grading after milling (30 minutes)	**Session guide**
Plenary presentation (15 minutes) • Overview of rice grading machine procedure at milling **Practical exercise (15 minutes)** Demonstrations on management options	• PowerPoint presentation • Distribute participants' handouts

13.7.7 Module review (30 minutes)	Session guide
(The facilitator leads the trainees in reviewing the module) • Summarize the main points of the training, and, together with the participants, review these points:	• Participants' handouts • Summarize the main points from the module on a flip chart and display

13.8 Training materials

13.8.1 Participants' handouts

- Mechanization of rice production activities training notes
- Mechanization Pamphlets and leaflets.

MODULE 14: RICE BUSINESS AND MARKETING

14.1 Introduction

Rice is the third most important cereal for food security and income in Kenya. It can be grown under irrigated and rain-fed conditions, where it does well in about 23 counties. It is mostly grown by smallholder farmers for food and for sale at local markets. The main challenge is competition from imports and disorganized markets. There is also limited knowledge on market requirements and standards, record-keeping, and gross margins. Markets and marketing of rice are a major issue of concern to smallholder farmers and other actors in the value chain, given that the country imports 80% of its rice requirements. There is a need to supply sufficient volumes required for trade at the domestic level. In order to strengthen the rice value chain, it is important to equip farmer facilitators with the requisite skills and knowledge on rice farming business and marketing strategies.

This module is designed to train master trainers, providing them with the required skills that are useful in rice farming and marketing in Kenya.

14.2 Module learning outcomes

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

- Business concepts and emerging farming business models described.
- Opportunities and challenges associated with rice farming enterprise identified.

- Business management tools such as budgeting, entrepreneurship, record keeping, break-even price and gross margin of rice production described.
- Marketing strategies identified and explained.
- Details of a farm business plan outlined.

14.3 Module target group

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

14.4 Module users

The intended users of the module include master trainers who are members of the Core Team of Trainers (CTT), lead farmers and agripreneurs in the rice value chain target counties. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts (Training materials).

14.5 Module duration

The module is expected to take 2 hours 20 minutes

14.6. Module summary

Module 14: Rice Business and Marketing			
Sessions	**Training methods**	**Training materials**	**Time**
14.6.1: Levelling participants expectations about the module	• Introduction • Discussions	• Laptop • Projector • PowerPoint presentation • Flip chart	15 minutes
14.6.2: Introduction of the Module objectives and expectations	• Plenary presentations	• Laptop • Projector • PowerPoint presentations • Flip chart	10 minutes
14.6.3: Farming as a business concept and emerging business models	• Plenary presentations • Discussions	• Laptop • Projector • PowerPoint presentations • Flip chart	10 minutes
14.6.4: Opportunities and challenges associated with rice marketing-SWOT analysis	• Plenary presentations	• Laptop • Projector • PowerPoint presentations • Flip chart	20 minutes

14.6.5: Tools for management of rice production;- budgeting, record keeping, break-even price and gross margin analysis	• Plenary presentations • Discussions	• Laptop • Projector • PowerPoint presentations • Flip chart	30 minutes
14.6.6: Marketing strategies	• Plenary presentations	• Laptop • Projector • PowerPoint presentations • Flip chart	15 minutes
14.6.7: Details of a simple farm business plan	• Plenary presentations	• Laptop • Projector • PowerPoint presentations • Flip chart	10 minutes
14.6.8: Training review	• Facilitators summary	• Module review • Participants' handouts	30 minutes
TOTAL			**2 hours**

14.7 Facilitator's guidelines

Module 14. Rice business and marketing	
14.7.1 Levelling participants' expectations about the module (15 minutes)	**Session guide**
(The facilitator welcomes trainees to the module and does self-introduction including his/her profile and experience).	• Program • Participants handouts • PowerPoint Presentation
14.7.1.2 Participants expectations	**Session guide**
The facilitator asks the trainees to state their expectations by listing on a flip chart/board. **Plenary discussions**	• Summarize trainees expectations and display on a flip chart/board

14.7.2 Module Introduction, objectives and expectations (10 minutes)	Session guide
(The facilitator introduces the module and states the objectives and expectations). By the end of this module training participants are expected to: • Describe business concepts and emerging farming business models. • Identify opportunities and challenges associated with rice farming enterprise. • Describe tools for business management (Budgeting, entrepreneurship, record keeping, break-even price and gross margin) for rice production. • Identify and explain marketing strategies. • Outline details of a simple farm business plan.	• PowerPoint Presentation • Participants' handouts
14.7.3 Farming as a business concept and emerging farming business models (20 minutes)	**Session guide**
(The facilitator highlights the elements of a farming as a business concept and emerging farming business models (Contract farming) Plenary presentations: • Farming as a business concept • Emerging farming business models	• PowerPoint presentation • Participants' handouts
14.7.4 Opportunities and challenges associated with rice marketing-SWOT analysis (20 minutes)	**Session guide**
Plenary presentation • Community production and marketing system *Allow the trainees to raise issues on rice marketing and discuss them*	• PowerPoint presentation • Participants' handouts
14.7.5 Tools for management of rice production (30 minutes)	**Session guide**
Plenary presentations on: • Budgeting • Record keeping • Break-even price determination • Gross-margin analysis	• PowerPoint presentation • Participants' handouts • Practical exercises

14.7.6 Marketing strategies (15 minutes)	Session guide
(The facilitator highlights on the available marketing channels and the marketing strategies (collective marketing) **Plenary presentation** **Discussions**	• PowerPoint presentation • Participants' handouts • Practical exercises
14.7.7 Details of a simple farm business plan (10 minutes)	**Session guide**
The facilitator guides the trainees on the process of preparing a simple farm business plan **Group exercises** • Preparing a business plan	• PowerPoint presentation • Participants' handouts • Practical exercises
14.7.11 Training review (10 minutes)	**Session guide**
The facilitator leads the trainees in reviewing the module **Plenary presentation** • Summarize the main points of the training (Group exercise) • Review the main points about rice marketing strategies together with the trainees	• Summary of the main points from the module.

14.8 Reference materials

14.8.1 Participants' handouts

- Rice business and marketing training notes

14.8.2 Further reading

1. Tawedzegwa M (2012). Farming as a family business. Training Manual. Zimbambwe agricultural competitive program.

MODULE15: RICE CROSS-CUTTING ISSUES

15.1 Introduction

This module consists of issues that influence the uptake and up-scaling of TIMPs in the Rice value chain. These issues are Agricultural Innovation Platforms, gender and social-environmental concerns and climate smart agricultural policy. Agricultural Innovation Platforms provide a forum for stakeholders to interact and develop technical, institutional and organizational innovations to solve value chain challenges. Gender and environmental concerns are considerations aimed at avoiding inappropriate solutions to value chain challenges. Finally, climate smart agricultural policy creates awareness on policy formulation and the various regulations that are put in place to facilitate the development of value chains. The method of delivery of each of these cross-cutting issues is presented.

15.1. AGRICULTURAL INNOVATION PLATFORMS

15.1.1 Introduction to the Sub-Module

Agricultural Innovation Platform (AIP) is an organizational model for stimulating innovation and development that brings actors together in a way that pools together skills and knowledge to address challenges and utilize opportunities. The actors include individuals, private and public sector organizations, policy makers,

agripreneurs and other value chain stakeholders. This module exposes the actors to an innovation systems-based configuration of stakeholders. These actors come together in an innovation platform to seek technical, institutional or organizational solutions to critical challenge hindering agricultural productivity within a value chain. The Agricultural Innovation Platform facilitates actors to interact, innovate, learn and change with time as they seek solutions to the common challenges.

In an innovation platform every actor's contribution is valued and benefits accrue to all in a win-win situation. The AIP is a useful methodology for development, testing and scaling of innovations in the pyrethrum value chain. The training module aim at enhancing practitioners' know-how in facilitating innovation platforms.

15.1.2 Sub-Module learning outcomes

- By the end of this module, the following outcomes should be achieved:
- Innovation platforms defined and explained.
- The characteristics of an innovation platform described and understood.
- Process of mobilization of stakeholders for initiation, establishment, management and sustenance of an Agricultural Innovation Platform explained and demonstrated.
- The innovation capacity building process of the AIP actors explained and understood.
- Benefits and challenges of agricultural innovation platforms described.

15.1.3 Sub-Module target group and categories

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

15.1.4 Sub-Module users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT) and lead farmers. The facilitator using this module should have an in-depth understanding of the participants' handouts.

15.1.5 Sub-Module duration

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

15.1.6 Module summary

15.1.1 Agricultural Innovation Platforms (AIP)			
Sessions	**Training methods**	**Training materials**	**Time**
15.1.6.1 Introduction, objectives and expectations	• Personal introductions • Presentations • Plenary discussions	• Flips charts • PowerPoint presentation • Laptop • Projector	20 minutes
15.1.6.2 Definition of Agricultural Innovation Systems and different types of innovations	• PowerPoint Presentations • Flip charts • Plenary discussions	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	20 minutes
15.1.6.3. Characteristics of an Agricultural Innovation Platform	• PowerPoint presentations • Plenary discussions • Role plays • Flips charts • PowerPoint presentation	• Laptop • Projector • Participants' handouts	20 minutes
15.1.6.4 Phases of an innovation platform (Initiation, Establishment, Management and Sustenance	• PowerPoint presentations • Plenary discussions • Role plays	• Flips charts • PowerPoint presentation • Laptop • Projector • Participants' hand outs	20 minutes
15.1.6. 5 Case studies of successful AIPS	• PowerPoint presentations • Plenary discussions • Role plays • Flips charts	• Laptop • Projector • Participants' hand outs	10 minutes
15.1.6. 6 Benefits and challenges of AIPS	• PowerPoint presentations • Plenary discussions	• Flip charts • Laptop • Projector • Participants' hand outs	20 minutes
15.1.6.7. Module review	• PowerPoint presentations • Plenary discussions	• Flip charts • Laptop • Projector	10 minutes
TOTAL			**2 hours**

15.1.7 Facilitator's guidelines

Sub-Module 15.1 Agricultural Innovation Platform (AIP)	
15.1.7.1. Introduction, levelling of expectations and objectives (20 minutes)	**Session guide**
Introduction *(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations)* **Module objectives** (The facilitator presents modules objectives and levels out expectations) By the end of the module training the trainee should be able to: • Define innovation process and the innovation products. • Explain characteristics of an innovation platform. • Describe how to initiate and establish Agricultural Innovation Platforms. • Explain how to manage and sustain innovation capacity of actors in Agricultural Innovation Platforms. • Get exposed to successful pyrethrum innovation platforms. • Understand benefits and challenges of agricultural innovation platforms.	• Summarize Trainees' "expectations" and display. • PowerPoint Presentation • Training Program
15.1.7.2 Definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational) (30 minutes)	**Session guide**
The facilitator presents an overview of innovation platforms and their main characteristics **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 • Participants' handouts

15.1.7.3. Characteristics of an Agricultural Innovation Platform (20 minutes)	Session guide
Plenary presentation (30 minutes) • Characteristics of Agricultural Innovation Platforms • Why Agricultural innovation platforms are used • Where to form Agricultural Innovation Platforms • Establishment of linkages between value chain actors in agricultural innovation platforms **Discussion (10 minutes)** Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint Presentation • Participants' handouts • Plenary discussion
15.1.7.4 Stages of an innovation platform (Initiation, Establishment, Management and Sustenance (20 minutes)	**Session guide**
Plenary presentation (50 minutes) **Initiation or preformation phase** • Engagement or mobilization of stakeholders in the pyrethrum value chain to lay down rules of engagement mediated by a change agent **Establishment phase** • Assessment of the status of the value chain to clearly identify the compelling; the weaknesses in the chains. • Planning, defining roles and establish working structure and resource acquisition **Sustainability** • Guiding in evolving and identifying fresh issues or challenges • Maintaining capacity acquired to address new issues or challenges in subsequent cycles. **Discussion (10 minutes)** Let the trainees recall what they learned and discuss any issue that may arise.	• PowerPoint Presentation • Distribute participants handouts • Short video clips

15.1.7. 5 Case studies of successful AIPS (10 minutes)	Session guide
Pyrethrum Processing Company of Kenya (PPCK): **Processing of pyrethrum and multiplication of planting materials to supply to farmers.** • Engage the participants in the discussion of the factsheets and application /use of the information • Invite a participant from the successful AIP to make a presentation • Let the trainees recall what they learned and discuss any issue that may arise.	• Participants' handouts • Marketing models and pathways • Case study reports
15.1.7. 6 Benefits and challenges of AIPS (10 minutes)	**Session guide**
List the benefits of a successful AIP • Participants reflect on what they want to do at home in terms of AIP initiation then develop concrete and achievable action plans based on a challenge that they could address back home. • Involvement of all the stakeholders in the pyrethrum value chain that will ensure easy flow of operations.	• Plenary presentation • Champions selected to campaign for attitude change
15.1.7.5. Module review (30 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module) • Summarize the main points of the training and together with the trainees review the main points on: • AIP characteristics and initiation • AIP establishment and management • Sustenance of rice AIPs • Discuss with trainees' new things learnt from this Module. • What are some of the problems and issues that they have become more aware of in the module?	• Participants handouts • Administer online exit questionnaire and present analysis real time

15.1.8 Reference materials

15.1.8.1 Participants' handouts

- AIP Fact sheets
- Entry and exit questionnaire on their smart forms

- Agricultural Innovation Platform establishment guide
- Summary of key policies

15.1.8.2 Further reading

1. Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional changes
2. Felister Makini, Wellington Mulinge, Lawrence Mose, Beatrice Salasya, Geoffrey Kamau, Margaret Makelo, and Ong'ala, J. (2018). Impact of Agricultural Innovation Platforms on Smallholder livelihoods in Eastern and Western Kenya. FARA Research Results Vol. 2 (6) 3.
3. F. Makini, G. Kamau, M. Makelo, A. Adekunle, G. Mburathi. (2013). Operational field guide for developing and managing local agricultural innovation platforms

15.2 RICE GENDER, VULNERABLE AND MARGINALIZED GROUPS (VMGs), SOCIO, ENVIRONMENTAL CONCERNS AND COHESION

15.2.1 Introduction to the Sub-module

Rice is the third-most important cereal crop grown in the country after maize and wheat. The crop involves all the gender categories (men, women, and youth) and vulnerable marginalized groups (VMGs) in its value chain, from production, marketing, and consumption. Women perform most of the crop's production activities, such as planting, weeding, and marketing, while men mostly perform the tasks of land preparation and marketing.

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

Rice value chain TIMPs interventions, when designed and implemented with gender-equitable principles, can hasten adoption, leading to increased productivity as well as enhanced social and environmental impacts. The overall objective of this sub-module is to ensure that gender mainstreaming and social inclusion in the rice value chain are enhanced by field agricultural practitioners and extension officers in an effort geared towards increasing agricultural productivity in target counties.

15.2.2 Sub-Module learning outcomes

By the end of the training Sub-Module, the following training outcomes must be achieved:

1. The concept of gender mainstreaming and social inclusion in rice value chain appreciated.
2. Youth empowerment in rice value chain explained.
3. Women empowerment in rice value chain explained and understood.
4. Strategies for inclusion of vulnerable and marginalized groups in rice value chain understood and applied.

5. Knowledge on environmental and social management framework (ESMF) tool explained and demonstrated.

15.2.3 Sub-Module target group

This Sub-Module is intended for service providers, agriprenuers, lead farmers, and extension agents.

15.2.4 Sub-Module users

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

15.2.5 Sub-Module duration

The Sub-Module is estimated to take a duration of 1 hours and 30 minutes.

15.2.6 Sub-Module summary

Sub-Module 15.2: Gender mainstreaming and social inclusion in the Rice value chain			
Sessions	**Training methods**	**Training materials**	**Duration**
15.2.6.1 Introduction, expectations and objectives	• Personal introduction • Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Laptop • Participants' handouts	20 minutes
15.2.6.2 Gender mainstreaming in rice value chain	• PowerPoint Presentations • Group Exercise • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	40 minutes
15.2.6.3 Youth empowerment in rice value chain	• PowerPoint Presentations • Group exercise • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes

15.2.6.4 Women empowerment in rice value chain	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
15.2.6.5 Strategies for inclusion of vulnerable and marginalized groups	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
15.2.6.6 Environmental and Social Management Framework	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	30 minutes
15.2.6.7 Sub-Module Review	• Plenary discussion	• Flips charts • Felt pens	10 minutes
Total			**3 hours 10 minutes**

15.2.7 Facilitator's guidelines

Sub-Module 15.2: Gender mainstreaming and social inclusion in rice value	
15.2.7.1 Introduction, objectives and expectations (20 minutes)	**Session guide**
(The facilitator welcomes trainees to the Sub-Module and thereafter invites them to introduce themselves and state their expectations). **Sub-Module objectives (40 Minutes)** *The facilitator presents modules objectives* By the end of the module training, the trainee should be able to: • Appreciate gender mainstreaming and social inclusion, in rice value chain. • Explain youth empowerment in the rice value chain. • Appreciate women empowerment in rice value chain.	• Summarize trainees "expectations" and display. • PowerPoint Presentation • Group exercise • Training Program

• Recognize strategies for inclusion of vulnerable and marginalized groups in the rice value chain. • Explain the environmental and social management framework (ESMF) tool.	
15.2.7.2 Gender mainstreaming and social inclusion in rice value chain (40 minutes)	**Session guide**
(The facilitator presents and explain what gender mainstreaming is, who does what activity, who has access to what resources among others and why gender mainstreaming is important in rice value chain). **Plenary presentation (40 minutes)** • Definition of gender • What is gender mainstreaming and why it is important? • Who does what? (gender division of roles in rice value chain) • Who owns what? (access and control of resources & benefits) • Who makes which decisions? • Existing policies in support of gender mainstreaming. **Group exercise and discussion** Let the trainees recall what they learned and discuss any issues that may arise	• PowerPoint presentation • Group exercise • Plenary discussion • Participants' handouts • Group exercise • Plenary discussion
15.2.7.3 Youth empowerment in rice value chain s (30 minutes)	**Session guide**
Plenary presentation (30 minutes) • Why agriculture is not attractive to youth • Youth's role in the value chain • Strategies to empower youth in rice value chain. Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Group exercise • Plenary discussion • Participants' handouts
15.2.7.4 Women empowerment in rice value chain (30 minutes)	**Session guide**
Plenary presentation (30 minutes) • Women's role in the value chain • Challenges facing women in the value chain • Strategies for empowering women in the value chain **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Participants' handouts • Plenary discussion

15.2.7.5. Strategies for inclusion of vulnerable and marginalized groups in rice value chain (30 minutes)	Session guide
Plenary presentation (30 min) • Who are vulnerable and marginalized groups (VMGs) • Why gender inequality exists • Social inclusion and why • Strategies of inclusion of VMG. **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Plenary discussion • Participants' handouts
15.2.7.6. Environmental and social management framework (ESMF) (30 minutes)	**Session guide**
Plenary presentation (30 minutes) • Objective of ESMF in rice value chain • Environmental and social safeguards of rice • Safeguard policies triggered by the project **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Plenary discussion
15.2.7.7 Sub-Module review (10 minutes)	**Session guide**
(The facilitator leads the participants in reviewing the module) Summarize the main points of the training and together with the trainees review the main points: • What is gender mainstreaming and why it is important? • Youth empowerment in rice value chain • Women empowerment in rice value chain • Strategies for inclusion of vulnerable and marginalized groups in rice value chain • Environmental and Social Management Framework of rice activities. Let the trainees recall what they learned and discuss any issues that may arise.	• Summary of the main points on from the module on a flip chart and display

15.2.8 Training materials

15.2.8.1 Participants' handouts

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

15.2.8.1 Further reading

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

15.3 AGRICULTURAL POLICY OPTIONS FOR SUPPORTING SMALLHOLDER FARMERS' RICE PRODUCTION AND MARKETING

15.3.1 Introduction

Policy guidelines or options are vital in influencing how an economy progresses. The Kenya vision 2030 in 2007 envisioned agriculture as the engine of growth through transformation of small holder and subsistence agriculture to innovative and commercially oriented agriculture. In 2010, Kenya promulgated the new constitution which proposed the formation of two levels of governments each with defined functions. Agriculture was one of the devolved functions which faces various challenges and threats. These include climate change, limited or declining high potential agricultural land, over-reliance on rain fed agriculture, poor and inadequate rural infrastructure, inadequate and declining research in agriculture, low agricultural sector and related activities financing and low technical capacity among the actors.

Agricultural policy in Kenya revolves around the main goals of increasing productivity, income growth and enhanced food security especially among the small-holder producers. Others include equity issues, emphasis on irrigated agriculture, commercialization and intensification of production, environmental sustainability and appropriate and participatory policy formulation.

This module introduces the agricultural service providers, agripreneurs, master trainers and lead farmers and relevant stakeholders in the design and implementation of effective climate-smart sensitive agricultural policy options to promote productivity and incomes.

15.3.2 Sub-Module learning outcomes

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

- Appreciate and discuss the role of agricultural policy frameworks in Kenya.
- Appreciate and explain the Policy cycle.
- Appreciate the policy options available for or related to the rice sector.
- Understand and discuss the role of data management for policy evaluation and improvement.

15.3.3 Sub-Module target group

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

15.3.4 Sub-Module users

The intended users of the module include master trainers who are members of the Core Team of Trainers (CTT), lead farmers and agripreneurs in the rice value chain target counties. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts (Training materials).

15.3.5 Sub-Module duration

The module is estimated to take 2 hours.

15.3.6. Sub-Module summary

Sub-Module 15.3 Agricultural policy options for influencing rice production and marketing			
Sessions	**Training methods**	**Training material**	**Time**
15.3.6.1: Introduction of the module, objectives and participant expectations	• Personal introductions • Plenary discussions	• Flip charts • Power point presentations	15 minutes
15.3.6.2: The role of agricultural policy frameworks in Kenya	• Presentation • Plenary discussions	• Power point slides • Flip charts	15 minutes
15.3.6.3: Policy cycle for policy issues and implementation	• Presentations • Plenary discussions	• Power point slides • Flip charts	10 minutes
15.3.6.4: Instruments of policy related to rice sector	• Presentations • Discussions	• Power point slides • Flip charts	20 minutes
15.3.6.5: The policy validation cycle(progress/impact, evidence for future policy making)	• Presentation • Plenary discussions	• Power point slides • Flip charts	20 minutes
15.3.6.6: the role of data management for policy evaluation and improvement	• Presentation • Plenary discussions	• Power point slides • Flip charts	20 minutes
15.3.6.7: Training Review	• Facilitators summary • Take aways	• Module review • Participant handouts	20 minutes
TOTAL			**2 hours**

15.3.7 Facilitator's guidelines

Module 15.3 Agricultural policy options to support rice production and marketing	
15.3.7.1 Introduction of the module, objectives and participant expectations (15 minutes)	**Session guide**
By the end of this module training, the trainee should be able to: • Appreciate and discuss the role of agricultural policy frameworks in Kenya. • Appreciate and explain the Policy cycle. • Appreciate the policy options available for or related to the rice sector. • Understand and discuss the role of data management for policy evaluation and improvement.	• Program • Participant handouts • Summarize participants expectations and display • Power point presentation
15.3.7.2 The role of agricultural policy frameworks in Kenya (15 minutes)	**Session guide**
Plenary presentation highlighting the role of agricultural policy frameworks in Kenya	• Power point slides
15.3.7.3 Policy cycle for policy issues and implementation (10 minutes)	**Session guide**
Plenary presentation • Stages in the policy cycle • Phases in the implementation Plenary discussions	• Power point presentation
15.3.7.4 Instruments of policy related to rice sector (20 minutes)	**Session guide**
Group exercises: *The facilitator requests the trainees to form groups and come up with policies available for and related to the rice sector* Plenary presentation	• Practical exercise • Powerpoint presentation • Participants handouts
15.3.7.5 The policy validation cycle(progress/impact, evidence for future policy making) (20 minutes)	**Session guide**
Plenary presentation on the policy validation cycle	• Power point presentation

15.3.7.6 the role of data management for policy evaluation and improvement (20 minutes)	Session guide
Plenary presentation • The role of data in policy programs • Data collection, analysis and utilization for policy evaluation and improvement • Develop policy advocacy skills **Plenary discussions**	• Power point presentation
15.3.7.7: Training Review (20 minutes)	**Session guide**
(The facilitator leads the trainees in reviewing the module). • The trainees lists the main points learnt during the training • Discuss with the trainees new things learnt from the module	• Question and answer sessions • Recap of the main points • Participatory evaluation of the session

15.3.8 Training materials

15.3.8.1 Participants' handouts

- Agricultural policy options training notes

15.3.8.2 Further reading

1. Republic of Kenya, 2021. Ministry of Agriculture, Livestock, Fisheries and Cooperatives. Agricultural Policy. "Food: Our Health, Wealth and Security"
2. Food and Agriculture Organization of the United Nations (FAO) 2010. Climate Smart Agriculture policies Practices and Financing for Food Security, Adaptation and Mitigation.
3. Republic of Kenya (2007). Kenya Vision 2030.
4. Republic of Kenya (2010). The Kenya Constitution.

ANNEXES

ANNEX 1: TRAINING PROGRAM

The program template presented here assumes that the trainees report on Sunday evening as the first day

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

Time	Activity	Duration	Responsible
Day 0: Sunday	Travel and Arrival in Naivasha	Whole day	KALRO Secretariat Gladys Mueni/ Bancy Wacha/VC Leader – Dr. Ruth Musila
Day 1: Monday	**Chair: Dr. Benjamin Kivuva Asst. Director Crop Breeding and seed systems)** **Rapporteur: Mr. Bernard Ngari**		**Facilitator**
8.00 a.m.-8.30 a.m.	Registration	30 minutes	Secretariat
	Opening Prayer and Introductions		Dr. Ruth Musila
8.30 a.m.-10.00 a.m.	**Official opening of the Rice Value Chain ToT Workshop**	1hr 30 mins.	Dr. Lusike Wasilwa (Chair)
	Rice ToT Workshop Objectives		Dr. Ruth N. Musila
	Remarks from Director Crops Systems and Welcoming Deputy Director General – Crops		Dr. Lusike Wasilwa
	Remarks from Deputy Director General - Crops and Official Opening		Dr. Felister Makini
	GROUP PHOTO		ALL

10.00 a.m.-10.30 a.m.	Climate setting and class organization	30 minutes	Mr. Mark Otieno
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	**ALL**
11.00 a.m.– 12.00 a.m.	Farmer field and business school (FFBS) approach in Maize production	1 hour	Mr. Mark Otieno
12.00 p.m. –1.00 p.m.	Climate Change and Climate Smart Agriculture in Rice value chain	1 hour	Dr. John Kimani
1.00 p.m.- 2 .00 p.m.	**LUNCH BREAK**	**1 hour**	**ALL**
2.00 p.m. –4.00 p.m.	Rice production, niche and climatic requirements	2 hours	Dr. John Kimani
4.00 p.m.	**TEA BREAK**		**ALL**
Close of Day 1			
Day 2: Tuesday	**Chair: Dr. Wilson Oyange** **Rapporteur: Lucy Muthoni**	**Period**	**Facilitator**
8.00 a.m. – 8.30 a.m.	Registration, Prayer Recap of Day1 activities	30 minutes.	Mr. Mark Otieno Group 1
8.30 a.m. – 9.30 a.m.	Rice Crop Health: Rice pests	1 hour.	Mr. Bernard Ngari/ Dr Miriam Otipa
9.30 a.m.-10.30 a.m.	Rice Crop Health: Rice diseases	1 hour.	Mr. Bernard Ngari/ Dr Miriam Otipa
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	**ALL**
11.00 a.m.-1.00 p.m.	Rice harvesting and post- harvest management	2 hours	Dr Francis Wayua
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**	**1hour**	**ALL**
2.00 p.m. - 3.00 p.m.	Rice value addition	1 hour	Mr. James Ndambuki
3.00 p.m.–4.00 p.m.	Rice value added products demonstrations and sensory evaluation	1 hour	James Ndambuki/ Dr Francis Wayua
4.00 p.m-4.30 p.m.	**HEALTH BREAK**	**30 minutes**	**ALL**
End of day 2			
Day Wednesday	**Chair: Dr. John Kimani** **Rapporteur: James Ndambuki**	**Period**	**Facilitator**
8.00 a.m. – 8.30 a.m.	Registration, Prayer Recap of Day 2 activities	30 minutes	Mr. Mark Otieno Group 2
8.30 a.m.– 10.30 a.m.	Rice variety and Selection	2 hours	Dr. John Kimani/ Dr Ruth Musila
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 minutes**	**ALL**
11.00 a.m.–1.00 p.m.	Climate smart agronomic practices	2 hours	Mr. Wilson Oyange/Mr. Robert Tabu
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**		**ALL**

2.00 p.m.-4.00 p.m.	Rice Seed Systems	2 hours	Dr. Ruth Musila
4.00 p.m. - 4.30 p.m.	**HEALTH BREAK**	**30 minutes**	**ALL**
Close of Day 3			
Day 4 Thursday	**Chair: Dr. Ruth Musila** **Rapporteur: Robert Tabu**	**Period**	**Facilitator**
4.00 a.m. - 5.00 p.m.	Excursion: Field trip to KALRO Mwea Rice Molecular Lab, KALRO Seeds Mwea, Kirogo farm, Nice rice Millers and MRGM	Whole day	Dr Ruth Musila/ Dr. Emily Gichuhi
Day 5: Friday	**Chair: Dr Ruth Musila** **Rapporteur: Robert Tabu**	**Period**	**Facilitator**
7.30 a.m. - 5.00 p.m. Travel Back to Naivasha	Excursion: Field trip to Nice rice Millers and MRGM	Whole day	Dr Ruth Musila/ Dr. Emily Gichuhi
Day 6: Saturday	**Chair: Dr Emily Gichuhi** **Rapporteur: Lucy Muthoni**	**Period**	**Facilitator**
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 4 & 5 activities	30 minutes	Mr. Mark Otieno Group 3
8.30 a.m.–10.30 a.m.	Integrated soil and water management practices for Rice production Part 1	2 hours.	Mr. Wilson Oyange
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**	**30 min.**	**ALL**
11.00 a.m.-1.30 p.m.	Integrated soil and water management practices for Rice production Part 11	2 hours 30 minutes	Mr. Wilson Oyange
1.30 p.m.-2.30 p.m.	**LUNCH BREAK**	1hr	**ALL**
2.30 p.m.– 4.00 p.m.	Mechanization of Rice Production and Precision Agriculture	1 hour 30 minutes.	Eng. Godwin G. Kuria/Robert Tabu
4.00 p.m.-5.00 p.m.	Guidelines on action planning at County Level	1 hour	
5.00 p.m.	**HEALTH BREAK**		**ALL**
Close of Day 6			
Day 7: Sunday	**Chair: Dr. Wilson Oyange** **Rapporteur: James Ndambuki**	**Period**	**Facilitator**
8.00 a.m. – 8.30 a..m.	Registration, Prayer and Recap of Day 6 activities	30 minutes	Mr. Mark Otieno Group 4
8.30 a.m. - 10.30 p.m.	Rice Business and Marketing	2 hours	Lucy Muthoni
10.30 a.m.-11.00 a.m.	**HEALTH BREAK**		**ALL**
11.00 a.m.-1.00 p.m.	Climate-Smart Agricultural Policy Options	2 hours	Lucy Muthoni
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**		**ALL**

2.00 p.m.– 4.00 p.m.	Agricultural Innovation Platforms (AIPs)	2 hours	Dr. Geoffrey Kamau
4.00 p.m.-4.30 p.m.	**HEALTH BREAK**		**ALL**
Close of Day 7			
Day 8: Monday	**Chair: Dr. Ruth Musila** **Rapporteur: Ms. Lucy Muthoni**	**Period**	**Facilitator**
8.00 a.m. – 8.30 a.m.	Registration, Prayer and Recap of day 7 activities	30 minutes	Mr. Mark Otieno Group 1
8.30 a.m.– 11.00 p.m.	Gender mainstreaming and social inclusions in the Rice value chain	2 hours. 30 minutes	Dr Jessica Ndubi
11.00 a.m. -11.30 a.m.	**HEALTH BREAK**		**ALL**
11.30 a.m.-1.00 p.m.	• Course Evaluation • Presentations of County Action plans	1 hour	Mr. Mark Otieno
1.00 p.m.-2.00 p.m.	**LUNCH BREAK**		**ALL**
2.00 p.m.-3.00 p.m.	Way Forward	1 hour	Dr. Charles Lungaho
3.00 p.m.-4.30 p.m.	**Official Closing of The ToT Workshop** • Remarks by the group Leader (Governor) • Remarks by the CPC • Remarks by NAVCDP Crops coordinator- **Ms. Violet Kirigua** • Remarks by NAVCDP NPCU -**Dr. Charles Lungaho** • Issuance of Certificates – **Dr. Lusike Wasilwa** Official Closing Address by Director Crops- **Dr. Lusike Wasilwa** • Closing Prayer	1 hour. 30 minutes	**Chair.** Ms. Violet Kirigua
Close of Day 8			
Day 9 Tuesday	**Departure from Naivasha**		
8.00 a.m.	**Registration, Prayer and Departure**		**ALL**

ANNEX 2: GENERAL REFERENCE LEARNING MATERIALS

FFBS LEARNING MATERIALS
PARTICIPATORY TECHNOLOGY DEVELOPMENT (PTD) AND CURRICULUM ON RICE SOIL FERTILITY MANAGEMENT:

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

Factors to consider:

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

Setting the P.T.D blocks:

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

Parameters Measurement

- No of leaves per plant
- Leaf length
- Leaf width
- Panicle size

- Yield /unit area

Setting of Blocks

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

AGRO ECOSYSTEMS ANALYSIS (AESA) ON RICE

AESA NO ……

General information

Variety …….

Fertilizer ……

Planting date……

Weather: …….

Agronomic data

No of leaves per plant……

Leaf length…..…

Leaf width…..……..

Panicle size…..……

Yieldsperunitarea…….

Time of observation: ……..…..

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

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

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