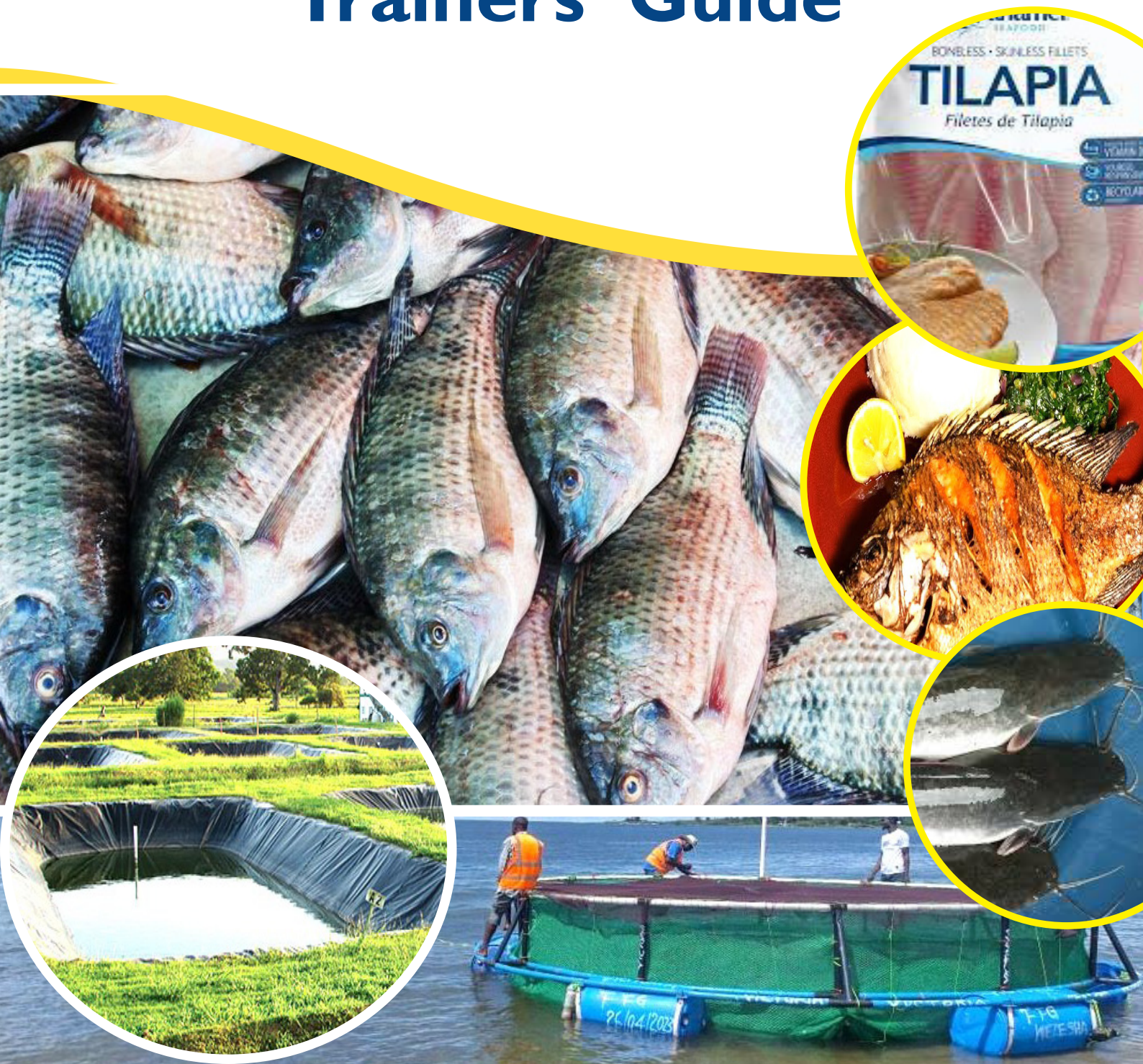
MESPT
MICRO ENTERPRISES SUPPORT PROGRAMME TRUST

MINISTRY OF FOREIGN AFFAIRS OF DENMARK
Danida

Aquaculture Value Chain Trainers' Guide



Aquaculture Value Chain Trainers' Guide

Disclaimer

This Guide is for advisory use only. Users of this manual should verify details that relate to their agro-climatic zones from their area agricultural extension officers. It is also advised that this training manual should be used in conjunction with the respective Value chain handbook and other relevant resource materials.

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Foreword

The Micro Enterprises Support Programme Trust (MESPT) is a local development organization founded in 2002 through a partnership between the Government of Kenya (GoK), the European Union (EU), and later, the Royal Danish Government. MESPT's main goal is to eradicate poverty by supporting the growth of micro-enterprises, including agricultural production, agribusiness, and afro-processing.This support aims to foster social, economic, and environmentally sustainable growth by increasing access to financial and business development services, creating jobs, and promoting sustainable micro-enterprises. Our vision is to build a more prosperous society, and our mission is to provide sustainable business development and financial services to smallholder farmers and agri-MSMEs in Kenya.

For over two decades, our team of professionals has been at the forefront of developing cost-effective and scalable solutions that promote financial inclusion and support the growth of sustainable agribusinesses. We accomplish this by providing tailored financial solutions that meet the specific needs of various agricultural value chains, delivered through a wholesale lending model to financial service providers such as SACCOs, MFIs, and Farmer Cooperatives. These providers, in turn, extend loans to smallholder farmers and micro agricultural enterprises. Our approach emphasizes delivering integrated financial and business development services to smallholder farmers and MSMEs in Kenya, helping them access finance, boost agricultural productivity, improve afro-processing and connect to markets. Over the years, we have worked closely with county governments, development agencies, donors, and investors to strengthen business development capacities in the agricultural sector, using a unique tripartite model that connects farmers, SMEs, and financial institutions.

Aquaculture is among key value chains that have been supported by MESPT over the years through various interventions in order to enhance commercialization. MESPT appreciates the importance of documenting best practices for the value chain in facilitating effective delivery of training for farm-ers and Agri-preneurs. Therefore, MESPT has facilitated the development of this trainers' guide alongside the value chain manual and other resource materials through Green Employment in Agri-culture Programme (GEAP) with support from DANIDA.

This guide is expected to enhance effectiveness in delivery of trainings on Good Agricultural Practices and commercialization of the value chain. I am optimistic that this guide will be helpful to partners in the the value chain including county governments. I am grateful to DANIDA for the continued support to MESPT programmes. I am also thankful to the value chain experts who spear-headed compilation of this guide.

Rebecca Amukhoye,

Chief Executive Officer, Micro-Enterprises Support Programme Trust

Preface

The Green Employment in Agriculture Programme is a 5 years' programme (2021 to 2025) funded by DANIDA and implemented by Micro-Enterprises Support Programme Trust (MESPT). GEAP seeks to contribute directly to Kenya's Vision 2030 and to one of Denmark-Kenya Strategic Framework on accelerated decent employment creation in MSMEs and improved competitiveness of targeted value chains in agriculture which will contribute to transforming the economy towards a greener and more inclusive growth.

GEAP programme targets 40,000 smallholder farmers and has been implemented in 12 counties namely, Kilifi, Kwale, Nakuru, Nyandarua, Siaya, Kisii, Kakamega, Bungoma, Trans Nzoia, Uasin Gishu, Makueni and Machakos. The programme facilitates increased commercialization, decent employment, and green transformation through targeted interventions in selected agriculture value chains that include, Cassava, Coconut, Dairy, Export Vegetables, Pineapple, Indigenous Poultry, Moringa, Pineapple, and Aquaculture.

MESPT through GEAP tasked multidisciplinary teams to develop resource materials tailored for extension service providers and farmers. This Aquaculture value chain trainers' guide is one of the series of the materials that were developed. MESPT further tasked value chain experts to develop a value chain manual for Aquaculture. This guide is to be used as an instructional tool for training on implementation of good agricultural practices, value addition and marketing for the value chain. Relevance of the content is based on needs identified among value chain players, actors and aligned to GEAP project objectives. The training content is drawn from the value chain manual and other relevant resource materials.

This trainers' guide consists of two sections. Section I comprises information about the value chain, guidelines and notes for facilitators while section II comprises of the training modules. The modules have a uniform outline that ensures every aspect of the manual is fully covered using approaches that the trainees can easily understand. The modules are progressively arranged to achieve a logical flow of the sessions. Recommended training durations are also provided.

A variety of delivery methods are outlined and where possible, demonstrations and practical work is incorporated. To maintain quality of training across various groups and settings, trainers' guidelines, program, training methods and training evaluation have been provided in the guide. It is advised that the trainers' guide should be used in conjunction with the respective value chain manual and other relevant reference materials. It is also recommended that participant hand outs and facts sheets are provided to trainers.

MESPT is grateful to the value chain experts who spearheaded the development and production of this trainers' guide. It is my hope that counties and other users will adopt and optimally use this resource so as to increase productivity and profitability while ensuring a greener and more inclusive growth.

Doreen Kinoti

Programme Manager, Green Employment in Agriculture Programme

Acknowledgements

The Green Employment in Agriculture Programme (GEAP) participating counties (Kilifi, Kwale, Nakuru, Nyandarua, Siaya, Kisii, Kakamega, Bungoma, Trans Nzoia, Uasin Gishu, Makueni and Machakos) are acknowledged for providing resource persons in compilation of the document. The technical support and expertise provided by Kenya Agricultural and Livestock Research Organisa-tion in development of the document is appreciated. Thanks to the Royal Danish Government's Danish International Development Agency (DANIDA) for facilitating the development of this re-source material. Micro Enterprises Support Programme Trust (MESPT) is appreciated for co-ordinating the process of development and production of this document.

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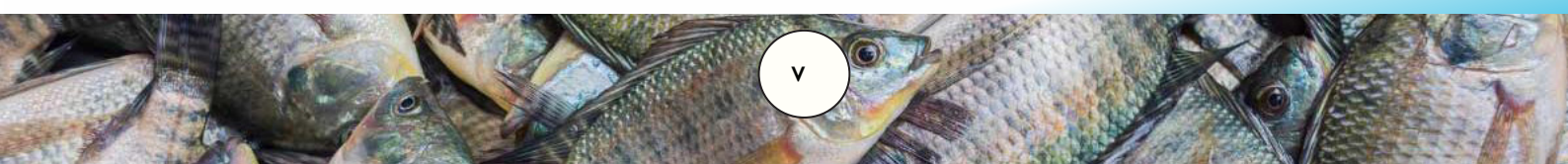


List of Abbreviations

APVC	Agriculture Product Value chain
ASAL	Arid and Semi-Arid Land
BMP	Best Management Practices
CIG	Common Interest Group
CLF	Crop Livestock Fish
CSA	Climate Smart Agriculture
CTT	Core Team of Trainers
DANIDA	Danish International Development Agency
EIA	Environmental Impact Assessment
ESP	Economic Stimulus Program
FCR	Feed Conversion Ratio
GAP	Good Aquaculture Practices
GEAP	Green Employment in Agriculture Programme
GDP	Gross Domestic Product
GHG	Greenhouse gasses
HDPE	High-Density Polyethylene
ha	Hectare
IDM	Integrated Disease Management
INRM	Integrated Natural Resource Management
IPM	Integrated Pest Management
KALRO	Kenya Agricultural and Livestock Research Organization
KMFRI	Kenya Marine and Fisheries Research Institute
kg	Kilogram
LF	Lead Farmer
LVHD	Low Volume High Density
MESPT	Micro-Enterprises Support Programme Trust
RAS	Re-circulative aquaculture systems
SPs	Service providers
VMG	Vulnerable and Marginalized Group

Aquaculture Value Chain Trainers' Guide

SECTION I

This section consists of six sub-sections, which include an overview of the Aquaculture Value chain in Kenya, Green growth opportunities in the aquaculture sub-sector, the Objectives of the training, the Content of the Training, and Facilitator Guidelines.

1.0 OVERVIEW OF THE AQUACULTURE VALUE CHAIN IN KENYA

Aquaculture plays an important role in food and nutrition security. Aquaculture also plays a significant role in poverty reduction and employment creation. Marine and freshwater aquaculture have a high potential to spur national economic growth and development. Kenya is endowed with an extensive network of aquatic ecosystems, which support the commercial production of a critical volume of fish that is required to fill the growing gap in national fish supply and demand as captured fish catches decline.

The State Department of Fisheries estimated a total of 32,000 fish farmers countrywide, with the sub-sector employing over 50,000 Kenyans along the fish value chain, who are engaged in aquaculture inputs and production, post-harvest handling and processing, services provision, marketing, and trade. Overall, aquaculture production grew by 9.6%, from over 1000 tons in 2006 to a peak of 24,096 tons in 2014. The massive growth occurred largely during the implementation of the Economic Stimulus Programme (ESP) between 2009 and 2013. Prior to the ESP project in 2008, there were only 4,742 fish farmers countrywide, with 7,530 fishponds occupying 271 Ha. The number of farmers increased tremendously to 49,050, with an estimated 69,998 ponds occupying 2,063 Ha at the peak of the subsidy program in 2012.

Pond-based aquaculture production has, however, registered depressed performance for the third consecutive year, from 18,656 tons in 2015 to 12,356 tons in 2017. Despite the enormous potential for commercialisation of aquaculture, the subsector faces many constraints and challenges, including competition for land, water, energy, and feed resources.

1.2 GREEN GROWTH OPPORTUNITIES IN THE AQUACULTURE VALUE CHAIN

Aquaculture is an exceptionally suitable value chain for upscaling green technologies and building resilience to climate change among smallholder producers. Crop Livestock Fish (CLF) based mixed systems can also improve overall income per unit area of land while promoting environmental conservation. At the same time, it delivers co-benefits for nutrition, improved livelihoods, and environmental sustainability through the integration of the crop-livestock systems. Sustainable green growth opportunities in aquaculture include the use of solar energy in water reticulation and fish processing.

Aquaculture hatchery operations offer business and employment opportunities for young women and Vulnerable and Marginalized groups (VMGs).

1.3 OVERALL OBJECTIVES OF THE TRAINING

The objective of this training is to equip trainees with the knowledge and skills necessary to increase productivity through the adoption of Good Aquaculture Practices (GAP) and principles. Specifically, the objectives of this training are to:

Provide farmer trainers with relevant attitudes, knowledge, and skills in Aquaculture farming as a business and market assessment techniques for market-led production.

Enhance farmer trainers' knowledge and skills in Aquaculture GAP, including on-farm Aquaculture species selection, establishment, and field management.

Equip farmers trainers with knowledge and skills in post-harvest and value addition of Aquaculture.

1.4 ORGANIZATION OF THE TRAINING CONTENT

The training content is organised into eight modules**,** which are targeted and orientated to ensure the adoption and upscaling of best practices in the Aquaculture Good Aquaculture Practices for improved productivity and competitiveness in a market-driven production system. The purpose of these modules is to enhance the knowledge and capacities of trainers in understanding and disseminating best practices in aquaculture—good Aquaculture Practices to the intended beneficiaries, who are primarily farmers.

A summary of the modules is presented in **Table 1**.

Table 1: Summary of the Eight training modules

No.	Module Name	Areas addressed	Expected Training Outcomes	*Duration
1	Introduction	• Understanding the aquaculture value chain • Suitable areas for aquaculture production • Economic importance of aquaculture	• Better understanding of the aquaculture value chain • Proper site selection for aquaculture production • The economic importance of aquaculture is appreciated	2 hours
3	Culture Systems and Management Practices	• Aquaculture productivity • Climate change adaptation • Semi-intensive culture systems and management practices • Intensive culture systems and management practices	• Awareness of improved Aquaculture systems • Knowledge of improved aquaculture management practices enhanced	7 hours
5	Fish breeding and hatchery management	Access to quality certified fish seed	• Improved skills in the production of high-quality fish seed • Innovative management practices in hatchery management	4 hours 30 minutes
6	Fish Nutrition and feed formulation	Aquaculture production and productivity	• Improved understanding and adoption of best practices in fish nutrition and feed formulation	4 hours 30 minutes

No.	Module Name	Areas addressed	Expected Training Out-comes	*Duration
7	Fish Health Management	Fish disease management and biosecurity.	• Enhanced capacity to identify and control important fish diseases. • Enhanced knowledge of fish biosecurity	4 hours 30 minutes
8	Fish post-harvest technologies and Value Addition	• Post–harvest handling of fish. • Value-addition of fish	• Measures to reduce losses in quantity and quality of fish appreciated and adopted. • Knowledge of proper harvesting techniques and storage facilities, hygiene, and monitoring is enhanced. • Knowledge of the production of various value-added fish products enhanced	6 hours
9	Fish business and marketing	• Business opportunities in the Aquaculture Good Aquaculture Practices • Investment Profiling for the Aquaculture Value chain • Gross Margin Analysis	• Business opportunities in the aquaculture value chain explored. • Investment options in aquaculture profiled. • Knowledge of gross margin analysis en-hanced	4 hours 45 minutes
10	Evaluation of the training	Participants' assessment of each training module	• Effectiveness of training established. • Areas for improvement identified	45 minutes
11	Green transformation-Techonology innovations	• Examples of Technolo-gies • Definition of Biofloc • Advantages of Biofloc • Critical issues to con-sider for biofloc to succeed	• Knowledge on Biofloc Technology • Investments options in Biofloc Technology	4 Hours
Total Duration				38 hours

*The duration of the training includes relevant practical and demonstration sessions. This training duration does not include break hours of mid-morning, lunch, and afternoon breaks.

1.5 PARTNERS AND THEIR ROLES

The partners envisioned in this training include:

Core Trainers - Master trainers drawn from Master trainers with the required competencies drawn from Kenya Marine and Fisheries Research Institute (KMFRI), Universities, Tertiary Institutions offering aquaculture courses, and the State Department of Fisheries and Blue Economy will facilitate the initial training of trainers. The team will also undertake an evaluation of the first round of LF training. They will also provide backstopping services for cascaded training.

County Government—The county Government will provide a team to be trained as ToTs. This team will include County technical staff, Service providers (SPs), lead farmers, and other experts who will further cascade the training to farmer groups and other Value chain players.

Lead Farmers – These are early adopters or role models at the community level. They are supposed to allow their farms to be used as learning sites.

1.6 FACILITATORS GUIDELINES

1.6.1 Preparation of Training Materials

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

The training materials should be available before the actual training dates.

The required stationery, including name tags and writing materials, should be available at the training venue before the training begins.

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

Flip charts and good quality felt pens could be used interchangeably with projections.

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.

Copies of the modules can be distributed at the end of each module.

1.6.2 Preparation of Training Venue and Sites

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

Training Room—The room should have adequate space for participants to be seated in an arrangement that ensures an unobstructed view of the front. An ideal group size is 20 to 30 participants. There should also be adequate desks and space for the trainers, their training materials, projector, and flip chart holders.

Demonstration Site – Preferably should be within walking distance.

Market Sites—These include retail outlets (kiosks, stalls, shops, and supermarkets), wholesale and aggregation points, and processing sites, if any. The operators should be informed in advance about the visits. They should not be very far away, preferably less than 20 minutes' drive.

1.6.3 The Trainees

The trainees will be drawn from the public and private sectors based on their roles in the Value chain. The trainer should act more as a facilitator than a lecturer.

1.6.4 Training Program

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

1.6.5 Training Methods

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

Table 2: Description of Training 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 are required
Group exercises, buzz groups, visits, and brainstorming sessions	To be considered where skills are an issue requiring sharing and trying
Role plays and problem-solving exercises.	Plenary discussions have been considered as training methods where attitude is an issue.
On-farm practical demonstration and exchange visits	To be considered where hands-on practical skills are acquired through practicals and demonstrations

1.6.6 Managing the Training Sessions

The logic of design and flow of each module is that the facilitator, paying attention to the proposed methods and session 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) (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.

1.6.7 Evaluation of the Training

Half an hour has been allocated for planning the way forward and evaluating the training on the last day of training. The individual trainees individually fill in valuation forms. The evaluation forms are then collected and analyzed by the core facilitators.

Table 3: Sample Evaluation Form

Gender of the respondent (Please tick): Male [] Female [] Please provide feedback on the topics by filling in the table below			
Aspect / Module	Rating (Tick only one per topic)		
	Very Useful (3 marks)	Useful (2 marks)	Of Limited Use (1 marks)
Introduction			
Culture Systems and Management Practices			
Fish breeding and hatchery management			
Fish Nutrition and feed formulation			
Fish Health Management			
Fish post-harvest technologies and Value Addition			
Aquaculture business and marketing			
Were the training materials (PowerPoint, handouts) adequate? (Please tick) Yes [] No [] Give reasons: ……. …….. …… How do you intend to apply what you have learned from this training? …….. ……..…… Please suggest areas of improvement …….. ……...			

1.6.8 Key references

Key references should be provided for each module, plus a list of other relevant publications for reference.

Aquaculture reference material will consist of materials such as an aquaculture production hand-book, manuals, guides, pamphlets, brochures, and Factsheets on specific topics.

SECTION II: TRAINING MODULES

This part presents the content of seven training modules: Introduction, Culture, Systems and Management Practices, Fish Breeding and Hatchery Management, Fish Nutrition and Feed Formulation, Fish Health Management, Fish Post-harvest Technologies and Value Addition, and Aquaculture Business and Marketing.

Outline of the modules

Each of the 9 modules consists of 4 parts. These parts are:

Overview – Context and background to training needs, knowledge and skills GAP being addressed.

Module learning outcomes – What trainees are expected to learn.

Module summary –sequence of sessions, training methods, materials, and duration. The module duration indicated is an estimation of the recommended minimum length of time the trainee is exposed to the training content.

Facilitator guidelines –detailed sessions, training methods, materials, and session guides

MODULE 1: INTRODUCTION

1.1 Overview

Adverse weather events due to climate change, scarcity of water and land resources due to competition from other sectors, high and increasing costs of inputs for aquaculture systems, and limited knowledge among fish farmers pose a great challenge to the growth of aquaculture in Kenya. Therefore, technological innovations have been promoted to achieve sustainable intensification of aquaculture. These include the development of model farms with re-circulative aquaculture systems (RAS), tank-based systems, hydroponics, and aquaponics, as well as high density, high carrying capacity intensive production in cages in lakes and reservoirs. For instance, cage culture has emerged from relative obscurity over the past decade to become an important supply system of Nile tilapia to consumers, mostly in rural and urban areas.

With unpredictable rainfall patterns, prolonged droughts, and increasing demand for food, improved knowledge of aquaculture production is crucial for improved productivity and commercialization. Therefore, it is important for farmers to be trained on suitable sites and innovative management practices for better aquaculture performance.

1.2 Module learning outcomes

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

1. The importance of Aquaculture in Kenya's economy is explained and appreciated.
2. Knowledge of suitable sites for aquaculture production enhanced.
3. Conditions required for aquaculture production are understood and applied.
4. Specific county zones for aquaculture production are explained and understood.

1.3 Module Summary

Module 1: Introduction			
Sessions	Training methods	Training materials	Time
1.3.1 Introductions and Climate Setting	Preliminaries Self-introduction Setting Norms & rules Plenary discussion Group exercise	Flips charts Felt pens. Laptop Projector	20 minutes
1.3.2 Importance of Aquaculture in Kenya's economy	Presentations Plenary discussion	Flips charts Felt pens. Laptop Projector Participants' hand-outs	30 minutes
1.3.3 Aquaculture production - requirements for optimal productivity	Presentations Plenary discussion	Flips charts Felt pens. Laptop Participants' hand-outs Projector	30 minutes
1.3.4 Aquaculture production constraints in the target Counties	Group exercise. Plenary Presentation Plenary discussion	Flips charts Felt pens. Laptop Projector	40 minutes
1.3.5 Module review	Discussions/conclusion and the way forward	Flip charts Felt pens. Laptop	10 minutes
Total			2 hours

1.4 Facilitator Guidelines

1.4.1 Introductions and Climate Setting	Session guide
(The facilitator welcomes trainees to the module and, after that, invites them to introduce themselves and state their expectations) Levelling of expectations The trainees form groups (e.g., sub-county-based) and list their expectations, norms, and rules. *The facilitator presents module objectives.* **Objectives** By the end of the module, the trainee should be able to: • To define the importance of Aquaculture in Kenya's economy. • Describe requirements for Aquaculture production. • Understand and be able to apply innovative Aquaculture production and management technologies in the target counties.	Summarize the facilitator/trainee's involvement in the Aquaculture Value chain. PowerPoint presentation
1.4.2 Importance of Aquaculture in Kenya's economy	
Plenary Presentation Aquaculture overview Aquaculture in Kenyan households General Aquaculture production trends in Kenya Aquaculture consumption and markets **Guided discussions by the Facilitator** Questions/answers/comments	PowerPoint presentation Participants' handouts Plenary discussion
1.4.3 Aquaculture Production Requirements	Session guide
Plenary Presentation Sites for Aquaculture production Requirements for Aquaculture production **Facilitator's guided discussion** Questions/answers/comments	PowerPoint presentation Participants' handouts Plenary discussion

1.4.1 Introductions and Climate Setting	Session guide
1.4.4 Aquaculture production and constraints in the target areas	Session guide
Plenary Presentation Facilitator guide in reviewing and discussing suitability map (County by County) **Group exercise.** Trainees to bring out specific county or sub-county aquaculture yields and constraints to Aquaculture production and present in the plenary: Sites suitable for Aquaculture Average land/farm size under Aquaculture production in Kenya Average yield of Aquaculture per unit farm area Constraints to Aquaculture production Opportunities to address the constraints. --- **Discussions/presentations from the groups** Let the trainees/groups share the group exercise outcomes	PowerPoint presentation Group work. Open discussions with the guidance of the facilitator Plenary discussion
1.4.5 Module review	Session guide
(The facilitator leads the trainees in reviewing the module) Summary of the main points from the training Objectives and expectations (review done on the basis of the expectations listed earlier) Trainees to recall the Aquaculture production requirements, aquaculture production average productivity, and constraints in the target Counties. Trainees will indicate new sets of skills and knowledge acquired from the module. The results are recorded per county presented. Trainees will randomly identify the issues for the way forward. Facilitator's guided discussion	The last participants' handouts/ training materials Summarize the main points of the module on a flip chart and display. Plenary discussion

MODULE 2: CULTURE SYSTEMS AND MANAGEMENT PRACTICES

2.1. Introduction

This module is designed to train and expose trainees to aquaculture systems. There are extensive water resources that are suitable for pond-and cage-based culture systems in Kenya. Aquaculture systems are mainly characterised into three categories depending on the scale of production as follows:

Extensive systems with a low degree of control, low initial costs, low-level technology, and low production efficiency.

Semi-intensive systems where supplemental feed is required to maintain higher stocking rates and

A high degree of control, high initial costs, high-level technology, and high production efficiency characterise intensive systems.

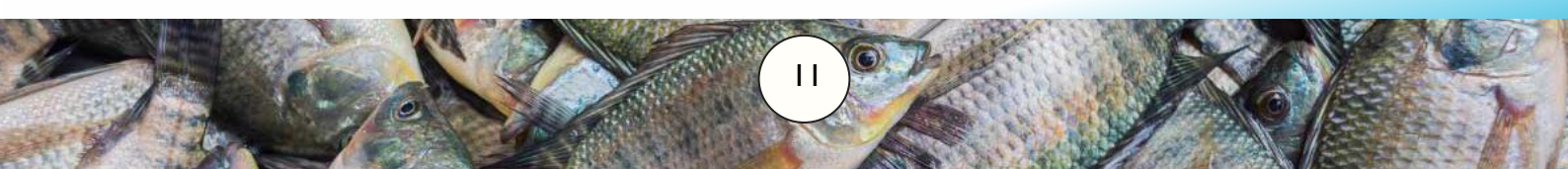
2.2. Module Learning Outcomes

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

1. • Site selection and validation of pond-based culture systems demonstrated and explained
2. • Pond-based culture systems design explained and demonstrated
3. • Best management practices (BMPs) in pond culture are described and explained.

2.3 Module Summary

Module 2. Culture Systems and Management Practices			
Sessions	Training Methods	Training Materials	Time
2.3.1 Introduction to aquaculture systems 1. Extensive systems understood and appreciated 2. Semi-intensive systems understood and appreciated 3. Intensive systems understood and appreciated	• Groups to bring out expectations. • Plenary presentation	• Module objectives • Marker pens • Flip charts • Projector • Laptop	20 minutes
2.3.2 Introduction to the various Fish species, their culture requirements	• Group Exercises to identify local fish species. • Plenary Presentations • Plenary discussion	• Flips charts • Felt pens. • Laptop • Projector • Manila papers	30 minutes



Module 2. Culture Systems and Management Practices			
Sessions	Training Methods	Training Materials	Time
2.3.3 Criteria for Pond site selection	PowerPoint Presentation Field demonstration Group discussions	• LCD Projector • Laptop • Flip charts and pens • Soil testing kit • Buckets • Timer • Handout	1 hour
2.3.4 Recommended species for specific culture conditions and systems	• Plenary Presentation • Group exercise. • Field demonstration	• Flips charts • Felt pens. • Laptop • Projector • Manila paper	20 minutes
2.3.5 Instructions on aquaculture systems applied	• Plenary Presentation • Group exercise. • Plenary discussions • Practicals/demonstration	• Flips charts • Felt pens. • Laptop • Projector • Manila papers • Sample kits. • Practical's	hour
2.3.6 Extensive culture systems and management practices	• Plenary Presentation • Group exercise. • Plenary discussions • Practicals/demonstration	• Flips charts • Felt pens. • Laptop • Projector • Manila papers • Practicals	1 hour
2.3.7 Semi-Intensive culture systems and management practices	• Plenary Presentation • Group exercise. • Plenary discussions • Practicals/demonstration	• Flips charts • Felt pens. • Laptop • Projector • Manila papers • Practicals	1 hour
2.3.8 Intensive culture systems and management practices	• Plenary Presentation • Group exercise. • Plenary discussions • Practicals/demonstration	• Flips charts • Felt pens. • Laptop • Projector • Manila papers • Practicals	1 hour

Module 2. Culture Systems and Management Practices			
Sessions	Training Methods	Training Materials	Time
2.3.9 Certified seed for Aquaculture identified and adopted. Information on fingerlings' preferred species identified. Group exercise. Circulate samples of certified Aquaculture fingerlings; Identify key information on fish seed	• Distribute Participants' handouts. • Group exercise. • Plenary discussion	• Demonstration of fingerling samples	30 minutes
2.3.10 Module review	• Participants' questions and comments • Facilitator's summary	• Participants' handouts • Module review	20 minutes
TOTAL			7 hours

2.4 Facilitator's Guidelines

2.4.1 Introduction and Levelling Expectations	Session guide
The facilitator welcomes trainees to the module and introduces themself, stating their profile and experience of working with farmers. **Trainees' introductions and expectations** The facilitator invites the trainees to state their expectations after brainstorming in their respective county groups. **Module Objectives** *The facilitator presents the module's objectives.* By the end of the module, the trainee should be able to: 1. Explain the role of private, community and public hatcheries aquaculture.	Summarize trainees' Expectations on a flipchart. PowerPoint presentation

2.4.2 Introduction to Aquaculture and the various Fish species and their uses	Session guide
(The facilitator describes the Aquaculture systems and guides the trainees in identifying the various fish species). • Group exercise and discussion. • Ask trainees to highlight and describe some of the Fish species they know. • **Plenary Presentation** • Fish species. • Categories of Fish species and comparison • Show trainees the photographs of each species, their full descriptions, and their uses.	• Distribute participants' handouts. • Group exercise. • Plenary discussion
2.4.3 Recommended Fish species for the target counties	• Session guide
• Plenary Presentation • Species for the target counties • Aquaculture production regions and the new regions are being targeted for aquaculture production in Kenya. • Fish species suited for each county. • Conditions for target county Trainees discuss and produce Fish species in their county. • **Field demonstration** • *(Identify farmers' fields with various Fish species).* • Visit the Aquaculture ponds with the trainees and assist them in identifying and studying the various species. • After the field visit, facilitate them to recall what they learned and discuss any issue that may arise. (you can also use fish samples/pictures for the various species)	• Distribute participants' handouts. • PowerPoint presentation • Group exercise. • Field demonstration
2.4.4. Instructions on fingerling sources applied	Session guide
• Plenary Presentation • Certified fingerling sources for aquaculture were identified and adopted. • Information on seed and fingerlings understood in preferred species identified. • Circulate samples of certified Aquaculture fingerlings • Identify key information on Aquaculture fingerlings provided	• Distribute Participants' handouts. • Group exercise. • Plenary discussion

• 2.4.5 Extensive Culture Systems and Management Practices	• Session guide
• Plenary Presentation • Criteria for pond site selection • General guidelines and requirements for pond • design and layout. • Operations • Discussion • Basic components • Component functions • Installation • Operations • **Field demonstration** • *(Identify farmers' fields with various Fish species).* • Visit the Aquaculture ponds with the trainees and assist them in identifying and studying the various species. • After the field visit, facilitate them to recall what they learned and discuss any issue that may arise. (you can also use fish samples/pictures for the various species)	• Distribute Participants' handouts. • Group exercise. • Plenary discussion
2.4.6 Semi-Intensive Culture System and Management Practices	Session guide
Plenary presentation The trainer makes PowerPoint presentations. • Criteria for pond site selection • General guidelines and requirements for pond • design and layout. • Operations Discussion • Components • Component functions • Installation • Operations **Field demonstration** (Identify farmers' fields with various systems). • Visit the fields with the trainees and assist them in identifying and studying the various systems. • After the field visit, facilitate them to recall what they learned and discuss any issue that may arise.	• Distribute Participants' handouts. • Group exercise. • Plenary discussion

2.4.7 Intensive Culture System and Management Practices	• Session guide
Plenary presentation • The trainer makes PowerPoint presentations. Recirculating and aquaponic systems Tank and Raceway Culture Cage culture system. Integrated crop-livestock-fish (CLF) culture Systems Discussion • Components • Component functions • Installation • Operations **Field demonstration** *(Identify farmers' fields with various systems).* Visit the fields with the trainees and assist them in identifying and studying the various systems. After the field visit, facilitate them to recall what they learned and discuss any issue that may arise.	• Distribute Participants' handouts. • Group exercise. • Plenary discussion
2.4.8 Module Review	Session guide
The trainer should lead the trainees in reviewing the module. Summarize and review with the trainees the main points of the training on culture systems and best management practices.	• Recap of the key take-home points using any of the following participatory methods: • Q & A session • Discussions • Questionnaires

MODULE 3: FISH BREEDING AND HATCHERY MANAGEMENT

3.1 Introduction

The low yields realized in Aquaculture production by farmers are a result of the non-adoption of the improved aquaculture management practices developed by researchers. There is a high demand for quality certified fish seed in Kenya for improved aquaculture productivity. To enhance the production of quality seed, there are several documented fish breeding and genetics techniques available, which include chromosomal manipulation, hybridization or crossbreeding, hormonal sex reversal, GIFT YY male technology, gene transfer and selective breeding. This module explains the protocols to be used in fish breeding of commercially important fish species in Kenya, namely Nile tilapia, African catfish, African carps (Barbus spp, Labeo victorianus), and ornamental fish.

3.2 Module Learning Outcomes

1. By the end of the module, the following should be achieved:
2. By the end of the module, the following outcomes should be achieved:
3. Skills and knowledge in fish genetics and breeding of commercially important fish species enhanced.
4. Skills and knowledge in commercially important wild fish stock selection and domestication enhanced.
5. Positive qualities for commercially important fish species to enhance production and market acceptability identified.
6. Skills and knowledge in fish breeding techniques for increased yields enhanced.
7. Knowledge in broodstock and fry/fingerling management acquired.
8. Skills and knowledge in broodstock genetic integrity and biosafety management developed and acquired.
9. Benefits of fish breeding and genetics in aquaculture development explained.

3.3 Module Summary

Module 3: Fish Breeding and hatchery management			
Sessions	Training methods	Training materials	Time
3.3.1 Introductions and climate setting, objectives, and expectations	• Self-introduction • Setting Norms & rules • Plenary Presentation • Plenary discussion • Group exercise	• Flips charts • Felt pens. • Laptop • Projector	15 minutes

3.3.2 Wild fish stocks selection and domestication	• Presentations • Group exercise. • Plenary discussions	• Flips charts • Felt pens. • Laptop • Projector • Participants' handouts	1 hour
3.3.3. Broodstock traits	• Presentations • Group exercise. • Plenary discussions	• Flips charts • Felt pens. • Laptop • Projector • Participants' handouts	40 minutes
3.3.4 Fish breeding and genetics improvement techniques and management	• Presentations • Group exercise. • Plenary discussions	• Flips charts • Felt pens. • Laptop • Projector • Participants' handouts	40 minutes
3.3.5 Broodstock genetic integrity and biosafety	• Presentations • Group exercise. • Plenary discussions	• Flips charts • Felt pens. • Laptop • Projector • Participants' handouts	40 minutes
3.3.6 Practical aspects of fish production, incubation and larval rearing	• PowerPoint presentation • Plenary discussion • Practical sessions	• Hatchery site • Broodstock • Sex reversal Hormone • Handouts • Laptop	1 hour
3.3.5 Module review and discussion	• Presentations • Group exercise. • Plenary discussions	• Flip charts • Felt pens. • Laptop • Projector	15 minutes
Total			4 hours 30 min

3.4 Guidelines for Facilitators

Module 3: Fish breeding and hatchery management	
3.4.1. Introductions, climate setting	Session guide
Preliminaries *The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations.* Expectations The trainees from groups (e.g., county-based) and list expectations from the module. *The facilitator presents the module objectives.* **Objectives** By the end of the module, the trainee should be able to: • Demonstrate acquisition of skills and knowledge of breeding and hatchery management for commercially important fish species. • Explain the benefits of fish breeding and hatchery management in aquaculture development.	• Summarize the trainees' expectations. • PowerPoint presentations • Group exercise (listing and presenting expectations). • Expectations lists are kept for later review of compliance.
3.4.2. Wild fish stocks selection and domestication	
Plenary Presentation Sources Access Transportation mode Genetic purity Policies **Plenary Discussion** Questions/answers and comments **Practical exercise** Guided group tours to model farms to observe various management techniques	• PowerPoint Presentation • Plenary discussion • Distribute participants' handouts/training materials. • Practical exercise
3.4.3. Broodstock traits	• Session guide
• Plenary presentation • Pure phenotypic traits • Crossbreeds traits • Causes of crossbreeds • Effects of crossbreeds. • Plenary discussion • Questions/answers and comments	• PowerPoint Presentation • Distribute participants' handouts. • Groups exercise • Plenary discussion

3.4.3. Fish breeding and genetics improvement. techniques and management	Session guide
Plenary presentation Selective Breeding Sex determination Broodstock Management and feeding. Types of spawning, e.g. natural, seminatural, semi-artificial and complete artificial propagation Hormonal Sex-reversal protocol YY technology Crossbreeding and hybridization Egg, fry, and fingerling management. Plenary discussion. Plenary discussion Questions/answers and comments	• PowerPoint Presentation • Distribute participants' hand-outs. • Groups exercise • Plenary discussion
3.4.4. Broodstock genetic integrity and biosafety	Session guide
Plenary presentation Phenotypic identification of pure strains and crosses Factors contributing to genetic pollution of broodstock. Genetic biosafety considerations in aquaculture **Plenary discussion** Questions/answers and comments	• PowerPoint Presentation • Distribute participants' hand-outs. • Groups exercise • Plenary discussion
3.4.5 Practical aspects of fish production, incubation and larval rearing	
Demonstration The trainer demonstrates quality broodstock, fish sexing, fish seed production techniques, egg, fry/ fingerling management and hatchery seed production opportunities and challenges Trainees are taken to the hatchery/laboratory and shown how to: • Prepare for broodstock acquisition • Determine the population size of broodstock • Selection of broodstock and management • Handling and care of broodstock • How to count fish eggs and determine egg quality • Nursing and care of fish larvae • Control of reproduction and prevention of inbreeding Environmental factors affecting breeding, e.g., dissolved oxygen, ammonia, nitrates, pH, and invasive species. **Plenary discussion** Question and answer, comments	• Practical demonstrations • Plenary discussions -Summarize the main points of the module on a flip chart and display.

MODULE 4: FISH NUTRITION AND FEED FORMULATION

4.1 Introduction

There is a high and increasing demand for quality certified fish feed in Kenya for improved aquaculture productivity. The module specifies the training competencies required to produce cost-effective cottage/supplementary and commercial pelleted fish feeds. It involves sourcing especially locally available fish feed ingredients, feed formulations using the locally available feed ingredients, feed processing for the different fish species and growth stages, feed conversion ratio, feeding strategies, the relationship between feeding and water quality in culture systems, and feed storage.

4.2 Module Learning Outcomes

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

1. Skills in the sourcing of quality feed ingredients enhanced.
2. Knowledge of formulating high-quality feeds, targeting various species, different developmental/ growth stages and different culture systems developed.
3. Knowledge and skills in fish feed processing enhanced.
4. Knowledge and skills in feed packaging and storage enhanced.
5. Knowledge of adequate management of feeding and water quality in culture systems is enhanced.
6. Best management practices in fish feeds are appreciated.
7. Knowledge for monitoring growth and feed conversion ratio of different formulations enhanced.

4.3 Module Summary

Module 4: Fish Nutrition, Feed Formulation and Management Practices			
Sessions	Training methods	Training materials	Duration
4.3.1 Introduction, objectives, and expectations	Self-introduction Plenary Presentation Plenary discussion	• Flip charts • Marker pens • Projector for Power-Point presentation • Laptop	15 minutes
4.3.2 Fish Nutrition, Feeds and Feeding	Plenary Presentations Plenary discussion	• Flip charts • Marker pens • Projector for Power-Point presentation • Laptop • Participants' handouts	1 hour 15 minutes
4.3.3 Quality Assurance in Fish Feeds	Plenary Presentations Plenary discussion	• Projector for Power-Point presentation • Participants' handouts	30 minutes

Module 4: Fish Nutrition, Feed Formulation and Management Practices			
Sessions	Training methods	Training materials	Duration
4.3.4. Feed Selection, Storage and Administration	• Plenary Presentation • Plenary discussion	• Flip charts • Marker pens • Projector for Power-Point presentation • Laptop • Participants' handouts	30 minutes
4.3.5 Fish Feed Formulation and Conversion Ratio (FCR) and Feed Storage	• Plenary Presentation • Plenary discussion • Practical demonstrations	• Flip charts • Marker pens • PowerPoint presentation • Participants' handouts	1 hour 45 minutes
4.3.9 Module review and discussion	Discussion	• Flip charts	15 minutes
Total			4 hours 30 minutes

4.4 Facilitator's Guidelines

Fish Nutrition, Feed Formulation and Management Practices	
4.4.1. Introduction, Objectives and Expectations	Session guide
(The facilitator welcomes trainees to the module. The trainees are then invited to introduce themselves and state their expectations) **Module Objectives** *(The facilitator presents module objectives)* By the end of the module, the trainee should be able to: • Explain the sourcing of quality feed ingredients. • Formulate highly efficient feeds, targeting various species, the different developmental/growth stages and different culture systems. • Demonstrate knowledge and skills in fish feed processing. • Demonstrate knowledge and skills in feed packaging and storage. • Adequately manage feeding and water quality in culture systems. • Apply best management practices in fish feeds. • Monitor growth and feed conversion ratio of different formulations.	• Summarize trainees' "Expectations" and display. • PowerPoint presentation • Distribute participants' handouts on Module. • Objectives and Training Program • Distribution of Feeds and Feeding handouts to trainees

4.4.2. Fish Nutrition, Feeds and Feeding	Session guide
Plenary Presentation • The trainer makes a PowerPoint presentation on fish feed and feeding and explains the main reasons for feeding fish. • Feeding rates for different culture systems • Sourcing raw materials for feed formulations and costing fish feeds to optimise profits. • Evaluating feed performance (feed records, FCR, etc.) • Nutrient loading in culture systems and water quality monitoring • Effects of feeding and water quality on fish growth rates • FCR of different feed formulations and managing FCRs. • Plenary discussion • Practical demonstration • Practical demonstration of feed ingredients and nutritional quality	• PowerPoint presentation • Feeding Guidelines • Demonstration of • live fish feeding • Distribution of • Feeds and Feeding handouts to trainees
4.4.3. Quality Assurance in Fish Feeds	**Session guide**
Plenary Presentation • The trainer makes PowerPoint presentation the following aspects: • Nutritional and physical characteristics of the feeds • Nutrient requirements for the different fish species & growth stages - right quantities and • proportions for good performance in terms of both growth and health • Accessibility of nutrients within the feeds – • bioavailability • Effects of floating and sinking feeds. **Plenary discussion** Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Plenary discussion • Distribute participants' handouts.

4.4.4 Feeding Selection and Management Practices	Session guide
Plenary Presentation • Present the following on PowerPoint slides and flip charts. • Feeding schedules for different fish sizes/stages • Feeding rates for different fish species • Feeding methods (broadcasting, automated and • demand-driven) • Administering the feed and feeding response • Factors to consider when feeding. Plenary discussion Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Distribute participants' hand-outs. • Brochures, leaflets, and manual
4.4.5 Fish Feed Conversion Ratio (FCR) and Feed Storage and calculation of FCR	• Session guide
Plenary Presentation • The trainer guides trainees on the calculation of the fish feed conversion ratio • Factors to consider in feed formulation. • Factors that affect Fish Feed Storage • Type of feed stores and shelf life of fish feeds • The conditions under which the fish feed is stored. Plenary discussion • Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Feeding schedules and proto-cols • Feed rates tables. • Plenary Discussion
4.4.7 Soil degradation and reclamation	• Session guide
Plenary Presentation • 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 Plenary discussion • Let the trainees recall what they learnt and discuss any issues that may arise.	• PowerPoint presentation • Feeding schedules and proto-cols • Feed rates tables. • Plenary Discussion

4.4.9. Module review	Session guide
• The facilitator leads the trainees in reviewing the module) • Summarize the main points of the training and review the main points together with the trainees. • Discuss new things learned from this module with trainees. • Let them identify some of the problems and any other issues arising from the module.	• Recap of the key take-home points using any of the following participatory methods: • Q & A session • Discussions • Questionnaires • • Any other method

MODULE 5: FISH HEALTH MANAGEMENT

5.1 Introduction

The occurrence of disease outbreaks in fish farming may be due to poor husbandry practices since the disease-causing organisms are always in the environment. This module specifies the training competencies required for fish health and biosecurity. It involves the practices, procedures and policies used to prevent the introduction of disease-causing organisms. They cause problems until the fish are stressed through inadequate dietary or environmental conditions. Since fish consumers want assurance that fish products are safe to eat, producers and handlers are responsible for ensuring the quality and safety of fish for human consumption. The farm management needs to ensure that biosecurity principles are observed in all farm operations.

5.2 Module Learning Outcomes

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

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

1. • Role of stress in disease development explained and understood
2. • Common diseases and predators in aquaculture identified
3. • Emerging diseases in aquaculture appreciated
4. • Control measures for fish diseases, parasites, predators, and pest control appreciated
5. • Important steps in biosecurity within a fish farm identified
6. • A comprehensive biosecurity plan within an aquaculture facility has been developed and shared.

5.3 Module Summary

Module 5: Fish Health			
Sessions	• Training methods	• Training materials	Time
5.3.1 Introduction, objectives, and expectations	• Self-introductions • Group exercise. • Plenary presentation • Plenary discussion	• Flips charts • Marker pens • Laptop • Projector	20 minutes
5.3.2 The role of stress in fish disease. development	• Group work. • Plenary presentation • Plenary discussion • Practical exercise	• Flips charts • Marker pens • Projector • Laptop • Participants' handouts	40 minutes
5.3.3 Common and emerging fish diseases and them prevention	• PowerPoint presentation • Plenary discussions • Practical demonstration • Field observations • Group work	• Flips charts • Felt pens. • Handouts • LCD Projector • Lab apparatus (Microscopes, Dissecting kit, trays, slides, and • coverslips • Fish specimens	1 hour 30 minutes

Module 5: Fish Health			
Sessions	• Training methods	• Training materials	Time
5.3. Fish predators and their control in aquaculture	• Group work. • Plenary Presentation • Plenary discussion • Practical session	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	40 minutes
5.3.5 Biosecurity plan for a fish farm	• PowerPoint presentation • Plenary discussion • Practical demonstration • Group work	• Flip charts • Marker pens • Projector • Laptop • Participants' hand-outs	1 hour
5.3.8 Module Review	• Discussion/ Recap of the module • Take away messages	• Flip charts • Marker pens • Participants' hand-outs	20 minutes
Total			4 hours 30 minutes

5.4 Facilitator's Guidelines

Module 5: Fish Health	
5.4.1 Introduction and levelling of expectations and objectives	Session guide
Introduction (The facilitator welcomes trainees to the module and, after that, invites them to introduce themselves and state their expectations) Module Objectives *(The facilitator presents module objectives)* By the end of the training module the trainee should be able to: • Understand the role of stress in disease development • Identify common diseases and predators in aquaculture • Appreciate emerging diseases in aquaculture • Implement control measures for fish diseases, parasites, predators, and pest control • Identify the important steps in biosecurity within a fish farm • Develop a comprehensive biosecurity plan within an aquaculture facility.	• Summarize trainees' "Expectations." • PowerPoint presentation • Participants' handouts

5.4.2 The role of stress in diseases development	Session guide
The facilitator makes presentations on the relationship. *between disease and stress in aquaculture* • The host-pathogen-environment relationship in stress development • Sources of stress in aquaculture • Good husbandry practices for the management of stress in aquaculture. • Maintenance of good water quality for reducing stress in aquaculture. Plenary discussion Question and answer session, comments	• PowerPoint presentation • Plenary discussion
5.4.3. Common and emerging fish diseases and their prevention	Session guide
Plenary Presentation *The facilitator presents the common diseases in aquaculture and their control measures.* • Some common fish diseases and their prevention in aquaculture: parasitic, fungal, bacterial, and viral diseases • Emerging diseases in aquaculture and their prevention: TiLV • Disease identification techniques • Control of diseases and parasites: water quality management, good farming, sanitation, handling, nutrition, and treatment. Plenary discussion • Group work on calculation exercise. • Practicals • Preparation of chemical treatments	• PowerPoint presentation • Demonstration on fish • parasites • Exercises in the calculation and preparation of chemical treatments
5.4.4 Fish predators and their control in aquaculture	Session guide
Plenary presentation *The facilitator makes presentations on fish predators and their control in aquaculture* • Common predators in aquaculture • Predators as hosts and vectors of disease agents • Role of predators in parasite life cycles • Controlling predators/ disease hosts in fish farms. **Plenary discussion** Question and answer session, comments	• PowerPoint presentation • Group discussions

5.4.5 Biosecurity facilities and important steps in Biosecurity	Session guide
Plenary presentation *The facilitator makes presentations on biosecurity facilities and important steps in biosecurity.* Definition of terms: Biosecurity, biosecurity plan, epidemiological unit, aquaculture establishment, compartment, zone, Biosecurity development process/steps in aquaculture: • Levels of biosecurity in aquaculture • Documentation and record-keeping in aquaculture biosecurity • Standards for biosecurity: construction, operation, disposal, disinfection, and sanitation standards. **Plenary discussion** Question and answer, comments	• PowerPoint presentation • Group work on hazards and risk identification. • Plenary discussion Field demonstration
5.4.6 Biosecurity plan for a farm	Session guide
Plenary presentation *The facilitator makes presentations on developing a comprehensive biosecurity plan for a fish farm.* • Need, purpose and regulatory requirements for a biosecurity plan. • Identify the routes of transmission onto, within and from the farm. • Identify the major disease hazards to the farm. • Document the layout of the farm. • Document how biosecurity plan guidelines will be addressed on the farm. • Implement the biosecurity plan measures on the farm. • Implement a review cycle for the biosecurity plan. • Group work. • Developing a biosecurity plan **Plenary discussion** • Question and answer, comments	• PowerPoint presentation • Group work to develop a biosecurity plan. • Plenary discussion

5.4.8 Module review	Session guide
(The facilitator leads the trainees in reviewing the module) Summarize the main points of the training on fish health.	The last participants' handouts Summarize the main points from the module on a flip chart and display.

MODULE 6: FISH POST-HARVEST TECHNOLOGIES AND VALUE ADDITION

6.1 Introduction

In this module, competencies required for fish postharvest and value addition are specified. Value addition aims to seize opportunities offered by the market. It involves improving the quality of products, enhancing their value and, in return, better income. Post-harvest and value addition comprise several processes, including transportation and handling fish hygienically; processing fish using different value-enhancing techniques; preparation of fish using different recipes; maintenance of good quality fish products; packaging, branding and certifying fish and fish products and preparation and storage, of fish safely for longer shelf life.

There are two possibilities for adding value: (1) value capturing through the improvement of current production, processing, and trading processes to increase productivity, reduce wastage, and reduce costs by entering new markets with existing products; and (2) value creation through product innovation (e.g., new processed products).

6.2 Module Learning Outcomes

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

- Skills in post-harvest handling of fish enhanced.
- Knowledge and skills in personal hygiene and fish handling are enhanced.
- Skills in best management practices in fish preservation and value addition enhanced.
- Knowledge and practical skills in fish value addition enhanced.
- Monitoring the quality and safety of fish value-added products enhanced
- Practical skills in fish packaging and branding enhanced.

6.3 Module Summary

Module 6. Fish Post – harvest Technologies and Value Addition			
Sessions	• Training Methods	• Training Materials	Time
6.3.1. Introduction, Objectives Expectations	• Personal introduction • Group work. • Plenary Presentation	• Flip charts • Projector • Laptop	20 minutes
6.3.2 Fish handling and hygiene requirements	• PowerPoint Presentation • Group exercise. • Plenary Presentation	• Flip charts • Felt pens. • Projector • laptop • Participants' handouts	40 minutes
6.3.3. Types of fish preservation methods	• PowerPoint • Plenary presentation • Group exercise. • Demonstrations/Practicals	• PowerPoint presentation • Flip charts • Felt pens. • Participant handouts	1 hour 30 minutes

6.3.4. Constraints, benefits, and factors to consider in fish value addition	• Group exercise. • Plenary Presentation	• List of value-added products. • Checklist for prioritisation • Pair-wise ranking tool. • Flip charts • Felt pens. • Participants' handouts • Projector • Laptop	40 min
6.3.5 Fish value-addition methods and recipes	• Plenary Presentations • Plenary discussion • Practical demonstration	• Projector • Laptop • Participant handouts • Assorted value addition equipment and ingredients • Sensory evaluation forms	2 hours 30 minutes
6.3.6. Module review	• Plenary discussion • Presentations	• Flip charts • PowerPoint presentations • Module evaluation forms	20 minutes
TOTAL			6 hours

6.4 Facilitator's Guidelines

Module 6. Fish value addition	
6.4.1 Introduction, expectations, and objectives	Session guide
Introduction and expectations *(The facilitator welcomes trainees to the module on the value addition of fish. They are then invited to introduce themselves and state their expectations)* **Module Objectives** *(The facilitator presents module objectives.)* By the end of the module, the trainee should be able to • Develop and share skills in post-harvest handling of fish. • Enhance knowledge and skills in personal hygiene and fish handling. • Explain skills for best management practices in fish preservation and value addition. • Enhance knowledge and practical skills in fish value addition. • To monitor the quality and safety of fish value-added products. • Appreciate the practical skills in fish packaging and branding.	• Participants' handouts • PowerPoint Presentation • Summarize trainees' expectations and display them on a flip chart/board.

Module 6. Fish value addition	
6.4.1 Introduction, expectations, and objectives	Session guide
6.4.2 Fish handling and hygiene requirements	Session guide
The trainer explains how to prevent fish contamination for food safety and guides the trainees in discussing and playing video clips on hygiene requirements for fish handlers. • Importance of Good Fish Handling Practices, • Hygiene requirements for fish handlers • Fish quality aspects. • What is fish quality, and its importance? • Factors affecting fish quality in farmed fish. • Apply good product handling practices in their farms to reduce fish contamination. • How to prevent Fish Contamination • Temperature control • Display units. • Sources of foodborne diseases • Humans • Food/Product • Environment	• PowerPoint presentation • Participants' handouts • Play video on food. • hygiene requirements • Q&A sessions • Good manufacturing practices manual • Group exercise
6.4.3 Fish processing and preservation	Session guide
Plenary presentation *Present the following on PowerPoint and flip charts.* • How to assess fish freshness • Factors contributing to spoilage. • Stages of spoilage • How to slow down spoilage • Fresh fish assessment • Sampling plan for fish freshness • Fish freshness score forms. • Utilization of various grades of fish • Types of fish preservation methods • Sun drying • Smoking (Traditional and Modern) • Gutting • Chilling and freezing (principles of good icing practice) • Salting (types of salting) • Canning • Fermentation Plenary discussions • Group work and audiovisuals	• PowerPoint presentation • Participant handouts • Brochures, leaflets, manuals, factsheets, posters • PowerPoint presentation • Demonstration/ Practical • Fish Recipe Book and • Videos on FTT Technology

Module 6. Fish value addition	
6.4.1 Introduction, expectations, and objectives	Session guide
6.4.4. Constraints, Benefits, and factors to consider in fish value addition	Session guide
(The trainer guides trainees on factors to consider in fish value addition and make a PowerPoint presentation on the listed aspects) • Quality standards • Constraints • Cost-benefit analysis • Increased product shelf life • Better product prices • The increased product mix in the market • Product quality assurance • Product traceability • Easy and safe commodity handling • Plenary discussions	• PowerPoint presentation • Group Exercise • Distribute trainees. • handouts • Fish Recipe Book and • Information Sheet • Q&A session
6.4.5 Fish value-addition Methods and Recipes	Session guide
• The trainer takes the trainees through product development practices and other value-added technologies. • Improved handling: washing the product, cleaning the package, using plastic buckets for cleaning, and transporting dried fish in plastic bags or cooler boxes. • Value-added products and their recipes, e.g., fish fillets, samosas, balls, fingers, sausages, fish sauce, soup, skewers, pie, and burgers. • Improved quality/standardization: Reduce use of paraffin, grading, proper selection of top-grade tilapia/ catfish in terms of sizes, standardization, and development of price policy according to sizes/grades. • Improved technologies: Advanced fishing technology, proper dressing racks, proper storage, drying on racks before frying. • Improved marketing: Advertising products with an emphasis on their values, branding to transcend across all market chains, proper marketing strategies, being honest and reliable to customers, advertisement, and neat packaging. • Use clear labels/Eco-labeling; Use colorful packaging materials. • Plenary discussions • Practical and demonstrations	• Participants handouts • PowerPoint presentation • Fish Recipe Book • Q&A Session • Demonstrations and practicals

Module 6. Fish value addition	
6.4.1 Introduction, expectations, and objectives	Session guide
6.4.6 Module review	Session guide
(The facilitator leads the trainees in reviewing the module) Review the main points about aquaculture value addition together with the trainees. • What new things did you learn from this Module? • What are some of the problems and issues that you have become more aware of in fish value addition? • What questions do you still have about fish value addition?	• Summary of the main points from the Module.

MODULE 7: FISH BUSINESS AND MARKETING

7.1 Introduction

Markets and marketing of fish are major concerns to small-scale farmers and other actors in the value chain in Kenya, particularly inconsistency in supplying sufficient volumes required for trade and price fluctuations. The low production/volumes and high perishability of the fish also limit farmers to the local markets, where demand is low and hence prices. To strengthen the aquaculture value chain, it is important to equip farmer facilitators with the skills and knowledge of fish farming business and marketing strategies. This module is designed to build the skills of trainees in fish farming business and marketing in Kenya.

The module guides on how to effectively market fish and fish products, formulate costing and pricing charts, prepare marketing tools, project supply and demand curves in the market, advertise and promote fish and fish products, maximize profit margin from fish sales, and market fish in groups or clusters. Furthermore, it will guide the process of market identification and selection of attractive enterprise options based on information gathered from the market chain and analysis of local supply and demand trends and market access options.

7.2 Module Learning Outcomes

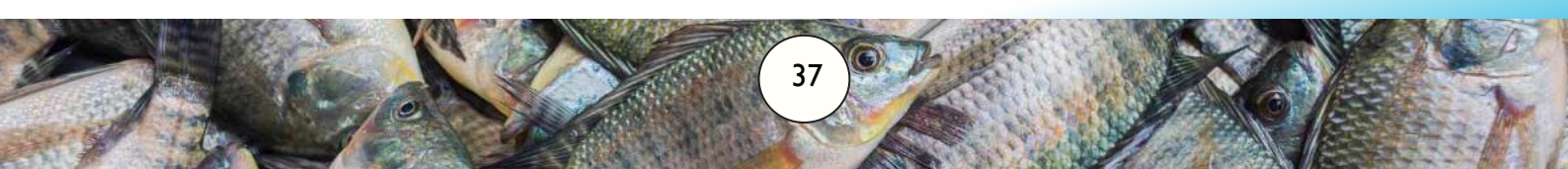
By the end of the module training, the following outcomes should be achieved:

- Fish markets and marketing are appreciated and understood.
- Concepts such as costs, income, prices, and profits applied and understood.
- Concepts of basic market survey and analysis to determine the demand for specific products understood and shared.
- Knowledge and skills on fish supply and demand and setting of marketing targets appreciated.
- Assessing the profitability of various marketing strategies understood. Determination of Profitability (Gross margin analysis) described.

7.3 Module Summary

Module 7. Fish Business and Marketing			
Sessions	• Training Methods	• Training Materials	Time
7.3.1. Introduction, learning outcomes and expectations (Levelling of participants' expectations about the module and objectives)	• Introduction • Plenary discussion	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/ flip chart holders	15 minutes

Module 7. Fish Business and Marketing			
Sessions	• Training Methods	• Training Materials	Time
7.3.2. Basics of Market and Marketing i. Business concept and emerging and farming business models) ii) Planning a farm business: SWOT Analysis, farm budgeting and business plan	• Plenary presentation • Plenary discussion • Group exercise.	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/ flip chart holders	1 hour 30 minutes
7.3.3. Fish Market channels, value chain analysis and distribution networks	• Presentation and • Plenary discussions • Role-play exercise	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/ flip chart holders	45 minutes
7.3.4 Developing Marketing Strategies and Marketing Analysis	• Plenary presentation • Plenary discussion	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/ flip chart holders	45 minutes
7.3.5 Scaling up a plan of the fish enterprise development approach	• Group work. • Plenary discussions	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/ flip chart holders	30 minutes



Module 7. Fish Business and Marketing			
Sessions	• Training Methods	• Training Materials	Time
7.3.6 Marketing Approaches (Contracted fish production model, Aquaculture marketing entrepreneurship model and Internet/ online/mobile marketing)	• Plenary presentation • Plenary Discussion	• Projector • Laptop • Flip charts • Marker pens • Masking tapes/ flip chart holders	45 minutes
7.3.7. Module review	• Facilitator's summary • Plenary presentation • Plenary Discussion	• Module review • Participants handouts	15 minutes
TOTAL			4 hours 45 minutes

7.4 Facilitators Guidelines

Module 7. Fish Business and Marketing	
7.4.1 Introduction, objectives, and expectations	• Session guide
(The facilitator welcomes trainees to the module and, after that, invites them to state their expectations) *(The facilitator presents module objectives)* Module Objectives • By the end of the module, the trainee should be able to: • Appreciate fish markets and marketing. • Appreciate and apply concepts such as costs, income, prices, and profits. • Conduct a basic market survey and analysis to • determine the demand for specific products. • Prepare marketing tools in the fish value chain. • Demonstrate knowledge and skills in fish supply and demand and setting marketing targets. • Develop skills in assessing the profitability of various marketing strategies.	• Summarize trainees' "Expectations" and display them on a flip chart/ board. • Participants handouts • PowerPoint presentation

7.4.2 Basics of Markets and Marketing	• Session guide
(The facilitator will highlight elements of business concepts and emerging farming business models) • Markets and marketing? • Supply and demand and how they affect prices • Types of markets • Fish costs, incomes, prices, and profits • 4 Ps of Marketing and Marketing Mix • Trends and changes in markets and marketing. **Group Exercise: Marketing Selection & Segmentation** **Plenary discussion** **Plenary Presentation** Business concept and emerging farming business models **Planning a farm business using SWOT Analysis, farm budgeting and business plan** *The facilitator highlights the components of the SWOT matrix and their interactions to generate opportunities based on the other components)* **Plenary Presentation** SWOT analysis Budgeting Business planning **Group Exercise** List the strengths, weaknesses, opportunities, and threats in Aquaculture farming as a business and marketing	• PowerPoint presentation • Participants' handouts • Group exercise
7.4.3 Fish Market Channels,Value Chain and Distribution Networks	• Session guide
(The facilitator highlights the importance and benefits of collective and group marketing • Types of value chain actors • Marketing functions and services • Marketing channels and distribution networks • Virtual and physical market aggregators • Marketing tools and applications **Group Exercise: Fish Value Chain Analysis** **Plenary discussions**	• Participants 'handouts • Group exercise.

7.4.4 Developing Marketing Strategies and Marketing Analysis	• Session guide
(*The facilitator highlights the importance of the tools in managing Aquaculture production as a farm business)* Market analysis • Market surveys tool (template of a basic questionnaire) • Analyzing and presenting market information • Development of group marketing strategies Group Work: Developing fish marketing strategy. Profitability analysis	• PowerPoint presentation • Participants' handouts • Plenary discussion
7.4.4 Scaling up plan of Aquaculture enterprise development approach	• Session guide
Group and Plenary discussions. • In groups, the participants discuss how to scale up Aquaculture agro-enterprise. • The group leaders in each group present back to the whole plenary and discuss the outcomes.	• Plenary discussion • Group exercise.
Marketing Strategies	• Session guide
Plenary Presentation (*The facilitator highlights the marketing strategies for the Aquaculture farm business)* • Market research • Producer organizations • Contract farming. • Online/internet marketing • Plenary Discussion	• PowerPoint presentation • Participants' handouts
Training review	• Session guide
(The facilitator leads the trainees in reviewing the module. Conclude by thanking the trainees) **Plenary Presentation** *Summarise the main points of the training*	• Plenary presentation • Summary of the main points from the Module.

MODULE 8 GREEN TRANSFORMATION - TECHNOLOGIES AND INNOVATION

Introduction

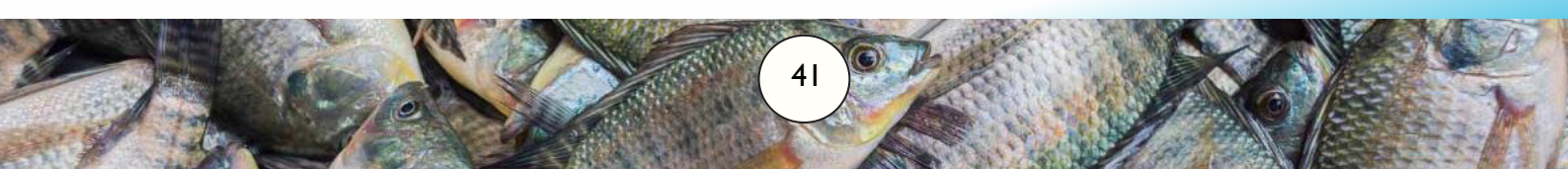
As the population of people continues to increase while water and land resources remain constant, there is need to produce more with the limited resources. This where technology comes in play. In fisheries, with the dwindling of fish from the capture fisheries, has put pressure on aquaculture. There are a number of new technologies that aim to increase production but have a negative impact on the environment. These include- RAS, Aquaponics, cage fisheries, raceways among the many. Biofloc technology is the only one that leads to increased production while safe guarding the environment.

Module learning outcomes

By the end of the lesson the learners are supposed to have achieved.

1. The different technologies that have been innovated to improve fish farming production explained.
2. Biofloc technology explained.
3. Benefits of using the BFT in comparison to other technologies explained.
4. Critical issues that must be put in place for BFT to succeed to be discussed.

Module 8: Green transformation- Techonology innovations			
Sessions	Training methods	Training materials	Time
8.3.1 Introduction, objectives, and expectations	• Self-introductions • Group exercise. • Plenary presentation • Plenary discussion	• Flips charts • Marker pens • Laptop • Projector	20 minutes
8.3.2 Examples of recent technologies in aquaculture	• Group work. • Question and answer • Plenary discussion • Practical exercise	• Flips charts • Marker pens • Projector • Laptop	40 minutes
8.3.3 Define BFT explain how works	• PowerPoint presentation • Plenary discussions • Field observations • Group work	• Flips charts • Felt pens. • Handouts • LCD Projector • Laptop	1 hour
8.3.4 State the advantages of using the BFT	• • Plenary Presentation • Plenary discussion • Practical session	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	40 minutes



8.3.5 Critical issues to be considered for BFT to succeed.	1. PowerPoint presentation 2. Plenary discussion 3. Group work	• Flip charts • Marker pens • Projector • Laptop • Participants' handouts	1 hour
8.3.8 Module Review	1. Discussion/ Recap of the module 2. Take away messages	• Flip charts • Marker pens • Participants' handouts	20 minutes
Total			4 hours

8.4 Facilitators Guidelines

Module 8. Green transformation- Technologies and Innovation	
8.4.1 Introduction, objectives, and expectations	Session guide
(The facilitator welcomes trainees to the module and, after that, invites them to state their expectations) *(The facilitator presents module objectives)* Module Objectives By the end of the module, the trainee should be able to: Give examples and explain different technologies in aquaculture Explain why BFT is better than others Give advantages of BFT High light and explain critical issues to be addressed for BFT to succeed.	• Summarize trainees' "Expectations" and display them on a flip chart/ board. • Participants handouts • PowerPoint presentation
8.4.2 Basics of recent technology innovation in Aquaculture	Session guide
(The facilitator will highlight different innovations in A aquaculture) --- • **State different technologies** • Explain how each works and how it affects the environment • State the benefits of RAS, Aquaponics, Cage, Raceways **Group Exercise: work out the challenges of technology** **Plenary discussion** **Plenary Presentation**	• PowerPoint presentation • Participants' handouts • Group exercise

8.4.3 Define BFT and explain how it is better than others	Session guide
(The facilitator highlights what makes biofloc • Types of micro-organisms in biofloc • How to prepare bio floc water • explain the autotrophic algae, heterotrophic bacteria and other organisms • relationship of ammonia and nitrites in water quality pollution **Group Exercise: how BFT works** **Plenary discussions**	• Participants 'handouts • Group exercise.
8.4.4 Advantages of BFT	Session guide
(*The facilitator highlights the importance of BFT)* • Demonstrate how BFT improves on farmers returns • Closed system minimizes environmental pollution • Water quality management by self-cleaning Fish feeds of biofloc and reduces amount of feeds How BFT reduces fish death at night and on cloudy days How BFT controls fish diseases by minimizing on stress	• PowerPoint presentation • Participants' handouts • Plenary discussion
8.4.4 Critical issues to be considered for BFT to succeed	Session guide
Group and Plenary discussions. In groups, trainees discuss the importance of each critical issue and how it can affect the outcome of BFT The group leaders in each group present back to the whole plenary and discuss the outcomes.	• Plenary discussion • Group exercise.
8.4.7	Session guide
Plenary Presentation (*The facilitator highlights the critical issues and how they affects outcome)* Species to be used Construction of the tank Water preparation before stocking Aeration Carbon nitrogen ratio Plenary Discussion	• PowerPoint presentation • Participants' handouts
Training review	Session guide
(The facilitator leads the trainees in reviewing the module. Conclude by thanking the trainees) **Plenary Presentation** *Summarise the main points of the training*	• Plenary presentation • Summary of the main points from the Module.

MODULE 9: GENDER EQUALITY , HUMAN RIGHTS AND SOCIAL INCLUSION

9.1 Introduction

Gender equality, human rights, and social inclusion are essential for achieving peaceful societies, full human potential, and sustainable development. Empowering women leads to productivity and economic growth. Advancing gender equality is critical for reducing poverty and promoting health, education, and well-being. Human rights, including freedom from violence and socio-economic equality, should be enjoyed by all people. Studies have shown that many right holders especially those in rural areas are not aware of their rights and the need to demand the same from duty bearers who include the state and non-state actors and even within households.

The achievement of the 17 UN Sustainable Development Goals(SDG) is dependent on the operationalization and implementation of gender equality and women empowerment strategies, Human Rights Based Approaches(HRBA) and social inclusion is guided om the principle of Leave no one Behind. Restrictive gender roles and social norms a lived reality in most of the rural smallholder farms continue to drag development behind. While men and women continue to perform these roles as is, may of them lack awareness of how some of these community sanctioned roles continue to limit their progress in live especially among in creating wealth out of the agricultural value chains.

Intentionality in creating awareness among right holders to claim their rights , capacity building the duty bearers to meet the claims and ensuring those likely to be left behind like people living with disabilities (PWDs), the marginalized and the minorities among others are included would greatly contribute to common good, dignified lives and sustainable development.

This facilitator guide provides a lay out on how to train on the issues gender equality, human rights and social inclusion.

9.1 Chapter Summary

Chapter 9.0: Gender equality, human Rights and social inclusion			
Sessions	**Training methods**	**Training materials**	**Time**
9.1 Introductions and climate setting, objectives and expectations	• Self-introduction • Setting Norms & rules • Plenary Presentation • Plenary discussion • Group exercise	• Flips charts • Felt pens • Laptop • Projector	20 minutes
9.1.1 Gender equality Definition of concepts	• Presentations • Individual reflections • Group exercise • Plenary discussions	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts	30 minutes

Chapter 9.0: Gender equality, human Rights and social inclusion			
Sessions	**Training methods**	**Training materials**	**Time**
9.1.2 The business case for gender mainstreaming	• Practical exercise (groups tour nearby successful Agri- business where both the a model couple) • Presentations	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts	40 minutes
9.1.3 Steps to main-stream gender	• Group exercise -same sex groups (trainees identify roles) • challenge these roles • Plenary discussions (share group work results) • Individual reflections • Presentations	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts	40minutes
9.2 Human rights	• Individual reflections • Buzz groups • Plenary Presentations • PowerPoint presentations	• Flip charts • Felt pens • Laptop • Projector • handouts	30 minutes
9.2.1 HRBA-PANT Prin-ciples	• Group work • Presentations • PowerPoint presentations	• Flip charts • Felt pens • Laptop • Projector • handouts	30 minutes
9.3 Social inclusion	• Buzz groups • Plenary discussions • Group discussions on who is likely to be left behind in the value chain	• Flip charts • Felt pens • Laptop • Projector • handouts	30minutes
Chapter review and discussion	• Discussion/conclusion Action plan	• Flip charts • Felt pens • Laptop • Projector	30 minutes
Total			**4, hrs**

9.2Guidelines for Facilitators

Chapter 8: Gender Equality, Human Rights and social inclusion		
9.1. Introductions, climate setting	**Session guide**	
Preliminaries *The facilitator welcomes trainees to the Chapter and thereafter invites them to introduce themselves and state their expectations* **Expectations** The trainees form groups (e.g., county based) and list expectations from the module *The facilitator presents the chapter objectives.* **Objectives** By the end of the training Chapter, the trainee should be able to: • Explain and describe what gender and gender mainstreaming is with practical examples • Describe appropriate steps to take in operationalizing the PANT principles • Describe and list those likely to be excluded from the value chains. • Specify the correct actions to take to address the root causes of exclusion and how they will be monitored.	• Summarize the trainees expectations • PowerPoint presentations • Group exercise (listing and presenting expectations). • Expectations lists kept for later reviewing compliance	
9.1.1 Gender equality definition of concepts		
Plenary Presentation The facilitator introduces the topic of background information and gender equality • Individuals reflect on their understanding of various concept sex, gender, equity, equality, diversity, gender mainstreaming among others • Presentations are made to dispel biases and stereotypes • Plenary discussions **Plenary discussion** Questions/answers and comments	• Plenary discussion • Distribute participants' handouts/training materials • PowerPoint Presentation • Practical exercise	

9.1.2 The business case for gender mainstreaming	Session guide
Group exercise • The facilitator guides trainees to visit successful Agri- business where both a model couple) • The group reflects on their findings • A PowerPoint presentation.	• PowerPoint Presentation • Distribute participants' handouts • Groups exercise • Plenary discussion
9.1.3 Steps to mainstream gender	**Session guide**
Group exercise : the facilitator conducts 1. Practical session on gender roles(daily calendar)- Women and men separately then present in plenary for further reflection 2. Practical session on Access, control, and ownership-separately then present in plenary 3. Social norms in the community about men and women-separate norms then present in plenary 4. Barriers and enablers to women and youth participation in the agricultural value chains and how they will be addressed by the group. 5. Presentations Plenary presentation and plenary discussion 6. PowerPoint presentation The facilitator leads the trainees into Individual visioning for a certain period future then in pairs share, prioritize and work on one priority area identify opportunities ,challenges and targets and activities Plan on next steps	• PowerPoint Presentation • Distribute participants' handouts • Groups exercise • Plenary discussion

9.2 Human rights	
The facilitator leads the trainees into; • Individual reflections on their human rights, those who have duty to address these rights • Buzz groups to identify issues of human rights • Plenary Presentations • PowerPoint presentations	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts
9.2.1 HRBA-PANT Principles	
• The facilitator lead the team on the PANT principles • Group work • Presentations • •PowerPoint presentations	• Flips charts • Felt pens • Laptop • Projector • Participants' handouts
• social inclusions	
• The faclilitator leads the trainee into group discussions on who is likely to be left behind in the value chain • Identification • Who is excluded? Are some groups less likely to benefit from a Program/project because of their identity? • Analysis • How and why is the particular group (or groups) excluded? What drives the exclusion? • Actions • What actions can the groups/ farmers take to ensure there is social inclusion • Monitoring • How would they know if they have made progress in ensuring social inclusion? • Action plan for mainstreaming Gender Youth and social inclusion	• Flips charts • Felt pens • Laptop • Projector • Participants' • handouts

Review and Close out	Session guide
(The facilitator leads the trainees in reviewing the chapter) Summary of the main points from the training • Objectives and expectations (review done on basis of the objectives and expectations listed earlier) • *Trainees to randomly indicate new sets of skills and knowledge learnt from the module. The results are recorded per county presented* • Randomly (average of 10 cases) trainees identify key issues for the way forward issues.	• Participants' handouts • Summarize the main points of the module on a flip chart and display

ANNEX I

MESPT
MICRO ENTERPRISES SUPPORT PROGRAMME TRUST

AQUACULTURE VALUE CHAIN TRAINING WORKSHOP FOR XXXX

TRAINING VENUE: XXX **DATES: XXX**

SAMPLE PROGRAMME

Date and Time	Activity	Duration	Responsible

ANNEX 2. List of participants who validated this document

S/NO	NAME	INSTITUTION
1	Joseph Kairu	County Government of Siaya
2	Winston Motanya	County Government of KISII
3	Nicholas Manyinsa	County Government of KISII
4	Cecilia Mutuku	County Government of MACHAKOS
5	Paul Busienei	County Government of NAKURU
6	David Kimera	Youth Agri-Preneur
7	Lawrence Swanya	County Government of MACHAKOS
8	Kenneth Kagai	County Government of TRANS-Nzoia
9	Benedict Khanyifu	County Government of TRANS-Nzoia
10	Mwalimu Menza	Kenya Agricultural and Livestock Research Organization
11	George Kamami	County Government of MAKUENI
12	Moses Munialo	County Government of BUNGOMA
13	Agesa Eric	County Government of KAKAMEGA
14	Benard Mainga	County Government of KWALE
15	Jane M Kamamu	County Government of KILIFI
16	Teresia Ndungu	County Government of NYANDARUA
17	Wilbur Mutai	County Government of UASIN-GISHU
18	Stephen Odipo	Kenya Agricultural and Livestock Research Organization
19	Solomon Mbivya	PAPA FARMERS Limited
20	William Mwangi	County Government of MAKUENI
21	Doreen Kinoti	Micro-Enterprises Support Programme Trust
22	Serah Nzau	Micro-Enterprises Support Programme Trust
23	Margaret Kikuvi	Micro-Enterprises Support Programme Trust

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