REPUBLIC OF KENYA

KALRO
Kenya Agricultural & Livestock Research Organization

NAVCDP
NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

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

TRAINING OF TRAINERS' MANUAL






Kanegeni N.N., Nyambati E.M., Changwony D.K., Mbuku S.M., Mungube E.O., Murage A.W., Ndubi J., Leparmarai P.T., Ayako W. O., Waineina R.W., Mathai M.N., Kiura. J.N., Chelimo E.J., Adongo A. O., Mutisya W.M., Sambu. S.K., Juma G.S., Muturi N.Z., Adero. A.W, Mwirigi M.K., Kipronoh K.A., Olum M.O., Ndirangu P.N., Ogillo B.P., Macharia E.W., Ouko R.O., Kimindu V.A., Tura A.I., Onyuka A., and Ilatsia E.D.

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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 Dairy 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 Dairy 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 Dairy 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, and logistics support providers and SMEs operating within the value chain. The Project places a strong focus on the 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 will be 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 KSCAP/NARIGP. It will also 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. Finally, the Ministry of Agriculture and Livestock Development (MoALD) has put in place relevant support mechanisms with KALRO to oversee effective implementation, coordination of research linkages and agriculture digitization.

In developing and updating suitable inventories of TIMPs, KALRO and its partners have developed and updated the ToT manuals to ensure that all identified needs of the farming community under the NAVCDP are met. Among these information resources are market participation, value addition and linkage of agriculture to nutrition education which, coupled with the accompanying training and other project components, will go a long way in enabling NAVCDP to meet its development objectives.

On behalf of the National Project Coordination Unit, I am grateful to all who participated in the development and production of this Dairy Value Chain ToT Manual. It is my hope that county governments and other users will put this resource to good use as they transform and reorient Kenya's agricultural systems to make them more productive and resilient while minimizing GHG emissions under the new realities of the changing climate.

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

TABLE OF CONTENTS

FOREWORD.....iii
PREFACE.....v
LIST OF ABBREVIATIONS AND ACRONYMS.....xi
INTRODUCTION.....1
PART I.....1
SECTION 1: BACKGROUND.....3
1.1 The Role of Dairy in the Kenyan Economy.....3
1.2 The Role of Dairy in Food and Nutrition Security.....3
1.3 Commercialization and Market linkages.....4
1.4 Climate Smart perspective in Dairy.....4
1.5 One Health Approach for Sustainable Dairy Production.....5
1.6 Objectives of the Training.....5
SECTION 2: TRAINING CONTENT.....6
2.1 Orientation of the Modules.....6
2.2 Modules Outline.....6
SECTION 3: TRAINING DESIGN.....11
3.1 Delivery System.....11
3.2 Partners and their Roles.....11
3.3 Training Duration.....11
3.4 Logic of Design and Flow of Sessions.....11
SECTION 4: FACILITATOR'S GUIDELINES.....13
4.1 Preparation of Training Materials.....13
4.2 Preparation of Training Venue and Sites.....13
4.3 The Trainees.....13
4.4 Training Programme.....14

4.5 Training Methods....14
4.6 Planning Schedule and Guidance for ToT preparation....14
4.7 Evaluation of the Training....15
4.8 Facilitator's Training Notes and Reference Materials....17
PART II: TRAINING MODULES....18
MODULE 1: CLIMATE SMART AGRICULTURE PRACTICES IN DAIRY PRODUCTION SYSTEMS....19
MODULE 2. FARMER FIELD AND BUSINESS SCHOOL (FFBS) APPROACH IN DAIRY VALUE CHAIN....25
MODULE 3: GOOD AGRICULTURAL PRACTICES (GAPs) AND FOOD SAFETY MANAGEMENT SYSTEMS (FSMS) IN DAIRY....32
MODULE 4: BREEDS AND BREEDING....39
Sub Module 4.1: Dairy Cattle Breeds and Breeding....39
Sub Module 4.2: Dairy Goat Breeds and Breeding....45
MODULE 5: FEED RESOURCES....51
MODULE 6: FEED FORMULATION....61
MODULE 7: FEEDING....69
MODULE 8: ANIMAL HEALTH....77
Sub Module 8.1: Dairy Cattle Health....77
Sub Module 8.2: Dairy Goat Health....85
MODULE 9: ONE HEALTH APPROACH FOR SUSTAINABLE DAIRY PRODUCTION....92
MODULE 10: MANURE MANAGEMENT FOR BIOENERGY AND SOIL FERTILITY IMPROVEMENT....99
MODULE 11: MILK VALUE ADDITION....108
MODULE 12: NUTRITIONAL BENEFITS OF DIFFERENT DAIRY PRODUCTS....114
MODULE 13: HIDES AND SKINS VALUE ADDITION-WET SALTING TECHNOLOGY....120
MODULE 14: DAIRY AGRIBUSINESS AND MARKETING....127
Sub Module14.1: Dairy Agribusiuness....127
Sub Module 14.2: Dairy Marketing....132
MODULE 15: CROSS-CUTTING THEMES IN DAIRY PRODUCTION....136

Sub Module 15.2.l: Dairy Gender, Vulnerable and Marginalized Groups , Social, Environmental Concerns and Cohesion.....136

Sub Module 15.3.1: Agricultural Innovation Platforms.....142

Sub Module 15.4.1: Dairy Policies and Regulations.....149

ANNEXES.....157

Annex 1: Training Programme.....157

Annex 2: General Reference Learning Materials.....169

Annex 3: FFBS Learning Materials.....170

Annex 4: Livestock Ecosystems Analysis (Lesa) on Dairy Cattle.....171

Annex 5: Per Unit Cost Analysis Tool.....172

LISTS OF TABLES

Table 1: Outline of the modules.....4
Table 2: Training methods.....9
Table 3: Training Preparation.....9
Table 4: Sample Evaluation Form.....10

LIST OF ABBREVIATIONS AND ACRONYMS

AEZ	Agro-Ecological Zones
AHITI	Animal Health and Industry Training Institute
AI	Artificial Insemination
AIP	Agricultural Innovation Platform
AMR	Antimicrobial resistance
AMU	Antimicrobial use
ART	Assisted Reproduction Technology
ASALS	Arid and Semi-Arid Lands
CCP	Critical Control Point
CCT	County Coordination Teams
CD	Compact Disc
CIG	Common Interest Group
CSA	Climate Smart Agriculture
CTT	Core Team of Trainers
DRI	Dairy Research Institute
DTI	Dairy Training Institute
ES	Estrus Synchronization
ESMF	Environmental and Social Management Framework
FFBS	Farmer Field Business School
FSMS	Food Safety Management System
GAP	Good Agricultural Practice
GHG	Green House Gases
Ha	Hectare
HACCP	Hazard Analysis Critical Control Points
HMC	Home-Made Concentrates
IFIF	International Feed Industry Federation
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	Kenya Climate Smart Agriculture Project
KDB	Kenya Dairy Board
LCD	Liquid Crystal Display
LF	Lead Farmer
MoALD	Ministry of Agriculture &Livestock Development
NARIGP	National Agricultural and Rural Inclusive Growth Project
NAVCDP	National Agricultural Value Chain Development Project
NPCU	National Project Coordination Unit
PDF	Portable Document Format

SMART	Specific, Measurable, Achievable Realistic and Time Bound
SNV	Netherlands Development Organization
TIMPs	Technologies, Innovations and Management Practices
TMR	Total Mixed Ration
ToT	Training of Trainers
VMG	Vulnerable and Marginalized Group

INTRODUCTION

About this manual

This training of trainers' manual consists of two parts; part I 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 dairy value chain, content of the Training, Training Design and Facilitators Guidelines.

SECTION 1: BACKGROUND

1.1 The Role of Dairy in the Kenyan Economy

The dairy sub-sector in Kenya is considered one of the most developed in Sub-Saharan Africa. At the national level, this sector contributes 3.5% of the total Gross Domestic Product (GDP). The current milk output is estimated at 5.2 billion litres per annum, out of which 60% is from grade dairy cattle and their crosses while the remaining 40% comes from zebu, camel and goats. The national dairy herd is estimated at 3.3 million heads, majority of which are grade cattle. Smallholder farmers account for about 2.5 million dairy cows, producing over 80% of total national milk output. Of the total milk produced, about 60% is marketed through traders, cooperatives, hotels and kiosks. An estimated 84% of the milk produced is sold in raw form. It is further estimated that, in the entire milk commodity chain, from producers (farmers) to milk hawkers, nearly one million households and businesses are involved. Today, informal milk sector accounts for more than 70% of the 40,000 jobs in dairy marketing alone and further directly supports over 350,000 others in formal employment. Considering that there are nearly one million smallholder farmers, for whom dairy is a family business, it is likely that more than two million people derive livelihood from the dairy sector.

However, despite the plausible performance, Kenya's dairy industry is bedeviled by several challenges, of which inadequate feed, prevalence of diseases (especially tick-borne), availability of quality replacement stock, low adoption of technologies, high cost of farm inputs (including fodder/pasture seeds) and low milk value addition among dairy producers, are the most critical.

1.2 The Role of Dairy in Food and Nutrition Security

Food and nutrition security refers to a situation where all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Food security therefore encompasses availability of adequate quantities of a diversity of food commodities such as cereals, fruits, vegetables and animal products. Currently over 10 million people in Kenya suffer from chronic food insecurity and poor nutrition, and between two and four million people require emergency food assistance at any given time. Food safety is critical to good health and nutrition status.

Dairy farming contributes positively to human wellbeing in a variety of ways: nutrition through quality food products, income and employment, organic fertilizer as well as assets and savings. Nearly 30% of children in Kenya are classified as undernourished, and micronutrient deficiencies are widespread. Milk is regarded as a whole food, providing energy, protein, vitamins and minerals in human diet. It can therefore correct malnutrition and nutrient deficiencies especially in children and young adults. In linking the Dairy value chain to nutrition, nutrition education is set to be delivered

through farmer groups. Partly, this involves awareness and practical training using nutritious dairy products and recipes to build the capacity of the rural and urban poor on nutritional issues such as balanced diets, micronutrients, child nutrition, feeding practices, health, and sanitation issues.

To achieve this KALRO has developed and implemented a module on nutrition education training in all ToT Manuals. The purpose is to incorporate nutrition messages such as balanced diet, access to nutritious food, child nutrition, feeding practices and diet for special needs in all TIMPs training sessions.

1.3 Commercialization and Market linkages

The Dairy sector needs to be revitalized and transformed from subsistence to commercial-oriented farming. There is need to increase market participation and value addition for smallholder farmers through: value chain driven integrated planning; building producer capacity and credit worthiness for enhanced access to credit and extension services; developing and strengthening FPOs to support collective marketing and value addition; Integrating Digital Agriculture solutions across all segments of dairy value chain; facilitating roll out and access to agriculture reforms like e-vouchers, warehouse receipt and commodity exchange; building stronger farmer-consumer market linkages with food systems, focused production and marketing in select urban clusters; supporting efficient value chains by linking project supported FPOs and farmer groups with digital aggregators and e-commerce platforms; and incorporating Climate Smart Agriculture (CSA) practices in the food systems and value chain.

In linking the Dairy value chain to nutrition, nutrition education is set to be delivered through farmer groups. Partly, this involves awareness and practical training using nutritious dairy products and recipes to build the capacity of the rural and urban poor on nutritional issues such as balanced diets, micronutrients, child nutrition, feeding practices, health, and sanitation issues.

To achieve this KALRO has developed and implemented a module on nutrition education training in all ToT Manuals. The purpose is to incorporate nutrition messages such as balanced diet, access to nutritious food, child nutrition, feeding practices and diet for special needs in all TIMPs training sessions. This effort has the intention of linking agriculture to nutrition.

1.4 Climate Smart perspective in Dairy

Technologies, innovations and management practices (TIMPs) have been developed through research to address some of the challenges in the dairy value chain. They address breeding, animal health, feeds and feeding, value addition and manure management. Some of the TIMPs include: assisted reproduction technologies (ART) in dairy breeding, animal health and disease management technologies, disease tolerant basal and supplementary forages, forage conservation technologies, feed rations for

maintenance and milk production, fortification of feeds, manure management and value addition of milk, hides & skin.

1.5 One Health Approach for Sustainable Dairy Production

As an integrated, unifying approach for One Health, it aims to sustainably balance and optimize the health of people, animals and ecosystems through a sustainable manner.

1.6 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 commercialization of dairy 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 dairy production

b) Knowledge, skills and information on dairy technologies, innovations and management practices within the dairy 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 dairy.

After the training, the Trainer of Trainers as facilitators will train lead farmers (LF) in various aspects of dairy 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 Modules

The training content is organized into **(15) modules**, with a total of **156 sessions**, exclusive of introduction and review.

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 dairy TIMPs, to increase market participation and value addition and 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 dairy practices to the intended beneficiaries, who are primarily farmers.

2.2 Modules Outline

Each of the 15 modules consist of 8 parts:

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) **Participants' handouts** – detailed notes and reference materials for trainees,

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

Table 1: Outline of the modules

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
1	Climate smart agriculture (CSA) practices in dairy production systems	• Tackling the negative consequences of climate change effects as well as shifting climatic patterns along the dairy Value chain	• Increased adoption of climate smart technologies, innovations and management practices (TIMPs)	1 hour 30 minutes
2	Farmer Field Business School (FFBS) approach	• Skills/ technologies for production, processing and marketing	• Improved technologies, innovations and agronomic practices for dairy availed	2 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 dairy value chain	2 hours 30 minutes
4	Dairy Animal Breeding and Management	• Long calving intervals, low productivity and poor management	• Methods of improving dairy breeds understood • Dairy management skills acquired	4 hours
5	Feed Resources	• Inadequate and poor quality of feeds particularly during the dry season.	• Appropriate (biomass yields and quality) feed resources for different AEZs	4 hours

		• Lack of or inadequate feed production and management skills and knowledge	• Enhanced quality of crop residues. • Appropriate (hay box, silage tube) feed conservation technologies	
6	Feed formulation	• High costs and poor quality of dairy feed rations • Lack of or inadequate feed formulation skills and knowledge	• Skills and knowledge on the formulation of least cost and nutrient balanced home-made concentrates (HMCs). • Skills and knowledge on the formulation of least cost and nutrient balanced total mixed rations (TMRs)	4 hours
7	Feeding	• Inefficient utilization of feeds hence low productivity by dairy animals • Pollution of the environment through rumen enteric methane emission	• Appropriate (feed options, cost and performance-based) feeding regimes of all classes of dairy cattle • Appropriate (feed options, cost and performance-based) feeding regimes for all classes of dairy goats	2 hours 30 minutes

8	Dairy Animal Health	• Low productivity due to diseases	• Disease recognition, prevention and treatment knowledge and skills acquired	5 hours
9	One health	• Climate change which has increased health security risks of public health importance such as the infectious diseases. • The need for pandemic preparedness and national plans for resilience.	• Trainees sensitized on sustainable balance and optimization of the health of people, animals and ecosystems.	2 hours 30 minutes
10	Manure Management for Bioenergy and Soil Fertility Improvement	• Poor utilization of manure and the need for cheap and sustainable source of energy	• Use of manure for soil fertility improvement and techniques for biogas production acquired	5 hours
11	Milk Value addition	• Low milk prices, low knowledge on milk value addition and short shelf life of raw milk	• Milk products and techniques of their processing learnt	2 hours 30 minutes

12	Nutritional benefits of dairy products	• Nutrition improvement in dairy based diets	• Trainees sensitized on importance of dairy products to the people with special conditions and the general public and its effect on food and nutrition security status of Kenya.	2 hours 30 minutes
13	Hides and skins value addition	• Low knowledge in value addition of hides & skin, low demand of the hides & skins and poor preservation	• Quality leather products that fetch more value • Proper preservation prevents spoilage of the hides & skin	3 hours
14	Dairy agribusiness and marketing	• Poor evaluation of profitability of dairy enterprise	• Ability to determine profitability of dairy acquired	2 hours 30 minutes
15	Cross cutting Issues in dairy (i) Gender mainstreaming and social inclusion (ii) Agricultural Innovation Platforms (iii) Agricultural policy options for supporting smallholder farmers' dairy production and marketing	• Articulate how voluntary marketing groups can draw benefits from dairy value chain • Options of employment opportunities in dairy production • Sites for information profiled at the county level	• Opportunities for marginalized groups identified and gains made • Farmers get access to more information on dairy production	i. 1 hour 30 minutes ii.1 hour 30 minutes iii. 1 hour 30 minutes
Total Duration				**48 hours**

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, Tertiary Institutions offering dairy courses (Universities, DTI, AHITI) and the State Department of livestock will facilitate initial training of farmer trainers. They will also provide mentorship to farmers' trainers during the first year of LF training. They should also be available in the evaluation of the first round of LF training.

b) **County Government (Department of Livestock)** –Master trainers and their supervisors referred to as County Coordination Teams (CCT) will take the role of LF trainers, mentors and coordinators at sub-County level. They will assist FFBS's form partnership with stakeholders for sustainability. They should also support LFs form their networks.

c) **Lead Farmer Networks** - Association of LFs in the target counties will train farmers and upscale TIMPs in 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 individuals or dairy farmer groups.

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

3.3 Training Duration

The proposed initial TOT course for Master trainers for **15** modules in the dairy value chain shall take a total of **48 hours** of the training period. This does not include break hours of mid-morning, afternoon and lunch breaks.

3.4 Logic of Design and Flow of Sessions

The logic of design and flow of each module is that the facilitator, paying attention to the proposed methods and sessions guidelines shall: (1) Introduce the module; (2) Draw

out the participants' expectations; (3) Relate participants' expectations with module objectives or learning outcomes; (4) Explore the concept and content, switching to different methods of delivery of the content (group exercise, brainstorming, excursions, plenary discussions, role plays as the session progresses; (5) Review the module at the end using participatory approaches; and, (6) Distribute handouts to the participants.

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:

a) The facilitators should familiarize themselves and internalize the guidelines provided by this manual prior to the training;

b) The stationery required should be available within the training institution 3 days before the training. These include name tags, writing materials, a paper punch and medium size box files for participants' handouts filling;

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

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

e) 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; and

f) Copies of the modules shall be distributed at the end of each module.

4.2 Preparation of Training Venue and Sites

The training venue will include the training room, field demonstration sites and market 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 LCD projector, flip charts holder and white wall to act as a projector screen.

b) Demonstration Site – Should be within walking distance with adequate practical facilities

c) Market Sites – These include milk retail outlets (Shops, Kiosks and Supermarkets) wholesale and aggregation points and processing sites if any. The operators should be informed in advance about the visits. These should not be very far away preferably less than 10 minutes' drive distance.

4.3 The Trainees

The trainees who will participate are extension officers, lead farmers, agripreneurs, educators, and researchers with an elaborate training background 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 trainer should, therefore, act more of a facilitator

than a lecturer and draw out and build on their knowledge, skills and experience that they shall bring in. As a golden rule, facilitators should not lecture participants but facilitate and listen and let them feel like equals to each other and the CTT team members.

4.4 Training Programme

The training programme 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, available time and experiences of the author of this manual. Depending on time available, the facilitator can modify these training methods but as a golden rule no presentation by the facilitator should take more than 30 minutes continuously; but should be separated by other participatory training methods. Table 2 presents a list of available training methods.

Table 2: Training methods

Training Method	Description of Method
Plenary presentations	Use of PowerPoint presentation or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Group exercises, buzz groups, visits and brain-storming sessions	To be considered where skills are an issue requiring sharing and trying
Role plays and problem-solving exercises	Involves acting, performing or dramatizing the part of a person or character used to foster teamwork and cohesion within teams.
Plenary discussions	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 Guidance for ToT preparation

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

Table 3: Training Preparation

Duration to Training	Activities to be Done
Six weeks	Recruit master trainers, compose CTT, identify the practical demonstration sites
Four weeks	Send out invitation letters to participants and special guests detailing purpose, venue and programme. Follow up on demonstration sites. Brief CTT members
Two weeks	Confirm names of participants; reproduce training materials for facilitators and package, confirm preparedness of the field sites to be visited. Hold briefing of CTT members to finalize training plan. Confirm special guests if any
Four days	Confirm training sites preparedness, prepare sitting arrangements, and brief assistants
One day	Arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for the reception of trainees at residence proposed
On the first day	Arrange for the reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes: • Registration • Welcome to the venue by host • Elaborate introduction of CTT and participants • Ground rules • Group formation

4.7 Evaluation of the Training

Half 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 programme in section 4.4 above. 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 4: Sample Evaluation Form

Aspect / Module	Rating		
	Very Useful (3 marks)	Useful (2 marks)	Of Limited Use (1 marks)
1. Climate smart agriculture (CSA) practices in dairy production systems			
2. Farmer Field Business School (FFBS) approach			
3. Good Agricultural Practices (GAP) and Food Safety Management System (FSMS)			
4. Dairy Animal Breeding and Management			
5. Feed Resources			
6. Feed formulation			
7. Feeding			
8. Dairy Animal Health			
9. One health			
10. Manure Management for Bioenergy and Soil Fertility Improvement			
11. Milk Value addition			
12. Nutritional benefits of dairy products			
13. Hides and skins value addition			
14. Dairy agribusiness and marketing			
15. Cross cutting Issues in dairy • Gender mainstreaming and social inclusion • Agricultural Innovation Platforms • Agricultural policy options for supporting smallholder farmers' dairy production and marketing			

4.8 Facilitator's Training Notes and Reference Materials

4.8.1 Key references

Two key references 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 trainees with at most two publications for each of the training sessions. This is because if they go away with many publications in one visit, they may be overwhelmed with the material load and thus limit knowledge uptake. Also, some will just take away as many as they can if allowed.

The list of all individual publications will be stored and availed 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 cybercafé.

Trainers will be advised to issue one General Dairy 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 SMART AGRICULTURE PRACTICES IN DAIRY PRODUCTION SYSTEMS

1.1 Introduction to the Module

Climate change is an emerging challenge to global sustainable development, with different regions experiencing positive and negative effects on agricultural and livestock systems. Developing countries, particularly those in Sub-Saharan Africa, such as Kenya, have experience more severe negative consequences. The escalation of temperatures, coupled with an increase in the incidence of extreme weather phenomena like El Niño and La Niña, aggravates these adverse impacts. Their consequences include decreased agricultural output, land degradation, and crop, animal, and fish losses as a result of shifting climatic patterns.

The country's agriculture sector is predominantly rain-fed and therefore vulnerable to climate change. The agricultural sector is heavily affected by climate change that is exacerbated by human activity. Livestock is the largest source of greenhouse gas (GHG) emissions; responsible for one-third of Kenya's total emissions in 2010 which is envisaged to increase from 20 Mt CO_2e in 2010 and to 27 Mt CO2e by 2030. Apart from the threat of climatic changes, the livestock sector is affected by increasing population pressures and demand for natural resources. In their quest to boost incomes, enhance food security, increasing overall productivity and market competitiveness, agricultural households face the challenge of maintaining an efficient natural resource base.

Dairy contributes significantly to family income generation, helping not just the general population but also women and youth. Technologies, innovations and management practices (TIMPs) have been developed through research to address some of the challenges in dairy farming along the value chain. They address breeding, animal health, feeds and feeding, value addition and manure management. Most of these technologies are climate smart. According to the national agricultural research

system policy (2021), climate change has resulted in severe, erratic weather patterns, emerging pests and diseases; decreasing access to production resources such as, credit and technology amidst increasing poverty levels. The adoption of climate smart agricultural technologies and innovations can lead to increased productivity and quality along agricultural value chains. The use of appropriate dairy breeds can enhance adaptability to a changing climate. This points to the need for adoption of climate-smart agricultural practices that can sustainably increase productivity, support resilience and adaptation to changing climatic conditions, mitigate or remove greenhouse gases, and contribute to the attainment of national food security and development goals.

1.1.1 CSA as a response to climate change

Climate-Smart Agriculture (CSA) is a pivotal contributor to sustainable development goals as it seamlessly integrates the three dimensions of economic, social, and environmental sustainability. The core pillars of CSA encompass sustainably elevating agricultural productivity and incomes, fostering adaptability and resilience to climate change, and strategically minimizing or eliminating greenhouse gas emissions whenever feasible. In essence, CSA provides a comprehensive framework to address the complex interplay between agriculture, climate, and sustainable development, aiming for a harmonious balance that benefits both present and future generations.

The urgent transition to a climate-smart and resilient agricultural production system is necessitated by several compelling reasons amid escalating climatic risks. Firstly, the increasing demand for food strains the existing resource base, including land, water, and capital. Secondly, there is a pervasive depletion and degradation of natural resources crucial for sustaining agriculture. Thirdly, subsistence farmers, especially vulnerable to climate change impacts, require a more sustainable approach for adaptation. Finally, the importance of enhancing food security while mitigating climate change underscores the need for a balanced strategy that preserves the natural resource base. Additionally, agricultural production systems must evolve to become more productive, efficient, stable, and resilient to risks, shocks, and long-term climate variability. Lastly, enhancing awareness creation urgently among farming communities about the potential impacts of climate change will assist in broadening capacity for adaptation.

1.2 Module Learning Outcomes

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

- Climate change defined and understood.
- Climate change effect on the dairy industry explained.
- Some Dairy value chain climate change and adaptations identified and explained.
- Practical solutions that dairy producers can put into practice to mitigate climate change identified.

1.3 Module Target Groups

This module is intended for use by public and private extension agents, agri-preneurs and lead farmers.

1.4 Module Users

This module is intended for use by trainers who are members of the Core Team of Trainers (CTT) and Farmer Trainers. The module user should thoroughly familiarize themselves with the participants' handouts and training reference materials.

1.5 Module duration

The module is estimated to take 1 hour 30 minutes.

1.6 Module Summary

Climate Smart Agriculture Practices			
Sessions	**Training methods**	**Training materials**	**Time**
1.6.1 Module Introduction, outcomes and expectations	• Personal introductions • Power-Point slides	• Flips charts • Felt pens • LCD Projector	10 minutes
1.6.2 Understanding climate change	• Power-Point slides • Plenary discussion	• Flips charts • Felt pens • LCD Projector • Upload Handouts	20 minutes
1.6.3 The effects of climate change on the dairy industry and food security	• Power-Point slides • Group work • Plenary discussion	• Flips charts • Felt pens • LCD Projector • Upload Handouts	30 minutes
1.6.4 Climate smart agriculture and dairy value chain - specific practices	• Power-Point slides • Group work • Plenary discussion	• Flips charts • Felt pens • LCD Projector • Upload Handouts	20 minutes
1.6.5. Module review	• Power-Point slides • Plenary discussion	• Flips charts • LCD Projector • Upload Handouts	10 minutes
TOTAL			**1 hour 30 minutes**

1.7 Facilitator's Guidelines

Climate Smart dairy Management Practices (10 minutes)	
1.7.1 Introduction, outcomes and expectations	**Session Guide**
The facilitator introduces the module and invites participants to introduce themselves and state their expectations. *The facilitator presents module objectives and expectations.* **Module training objectives** By the end of the module training the trainee should be able to: • Define climate change and its causes. • Explain how climate change affects the dairy industry. • Identify and explain some Dairy value chain climate change and adaptations. • Identify practical solutions that dairy producers can put into practice to mitigate climate change	• Summarize participants "expectations" using cards/flip charts. • PowerPoint presentation • Upload handouts at the end of the module
1.7.2 Understanding climate change (20 minutes)	**Session guide**
(The facilitator makes a presentation on climate change; - causes, effects, and mitigation). **Plenary discussion** • The participants recall what they learnt and discuss any issues that may arise. Questions are answered during this session.	• PowerPoint presentation • Plenary discussion
1.7.3 Climate change impacts on livestock systems and food security (30 minutes)	**Session guide**
(The facilitator makes a presentation on the effects of climate change on livestock systems and food security and guides the participants in discussing the impact of climate change on food security). • Effects of climate change on livestock • How does agriculture contribute to climate change? • The link between climate change and food security	• PowerPoint presentation • Plenary discussion

Plenary discussion • Question and answer session. • Sharing of experiences and practical discussions on climate change in livestock systems and food security	
1.7.4 Climate Smart Agriculture TIMPs Definitions and Context-Specific Practices (20 minutes)	**Session guide**
The facilitator makes a PowerPoint presentation highlighting definitions of TIMPs and their validation through adaptive research and their dissemination. The presentation will also address the CSA practices that ameliorate climate change effects on the chicken value chain • Characteristics of CSA and why CSA? • Principles of climate-smart agriculture **Plenary discussion** **Group Work** Participants to conceptualize and provide examples of CSA TIMPs and climate smart dairy practices	• PowerPoint presentation • Flip charts • Group work • Plenary discussions
1.7.5 Module review (10 minutes)	**Session guide**
The facilitator leads the participants in reviewing the module Summarize and review the main points of the module with the participants. • Identify new concepts in the module. • What are the problems and issues addressed? • Highlight the take-home messages.	Recap of the key take-home points using any of the following participatory methods: • Q & A session • Discussions • Questionnaires • Any other

1.8 Reference Materials

1.8.1 Participants' handouts

- FFBS factsheets
- Training notes
- PowerPoint presentations

1.8.2 References

World Bank; CIAT. 2015. Climate-Smart Agriculture in Kenya. CSA Country Profiles for Africa, Asia, and Latin America and the Caribbean Series. Washington D.C.: The World Bank Group.

FAO (2019). Climate Smart Agriculture Curriculum/Module for Training of Trainers in Myanmar. (Angon 28 pp). Food and Agricultural Organization of the United Nations and AVSI Foundation, Naypyidaw, 2019. License: CC BY – NC – SA 3.0 IGO

FAO (2018). Climate Smart Agriculture Training Manual: A reference manual for agricultural extension agents. Food and Agricultural Organization of the United Nations. Rome 2018 (106 pp).

GIZ-SLM (2017). Climate Smart Agriculture: A Manual for Implementing the Sustainable Land Management Programme (SLMP). Ethiopia and GIZ, Addis Ababa, 2017.

Denmark (2017). Climate Smart Agriculture Manual for Agricultural Education in Zimbabwe, Climate Technology Centre and Network, Denmark, 2017.

FAO (2013). Climate Smart Agriculture Sourcebook. Food and Agricultural Organization of the United Nations Rome, 2013.

MODULE 2. FARMER FIELD AND BUSINESS SCHOOL (FFBS) APPROACH IN DAIRY VALUE CHAIN

2.1 Introduction to the module

Farmer Field and Business School (FFBS) is an extension method that promotes exploration, discovery and adaptation of agribusiness and production 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" implies 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 Dairy value chain to farmers. The trainees will thereafter facilitate farmers in the Common Interest Groups (CIGs) to learn by doing from a common training farm of FFBS and then implement what they have learnt to their individual farms in order to meet the NAVCDP project objective of Dairy value chain commercialization. Since the methodology is participatory, it improves the learners' observation skills and creates linkages with other value-chain players, thereby making Dairy production profitable and sustainable.

2.2 Module Learning Outcomes

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

a) Concept of Farmer Field and Business School approach in the Dairy value chain through teaching and facilitating described and explained.

b) Approaches of facilitating FFBS participatory learning process and developing FFBS curriculum demonstrated and explained in dairy value chain.

c) Knowledge and analytical skills to design simple experiments for testing and selecting the best option to mitigate the constraints of the Dairy value chain mapped, identified and explained.

d) Knowledge on engaging FFBS to shift from the subsistence production and focus on improving productivity towards farming business described and demonstrated.

e) Knowledge and skills for disseminating TIMPS through a well-defined specific, measurable, achievable realistic and time bound (SMART) action plan is identified and explained.

2.3 Module Target Group

This module targets agricultural extension service providers and agriprenuers 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 agriprenuers in the Dairy value chain target counties. The trainers using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

2.5 Module Duration

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

2.6 Module Summary

Module 2. Farmer Field and Business School Approach			
Sessions	**Training Methods**	**Training Materials**	**Time**
2.6.1 Introduction, Climate setting, leveling of expectations and objectives.	• Setting norms and group discussions on expectations	• Laptop • Projector, PowerPoint presentation, • Flip charts and Mark pens	5 minutes
2.6.2 Overview of FFBS key activities	• Presentations and plenary discussions	• Pictorials, • power point presentation and • projector	20 minutes

2.6.3 Introduction to Communication and communication skills	• Plenary presentation, group discussions	• Laptop, Power point presentation, • Projector, Flip charts • Felt pens	10 minutes
2.6.4 Facilitation and leadership skills	• Presentation and plenary	• Laptop, • Power point presentation and • Projector.	10 minutes
2.6.5 Organization and Management in FFBS	• Plenary Presentation	• Laptop, • Power point presentation and • Projector.	15 minutes
2.6.6 Developing FFBS Curriculum for the Dairy value chain	• Group discussion and presentation, and plenary presentation	• Laptop, Power point presentation, • Projector, Flip charts • Felt pens	15 minutes
2.6.7 FFBS marketing tools	• Group discussion and presentation and plenary presentation	• Laptop, Power point presentation, • Projector, Flip charts • Felt pens	20 minutes
2.6.8 SMART County action plan of Dairy value chain on the transfer of TIMPS	• Group discussion and presentation and plenary presentation	• Laptop, Power point presentation, • Projector, Flip charts • Felt pens	20 minutes
2.6.9 Module review	• Discussions Conclusions and way forward	• Flip charts, Power point presentations, laptop and projector	5 minutes
TOTAL			**2 hours**

2.7 Trainers Guidelines to FFBS establishment and operations

2.7.1 Introduction, climate setting Leveling Expectations and Objectives (5 minutes)	**Session Guide**
(Introduction of participants, setting training norms, formation of FFBS sub groups (Working groups) and trainees to share their expectations) The facilitator presents modules objectives By the end of the module the trainee should be able to: • Describe and explain the concept, characteristics, principles and plans of Farmer Field and Business School (FFBS) as a 'learning by doing approach as it applies in Dairy value chain • 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 SMART.	• Provide checklist for introduction of trainees to help them build confidence in participation • Summarize and display trainees' expectations • Assign roles to the Sub groups • Set norms and nominate leaders • PowerPoint presentation on the Objectives of the FFBS training module
2.7.2 Overview of FFBS key activities (20 minutes)	**Session guide**
Plenary presentation The facilitator takes the trainees through the main concepts and pillars of FFBS which includes: • Definition of FFBS • Participatory technology development (PTD) for the Dairy value chain TIMPS • Livestock Ecosystems Analysis (LESA) of the Dairy value chain • Concept of "what is this" and "what is that" • FFBS principle of Integrated production and pest management (IPPM). • FFBS Business concept and opportunities in the Dairy value chain stages.	• PowerPoint presentation

2.7.3 Introduction to Communication andCommunication skills (10 minutes)	Session guide
Group exercise Ask the trainees to: • Define communication • Identify communication channels • Identify barriers to effective communication • Demonstrate how to effectively communicate **Plenary presentation** • Communication and communication skills	• Group exercise and presentations on flip charts and PowerPoint presentation • Participants' handouts
2.7.4 Facilitation and leadership skills (10 minutes)	**Session guide**
Plenary presentation Facilitator guides the trainees in: • Defining facilitation and effective facilitation • Identifying qualities of a good facilitator. • Pointing out golden rules of facilitation. • Listing roles and responsibilities of FFBS Facilitators. • Distinguish between facilitation and teaching • Defining leadership • Identifying elements of leadership • Classifying types of leadership • Characteristics of a good leader	• PowerPoint presentation
2.7.5 Organization and management in FFBS (15 minutes)	**Session guide**
Plenary presentation on FFBS implementation and framework (30 minutes) • Ground working • Training of Facilitators • Establishing PTDs at the FFBS • Season long FFBS sessions • Evaluation of PTDs • Field days • Graduation • Establishment of Lead FFBS • Follow ups.	• PowerPoint presentation • Participants' handouts

2.7.6 Developing FFBS Curriculum for the Dairy value chain (15 minutes)	Session guide
Plenary presentation Steps of Participatory technology development on the Dairy value chain production • Identify the major constraints to increased yields of Dairy value chain production • Ranking of constraints in order from highest. • Identify list of TIMPS to address the constraints • Rank the TIMPS in order from the most preferred • Develop PTD on the most preferred • Decide on the parameters for LESA • Develop FFBS curriculum using Dairy cow/goat developmental stages • Calendar for the Dairy value chain **Group exercises** Pair wise matrix ranking of constraints and TIMPs in Dairy value chain • Curriculum development-based on the dairy value chain developmental stages • Presentations of the group exercises on flip charts **Plenary presentation** on curriculum development • Constraint identification and ranking • TIMPS options identification and ranking • Identification of the growth stages of the value chain • Development of Dairy value chain FFBS training curriculum	• PowerPoint presentation • Group exercises
2.7.7 FFBS Marketing tools (20 Minutes)	**Session guide**
Plenary presentation • Introduction to marketing concept • Marketing planning • Market survey **Group exercise** • Profitability determination	• Power point presentation, projector, flip charts, felt pen • Group exercise on using market information for margin determination

2.7.8 SMART County action plan of Dairy value chain on the transfer of TIMPS (20 minutes)	Session guide
Plenary presentation • County Dairy Value chain Action Plan • Implementation • Monitoring and Evaluation **Group discussion** • Suitability • Implementation • Linkage Issues	
2.7.9 Module review (5minutes)	**Session guide**
(Facilitator leads the trainees in reviewing the module) Plenary Presentation and Discussion • Participants Questions and answers • Facilitators Summary	• PowerPoint presentation

2.8 Reference materials

2.8.1 Participants' handouts

- FFBS factsheets
- Training notes
- PowerPoint presentations

2.8.2 References

Ferris, S, Kaganzi, E., Ostertag, C and Wicherde-cati, T,Co. (2006) A market facilitation guide to participatory agro enterprise development central internacionale de Agricultura Tropical (CIAT).

FAO (2006) Farmer Field school guidance document planning for quality programmes.

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

3.1 Introduction to the module

Good Agricultural Practices (GAPs) for dairy production are meant to help competent authorities to support stakeholders including dairy farmers to fully assume their responsibilities at the animal production stage of the food chain to help produce safe products. Food safety is universally recognized as a public health priority and thus, it requires a holistic approach, from production (farm) to consumption (fork). 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. These hazards may enter dairy products through a variety of exposure points along the value chain with consequent potential risks to consumers.

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 dairy value chain.

3.2 Module Learning Outcomes

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

- The role of GAPs on matters of dairy product safety and quality described.
- Common hazards which compromise the safety of dairy products identified.
- The role of veterinary services in supporting dairy farmers to produce safe food explained.
- The farm to fork concept in relation to food safety explained.
- The recommended GAPs required for producing safe dairy products understood.
- Traceability in dairy products safety and quality mapped and described.
- Critical control point (CCPs) at different levels of dairy production mapped and determined.

3.3 Module Target Group

This module targets livestock extension service providers and agri-prenuers based at the sub county and ward levels. It will also be used by private livestock extension service providers dealing directly with farmer groups at the community level and lead farmers.

3.4 Module Users

This module is intended for use by master trainers who are members of the core team trainers (CTT), lead farmers and agri-prenuers in the dairy value chain in target counties. The facilitators using this module should thoroughly familiarize themselves with the hand outs (training materials).

3.5 Module Duration

The module is estimated to take a minimum of 2 hours 30 minutes.

3.6 Module Summary

Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS) in Dairy			
Sessions	**Training Methods**	**Training Materials**	**Time**
3.6.1 Introduction, objectives and levelling of expectations	• Plenary Presentations • Group exercise • Plenary discussion	• Marker pens • Flip chats • PowerPoint presentation • Laptop • projector	5 minutes

Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS) in Dairy			
Sessions	**Training Methods**	**Training Materials**	**Time**
3.6.2 Understanding GAP and its application in the dairy value chain	• Plenary Presentations • Group exercise • Plenary discussion	• Marker pens • Flip chats • PowerPoint • Presentation • Laptop • Projector	20 minutes
3.6.3 Good dairy farming practices	• Plenary • Presentations • Group exercise • Plenary discussion	• Marker pens • Flip chats • PowerPoint resentation • Laptop • Projector	20 minutes
3.6.4 Dairy animal feed production and handling	• Plenary Presentations • Group exercise • Plenary discussions	• Flip charts • Marker pens • Presentation • Laptop • Projector	20 minutes
3.6.5 GMPs for dairy product processing and handling	• Group work • Plenary presentation • Plenary discussions	• Flip charts • PowerPoint presentation • Laptop • Projector	20 minutes
3.6.6 Determination of food safety risk hazards in dairy value chain (hazard analysis)	• Group work • Plenary presentation • Plenary discussions	• Flip charts • PowerPoint presentation • Laptop • Projector	10 minutes
3.6.7 Determination of critical control points (CCP) and corrective measures in dairy value chain	• Group work • Plenary presentation • Plenary discussions	• Flip charts • PowerPoint Presentation • Laptop	20 minutes
3.6.8 Module review	• Participants' questions and comments • Facilitator's summary	• Participants' handouts • Module review	5 minutes

Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS) in Dairy			
Sessions	**Training Methods**	**Training Materials**	**Time**
TOTAL			**2 hours 30 minutes**

3.7 Facilitator's Guidelines

Module 3: Good Agricultural Practices (GAPs) and Food SafetyManagement Systems (FSMS)	
3.7.1 Introduction and Levelling Expectations (5 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' introduction and expectations** The facilitator invites the trainees to state their expectations after discuss in their respective county groups The facilitator presents modules objectives. **Module Objectives** By the end of the module training the trainee should be able to: • Describe the role of GAPs on matters of safety of dairy products. • Identify the common hazards which compromise the safety of dairy products. • Discuss the role of veterinary services in supporting dairy farmers to produce safe food. • Related and understand the farm to fork concept in food safety • Explain the need for safe food production as a moral market requirement. • Appreciate the importance of traceability in food safety and quality. • Describe Critical control point (CCPs) at different levels of dairy value chain	• Summarize trainees' "Expectations" on a flipchart and make displays • PowerPoint presentation

3.7.2 Understanding what is GAP and its application in the dairy value chain (20 minutes)	
(Facilitator leads discussions on understanding of GAPs and its relevance to actors in the dairy value chain). **Plenary Presentation** Understanding GAP in the context of dairy production • Explain the role of GAPs in production of safe and quality dairy products • Understanding GAPs as the key to high commodity market destinations	• PowerPoint presentation and discussion
3.7.3 Good dairy farming practices (20 minutes)	**Session Guide**
(Facilitator guides discussions on good dairy farming practices). **Group work** Trainees to list some of the good dairy farming practices that guarantee production of safe and quality dairy products. **Plenary Presentation** • Dairy animal health and its role in preventing hazards in dairy products • Dairy animal welfare • Requirements for farm structures, tools and equipment • Dairy farm environment and hygiene. • Safety concerns for drugs and chemical residues in dairy products • Dairy health records **Plenary Discussion** Ask the participants to give their experiences in Good dairy farming practices and address any issues that may arise.	• PowerPoint presentation • Participants' Handouts
3.7.4 Dairy animal feed production and handling (20 minutes)	**Session Guide**
The facilitator presents and leads discussion on dairy animal feed production and handling **Plenary Presentation** • Opportunities, concerns and challenges the Feed Industry will face in the coming years. • Importance of feed safety for human health and how to identify the health hazards associated with feed. • Sources of feed contamination, its causes and the different roles involved in the production chain. • Good Production Practices in Feed Production (HACCP, GMP, GAPs & KEBS).	• PowerPoint presentation • Participants' Handouts

• Sampling procedures and analysis methods used by the industry to achieve consistent quality. • Available facilities for analysis of feed quality and safety (KALRO, Universities, KEBS, GoK chemists) **Discussion** After the presentations allow trainees to raise any issues and discuss them.	
3.7.5 GMPs for dairy product processing and handling (20 minutes)	**Session Guide**
(The facilitator presents and leads discussion on GMPs for dairy product processing and handling). **Group work** Trainees to list some of the good dairy farming practices that guarantee production of safe and quality dairy products. **Plenary Presentation** • Milk quality control • Processing premise requirements • Processing equipment requirements • Food handlers' safety requirements • Hygiene requirements in processing • Waste management **Discussion** After the presentations allow trainees to raise any issues and discuss them.	• Group work • PowerPoint presentation • Participants' Handouts
3.7.6 Determination of food safety risk hazards in dairy value chain (hazard analysis) (10 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 **Group Exercise** • Groups to identify major risk/hazards at points in dairy value chain • Produce flow diagrams for each point within the value chain	• Group work • PowerPoint presentation • Participants' Handouts

3.7.7 Determination of critical control points (CCP) and corrective measures in dairy value chain (20 minutes)	Session guide
(The facilitator introduces the topic on determination of critical control points (CCP) and corrective measures in dairy value chain) **Plenary presentation** • Determination of critical control points (CCP• • 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 **GESTURE** **Group Exercise** Groups to identify and establish corrective actions and verification procedures for dairy.	• Group work • PowerPoint presentation • Participants' Handouts
3.7.8 Module review (10 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 new things did you learn from this topic? • What other important aspects/topics were omitted? • Any other comments.	`

3.8 Reference materials

3.8.1 Participants' Handouts

- Participant training notes.

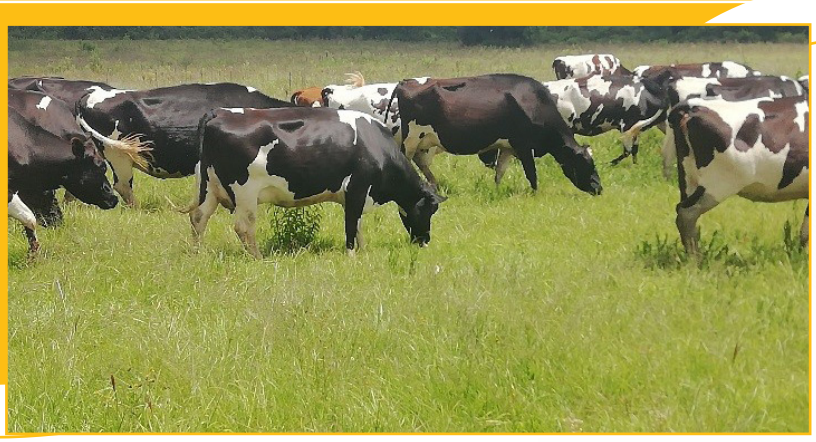
3.8.2 References

Guide to Good Dairy Farming Practice, FAO and IDF. 2011. Guide to good dairy-farming practice. Animal Production and Health Guidelines. No. 8. Rome.

General Principles of Food Hygiene (As Per Codex Standard -CAC/RCP 1-1969).

Code Of Hygiene Practice for Milk & Milk Product (As Per Codex Standard -CAC/RCP 57-2004).

The Dairy Industry (Dairy Produce Safety) Regulations, 2020.



MODULE 4: BREEDS AND BREEDING

Sub Module 4.1: Dairy Cattle Breeds and Breeding

4.1.1 Introduction to the Sub Module

The sub module exposes trainers to various dairy cattle breeds suitable for different production systems. In Kenya, dairy production falls under three systems that include intensive, semi-intensive and extensive. Crossbreeding is mating between animals of different breeds or lines. The crossbreds have increased productivity as compared to the indigenous cattle. The Friesian-Sahiwal cross-bred in KALRO combines the hardiness of a zebu and high milk yield of an exotic breed making it suitable for most dairy agro-ecological zones (AEZs) in Kenya.

The different techniques used in assisted reproductive technologies (ART) include multiple ovulations, embryo transfer, synchronized artificial insemination or natural mating. The community based breeding programme (CBBP) is a three-tier breeding structure which comprise of tier one which serves as a nucleus farms, for example, KALRO DRI, Sahiwal ranchers and progressive individuals. Tier two are multiplier farms in selected counties and tier three are producer herds who are ordinary pastoralists and are the main recipients of genetic materials.

4.1.2 Sub Module Learning Outcomes

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

a) Information on various dairy cattle breeds described.

b) Information on the importance of crossbreeding and different cross breeding systems for dairy cattle described and explained.

c) Information on the significance of the Friesian x Sahiwal crossbred and its suitability in various AEZs explained.

d) Knowledge on Estrus Synchronization (ES) and Artificial Insemination (AI) using Sahiwal germplasm explained.

e) Importance and application of community based breeding programme (CBBP) explained and demonstrated.

4.1.3 Sub Module Target Group

This sub 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.

4.1.4 Sub Module Users

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

4.1.5 Sub Module Duration

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

4.1.6 Sub Module Summary

DAIRY CATTLE BREEDING AND MANAGEMENT			
Sessions	**Training Methods**	**Training Materials**	**Time**
4.1.6.1 Introduction, objectives, expectations	• Personal introduction • Plenary presentation	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	10 minutes
4.1.6.2 Introduction to animal breeding	• Plenary Presentation • Discussion	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes

4.1.6.3 Selection and crossbreeding	• Plenary Presentation • Discussion	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes
4.1.6.4 Friesian x Sahiwal crossbred	• Plenary Presentation • Discussion	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes
4.1.6.5 ART using Sahiwal germplasm- Fixed time Artificial Insemination	• Plenary Presentation • Discussions	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes
4.1.6.6 Community Based Breeding Programme	• Plenary Presentation • Discussion	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes
4.1.6.7 Module Review	• Participants' • questions and • comments Facilitator's • summary	• Participants' handouts • Module review	10 minutes
TOTAL			**2 hours**

4.1.7 Facilitator Guidelines

4.1.7 Dairy cattle breeds and breeding	
4.1.7.1 Introduction and Levelling Expectations (10 minutes)	**Session Guide**
The facilitator welcomes trainees to the module dairy animal breeding and management, then introduces him/herself by stating his/her profile and experience of working with farmers. **Module Objectives** *The facilitator presents modules objectives.* *By the end of the module training the trainee should be able to:* • Describe the various dairy cattle breeds characteristics. • Explain the importance of crossbreeding and different crossing breeding systems for dairy cattle breeds.. • Explain the significance of Friesian X Sahiwal crossbred and its suitability in various AEZ. • Explain the importance of Estrus Synchronization (ES) and Artificial Insemination (AI) using Sahiwal germplasm. • Explain and demonstrate the importance and application of community-based breeding programme (CBBP).	• Summarize trainees' "Expectations" on a flipchart and make displays • PowerPoint presentation
4.1.7.2 Introduction to cattle breeding (20 minutes)	**Session Guide**
Facilitator leads discussions on understanding cattle breeding and its relevance to actors in the dairy value chain. **Plenary presentation** • Understanding breeding the context of dairy cattle production • Discuss the major dairy cattle breeds kept and their suitability to various ecological zones • Discuss the different production systems under which the dairy cattle are reared • Understanding the availability of dairy cattle germplasm	• PowerPoint presentation • Participants' handouts

4.1.7.3 Selection and crossbreeding (20 Minutes)	Session Guide
(The facilitator presents and leads the trainees in discussing selection of parents for different cross breeding systems). **Plenary presentation** • Desired characteristics for a breeding dairy cow • Desired characteristics for a breeding bull (Bull Catalogue) • Different crossbreeding systems in cattle • Importance of animal registration with KLBA • Record keeping (breeding)	• PowerPoint presentation • Participants' handouts
4.1.7.4 Friesian x Sahiwal crossbred (20 minutes)	**Session Guide**
(The facilitator leads the trainees on the importance of Friesian X Sahiwal crossbred) **Plenary presentation** • Explain the production and reproduction performance. • Explain the suitability of Friesian x Sahiwal crossbred in various ecological zones. • Availability of Friesian x Sahiwal crossbred germplasm.	• PowerPoint presentation and discussion
4.1.7.5 ART using Sahiwal germplasm- Fixed time Artificial Insemination (FTAI) (20 minutes)	**Session Guide**
(The facilitator guides the trainees the importance of ARTs using Sahiwal germplasm- FTAI). **Plenary presentation** • Explain the importance of FTAI in Sahiwal germplasm • Understanding the selection criteria of cows to be involved on FTAI	• PowerPoint presentation and discussion
4.1.7.6 Community Based Breeding Programme (20 minutes)	**Session Guide**
(The facilitator presents and leads the trainees in discussing the aspects of community-based breeding programme). **Plenary discussion** • Importance of community-based breeding programme • Explain how the CBBP works	

4.1.7.7 Module review (20 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

4.1.8 Reference Materials

4.1.8.1 Participants' Handout

- Friesian x Sahiwal crossbred pamphlet and leaflet
- Desired characteristics of a breeding cow and bull training notes
- Community based breeding programme training notes

4.1.8.1 References

Magothe, T. M., Mwangi, D. K., Wasike, C. B., Waineina, R. W., Miyumo, S. A., Mwangi, S. I., & Ilatsia, E. D. (2023). Response to hormonal treatment and conception rates of Sahiwal cows subjected to fixed time artificial insemination in pastoral dairy systems. Tropical Animal Health and Production, 55(1), 49.

Waineina, R.W., Mwangi, S.I., Wasike, C.B., Mwaura, T.M., Mukhebi, L., Mwangi, D., & Ilatsia, E.D. (2022).

Muhuyi, W. Friesian-Sahiwal Crossbreds for More Milk (https://www.kalro.org/oldsite/fileadmin/publications/brochuresI/FresSahiMilk.pdf).

Waineina, R,W., Mwangi, S.I., Wasike, C.B., Mwaura, T.M., Mukhebi, L., Mwangi, D., and Ilatsia, E.D. (2022). Multiplication and delivery of improved Sahiwal cattle, selected exotics and their crosses for dairy production in low to medium potential areas. End of KCSAP Sahiwal seed system project report.

Dairy Breeding Manual (Ministry of Livestock Development 2011)

Ministry of Agriculture, Livestock and Fisheries (2014). Dairy Cattle Extension Manual. 151 pages

Sub Module 4.2: Dairy Goat Breeds and Breeding

4.2.1 Introduction to the Sub Module

The Dairy Goat Breeds and Breeding sub module exposes trainers to various dairy goat breeds suitable for different production systems. In Kenya, dairy goat production falls under two systems that include intensive and semi-intensive. Kid management is a process that take place from birth up to weaning (3 months). Kid rearing is a critical management component of a dairy goat enterprise. The kid management process has the largest impact on the dairy goat flock's long-term output and productivity. Dairy goat identification is the process of uniquely identifying a dairy goat using a permanent marking on the body of the dairy goat. Identification is done by applying ear tags and/or tattoo on the ear. The community based breeding programme (CBBP) is a three-tier breeding structure which comprise of tier one which serves as a nucleus farms, for example, KALRO DRI and progressive individual dairy goat breeders. Tier two are selected multiplier farms in selected counties and tier three are producer herds who are ordinary goat farmers and are the main recipients of genetic materials.

4.2.2 Sub Module Learning Outcomes

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

a) Information on various dairy goat breeds described.

b) Dairy goat management guide explained and demonstrated.

c) Identification and recording of dairy goat explained and demonstrated.

d) Methods of breeding and mating systems explained

e) Dairy goat kid management guide described

f) Importance and application of community-based breeding programme (CBBP) explained and demonstrated.

4.2.3 Sub Module Target Group

This sub 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

4.2.4 Sub Module Users

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

4.2.5 Sub Module Duration

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

4.2.6 Sub Module Summary

Dairy Goat Breeds and Breeding			
Sessions	**Training Methods**	**Training Materials**	**Time**
4.2.6.1 Introduction, objectives, expectations	• Personal introduction • Plenary presentation	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	10 minutes
4.2.6.2 Introduction to dairy goat breeds and breeding	• Plenary Presentation • Discussion	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes
4.2.6.3 Selection of a breeding doe and buck	• Plenary Presentation • Discussion • Demonstration	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens • A buck and a doe	20 minutes
4.2.6.4 Methods of breeding system/ strategies and breeding management	• Plenary Presentation • Discussion	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes
4.2.6.5 Identification and recording of dairy goats	• Plenary Presentation • Discussions • Demonstration	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens • Ear tags and applicator, • Tatoo machine and inks	20 minutes

4.2.6.6 Community Based Breeding Programme	• Plenary Presentation • Discussion	• Laptop • Projector • Power Point presentation • Flip charts • Marker pens	20 minutes
4.2.6.7 Module Review	• Participants' • questions and • comments Facilitator's • summary	• Participants' handouts • Module review	10 minutes
TOTAL			**2 hours**

4.2.7 Facilitator Guidelines

4.2.7 Dairy goat breeds and breeding	
4.2.7.1 Introduction and Levelling Expectations (10 minutes)	**Session Guide**
Introduction *The facilitator welcomes trainees to the module dairy goat breeds and breeding, then introduces him/herself by stating his/her profile and experience of working with farmers.* • Trainees' introductions and expectations • The facilitator invites the trainees to state their expectations • after discuss in their respective county groups • The facilitator presents modules objectives **Module Objectives** By the end of the module training the trainee should be able to: • Describe the various dairy goat breeds characteristics • Explain desirable characteristics of a breeding doe and buck • Explain the various methods of breeding and mating systems • Explain dairy goat breeding management • Describe dairy goat kid management guide • Explain identification and recording of dairy goats • Explain and demonstrate the importance and application of community-based breeding programme (CBBP)	• Summarize trainees' "Expectations" on a flipchart and make displays • PowerPoint presentation

4.2.7.2 Introduction to dairy goat breeds and breeding (20 minutes)	Session Guide
Facilitator leads discussions on understanding goat breeding and its relevance to actors in the dairy value chain **Plenary presentation** Understanding breeding the context of dairy goat production • Discuss the major dairy goat breeds kept and their suitability to various ecological zones • Discuss the importance of dairy goats • Discuss the different production systems under which the dairy goats are reared • Understanding the availability of dairy goat germplasm	• PowerPoint presentation • Participants' handouts
4.2.7.3 Selection of a breeding doe and a buck (20 minutes)	**Session Guide**
(The facilitator presents and leads the trainees in discussing selection for a breeding doe and a buck). **Plenary presentation** • Desired characteristics for a breeding doe • Desired characteristics for a breeding buck • Demonstration Practical demonstration of desired characteristics for a breeding doe and a buck	• PowerPoint presentation • Participants' handouts
4.2.7.4 Methods of breeding strategies/system and breeding management (20 minutes)	**Session Guide**
(The facilitator leads the trainees on the methods of breeding system and breeding management) **Plenary presentation** • Explain the various methods of breeding strategies/ systems • Explain the different methods of mating • Discuss the breeding management	• PowerPoint presentation and discussion
4.2.7.5 Identification and recording of dairy goats (20 minutes)	**Session Guide**
(*The facilitator presents and leads the trainees in explaining the aspects of identification and recording of dairy goats)* **Plenary presentation** • Describe reasons for dairy goat identification • Explain important considerations during goat identification • Explain methods of identification	• PowerPoint presentation, discussion and • Demonstration

• Describe importance of records in dairy goat farming • Discuss type of goat records to be kept • Explain importance of dairy goat registration • Explain dairy goat registration process **Demonstration** Practical demonstration on identification and record keeping	
4.2.7.6 Community Based Breeding Programme (20 minutes)	**Session Guide**
(The facilitator presents and leads the trainees in discussing the aspects of community -based breeding programme). **Plenary discussion** • Importance of community-based breeding programme • Explain how the CBBP works • Discuss buck rotation	• PowerPoint presentation and discussion
4.2.7.7 Module review (20 Minutes)	**Session Guide**
The facilitator leads the trainees in summarizing the key points discussed in the module • Discussion 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

4.2.8 Reference materials

4.2.8.1 Participants' handout

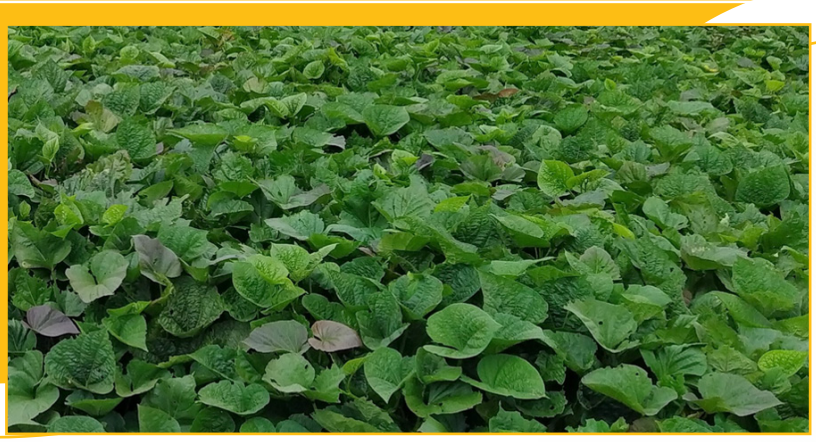
- Dairy goat breeds and breeding pamphlet and training notes
- Dairy goat kids management guide and training notes
- Community based breeding programme training notes
- Selection of a breeding doe and a buck training notes
- Dairy goat identification and registration pamphlet and training notes

4.2.8.2 References

Waineina, R.W., Wasike, CB, Mwangi, S.I, Kiura, J.N., Ondoro, D, Gachina, W, Wahome, C., Mukhebi, L., Nyambati, E.M. and Ilatsia E. (2021). Dairy Goat Management- Resource Book. A Publication of the Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya. Page 3-13. ISBN: .978-9966-30-112-3.

Waineina, R.W., Mwangi, S.I., Wasike, C.B., Kiura, J.N. & Ilatsia, E.D. (2022). Dairy Goat Germplasm Multiplication and Delivery to smallholder farmers. End of KCSAP dairy goat seed system project report.

Waineina, R.W., Wasike, C.B., Magothe, T.M., Mwangi, S.I., Mukhebi, L., & Ilatsia, E.D (2021). Dairy goat kids management guide. A Publication of the Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya.



MODULE 5: FEED RESOURCES

5.1 Introduction to the Module

This module will address challenges of inadequate and poor-quality feed resources which are encountered by dairy farmers, especially during the dry season. The training will cover appropriate dairy feed resources (pastures, established fodder including multi-purpose shrubs and legumes, concentrates, and minerals) that are suitable for different Agro-Ecological Zones (AEZs), agronomic practices to improve biomass yields and quality, pests and disease control methods, roles of protein-rich forages and tree pods, and concentrate supplements, quality enhancement of crop residues, feed conservation methods, feed quality and safety issues, feed budgeting, and record keeping for dairy feed resources.

5.2 Module Learning Outcomes

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

a) Knowledge on different classes of dairy feed resources enhanced and shared

b) Forage ecological suitability, agronomic management, and biomass yields explained and understood

c) Factors affecting forage biomass yields identified and explained

d) Forage pests and diseases, causes and their control identified, described and shared

e) Crop residues and the technologies to improve their quality explained and understood

f) Knowledge on appropriate forage conservation technologies acquired and shared

g) Knowledge on the roles of protein-rich forage and concentrate supplements acquired and shared

h) Challenges of dairy feed quality and safety, and how to overcome them explain and understood

i) Effects of anti-nutritive factors in dairy feeds, and the technologies to reduce the negative effects explained and understood

j) Year-round budgeting of dairy feeds and keeping of dairy feed records explained and understood.

5.3 Target Group and Categories

This module targets Service providers who include County extension staff, private service providers and lead farmers.

5.4 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 dairy value chain target Counties. The facilitator using this module should thoroughly familiarize him/herself with the participants' Handouts (training materials).

5.5 Module Duration

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

5.6 Module Summary

FEED RESOURCES			
Sessions	**Training Methods**	**Training Materials**	**Time**
5.6.1 Module outline, introduction, expectations, and objectives	• Presentation • Plenary discussion	• Flip charts • Projector • Laptop	5 minutes
5.6.2 Classification of feed resources	• Presentation • Plenary Discussions	• Flip charts • Projector • Laptop • Participants' handouts	15 minutes
5.6.3 Forage ecological suitability, agronomic management, and biomass yields	• Presentation • Discussions • Displays	• Flip charts • Projector • Laptop	30 minutes
5.6.4 Factors affecting forage biomass yield and quality	• Presentation • Discussion	• Flip charts • Projector • Laptop	20 minutes

5.6.5 Forage pests and diseases	• Presentation • Discussion	• Flip charts • Projector • Laptop • Participants handouts	30 minutes
5.6.6 Crop residues	• Presentation • Discussion • Displays • Demonstrations • Practical	• Flip charts • Projector • Laptop • Participants' handouts	30 minutes
5.6.7 Anti-nutritive factors in dairy feeds	• Presentation • Discussion • Displays • Demonstrations	• Projector • Laptop • Participants' handouts	15 minutes
5.6.8 Forage conservation	• Presentation • Demonstrations • Practical • Discussions	• Projector • Laptop • Flip charts • Participants' Handouts	30 minutes
5.6.9 Dairy feeds quality and safety	• Presentation • Discussion • Displays • Demonstrations • Group exercise	• Projector • Laptop • Flip charts • Participants' Handouts	15 minutes
5.6.10 Budgeting of dairy feed	• Presentation • Discussion • Displays • Demonstrations • Practical Exercise	• Projector • Laptop • Flip charts • Participants' handouts	30 minutes
5.6.11 Keeping of dairy records	• Presentation • Discussion • Displays • Demonstrations	• Projector • Laptop • Flip charts • Participants' handouts	15 minutes

5.6.12 Module Review	• Individual exercise	• Review questionnaire	5 minutes
TOTAL			**4 hours**

5.7 Facilitator Guidelines

5.7.0 Feed Resources	
5.7.1. Introduction and Levelling Expectations (5 minutes)	**Session Guide**
Introduction *The facilitator welcomes trainees to the module on dairy feed resources and introduces him/herself by stating his/her profile and experience of working with farmers.* *(The facilitator invites the trainees to state their expectation for the module).* **Module Objectives** The facilitator presents modules objectives By the end of the module training the trainee should be to: • Describe different classes of dairy feed resources • Understand and explain forage ecological suitability, agronomic management, and biomass yields • Identify and explain factors affecting forage biomass yields and quality • Identify and describe forage pests and diseases, causes and their control • Describe crop residues and their quality improvement technologies • Explain forage conservation technologies • Describe and explain the roles of protein-rich forage and concentrate supplements • Describe and explain and effects of anti-nutritive factors in dairy feeds and the technologies to reduce the negative effects • Describe the dairy feed anti-nutritive factors, their effects, and the methods to reduce the effects • Explain and demonstrate year-round budgeting of dairy feeds and keeping of feed records.	• Summarize Participants' "Expectations" and display. • PowerPoint presentation • Participants exercise • Participants flip chart presentations

5.7.2 Classification of dairy feed resources (15 minutes)	Session Guide
The facilitator presents and guides trainees in the discussion on the importance of classifying the various feed resources. **Presentation and discussion** Present and discuss roles, attributes, and classification by types: • Roughages • Concentrates • Minerals • Feed additives Present and discuss roles, attributes and classification by nutrients: • Protein-rich feed resources • Carbohydrate (energy)-rich feed resources • Mineral-rich feed resources Present and discuss roles, attributes and classification by origin: • Feed resources of animal origin • Feed resources of crop origin • Industrial by-products Present and discuss roles, attributes and classification by their use: • Basal forages • Complementary forages • Supplementary feeds **Discussion** After presentation allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
5.7.3 Forage ecological suitability, agronomic management, and biomass yields (30 minutes)	**Session Guide**
The facilitator leads trainees in identifying suitable forages for different AEZs, their agronomic practices, and biomass yields. **Presentation and practical exercise** • Effect of climate change on forage production • Forages suitable for different AEZs (soil conditions, altitude, temperature, annual rainfall)	• PowerPoint presentation • Plenary discussion • Practical Exercise

• Agronomic management (land preparations, seed rates, fertilization, weeding, harvesting) for different forages • Biomass yields of different forages • Demonstrations on agronomic practices and estimation of biomass yields (quadrant, actual harvesting, number of plants per unit area) **Discussion** After the presentations and demonstrations sessions allow trainees to raise any issues and discuss.	•
5.7.4 Factors affecting forage biomass yields and quality (20 minutes)	**Session Guide**
The facilitator presents and leads the trainees in discussing the factors affecting biomass yield and quality of forages **Presentation** • Choice of forage • Agronomic practices • Pests and diseases • Timing of harvesting • Prevailing weather conditions **Discussion** After the presentations allow trainees to raise any issues and discuss them.	• PowerPoint presentation • Plenary discussion
5.7.5 Forage pests and diseases (30 minutes)	**Session Guide**
Presentation *The facilitator presents and leads discussion on common pests and diseases affecting forages, and their causes and control* • Common forage pests and diseases • Economic importance of forage pests and diseases • The predisposing factors to forages pests and diseases • Forage pests and diseases control measures **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary Discussion

5.7.6 Crop residues (30 minutes)	Session Guide
Presentation and demonstration *(The facilitator presents and leads discussion on common crop residues and how to improve their quality for dry season feeding of dairy animals).* • Common crop residues and their attributes • The opportunities and challenges of enhancing the quality of crop residues • How to enhance the quality of crop residues through treatment technologies • Demonstrations on how to enhance the quality of crop residues at the farm level • Total mixed ration blocks (TMRBs) and their attributes • Urea-molasses-mineral blocks (UMMBs) supplements and their characteristics **Discussion** After the presentations allow participants to raise any issues and discuss them.	• PowerPoint presentation • Plenary discussion • Practical demonstration
5.7.7 Anti-nutritional factors in dairy feeds (15 minutes)	**Session Guide**
The facilitator presents and leads discussion on the importance of anti-nutritive factors in feed resources when feeding dairy cattle. **Presentation** • Importance of anti-nutritive factors in feeding • Types and levels of anti-nutritive factors in feed resources (tannins, saponins, phenols, mimosine, alkaloids, trypsin, cyanide, gossypol) • Methods of reducing the anti-nutritive factors in feed resources **Discussion** After the presentations allow trainees to raise any issues and discuss them.	• PowerPoint presentation • Plenary discussion

5.7.8 Forage conservation (30 minutes)	Session Guide
The facilitator presents and leads discussion on the different forage conservation technologies and their applications **Presentation and demonstration** • The current forage conservation status • The opportunities and challenges of forage conservation at farm level • Methods of forage harvesting and curing • Forage conservation techniques (hay box & polythene tube silage) • Structures required for storage of conserved forages • Demonstrations on how to conserve forages at farm level **Discussion** After the presentations allow trainees to raise any issues and discuss them.	• PowerPoint presentation • Plenary discussion • Practical demonstration
5.7.9 Dairy feed quality and safety (15 minutes)	**Session Guide**
The facilitator presents and leads discussion on the importance and assessment of feed quality and safety **Presentation** • Know the opportunities, concerns and challenges the Feed Industry will face in the coming years. • Understand the importance of feed safety for human health and how to identify the health hazards associated with feed. • Identify the sources of feed contamination, its causes and the different roles involved in the production chain. • Learn the Good Production Practices in Feed Production (HACCP, GMP, GAPs & KEBS). • Defining Cross Contamination and Carry Over, and how to avoid the risk of its occurrence. • Know the sampling procedures and analysis methods used by the industry to achieve consistent quality. • Available facilities for analysis of feed quality and safety (KALRO, Universities, KEBS, GoK chemists) **Discussion** After the presentations allow trainees to raise any issues and discuss them.	• PowerPoint presentation • Plenary discussion

5.7.10 Budgeting of dairy feeds (30 minutes)	Session Guide
The facilitator presents and leads discussion on quantifying feed budgets for year-round feeding of dairy cattle **Presentation and exercises** • Estimation of all dairy animal feed requirements for maintenance, reproduction, and production annually • Estimation with a safety margin of total quantities of feed required annually • Conversion of dry matter to fresh weight and vice versa • Estimation of quantities of forages and concentrates required annually • Estimation of land required to produce forages for the dairy animals • Estimation of costs • Demonstration using graphs and bar charts to show feed supply and demand in all months of the year • Exercise on the budgeting of dairy feeds **Discussion** After the presentations allow trainees to raise any issues and discuss	• PowerPoint presentation • Plenary discussion • Practical exercise • •
5.7.11 Keeping of dairy feed records (15 minutes)	**Session Guide**
Presentation The facilitator presents and leads discussion on the importance of keeping good dairy feed records • Importance of records in feed budgeting and planning • Feed record, labelling and traceability issues • Types of feed records to be kept (yield, sales, input costs) • Management of the records • Monitoring and evaluation of the profitability of the feed resource enterprise **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion • Practical exercise

5.7.12 Module review (5 minutes)	
(The facilitator leads the trainees present their views on each of the sessions covered under this module.) Review the main points about dairy feed resources by answering the following: • What new things did you learn from this topic? • What other important aspects/topics were omitted? • Any other comments	Distribute handout and questionnaire on module review

5.8 Reference materials

5.8.1 Participants' handouts

- KALRO pasture and fodder common in the cold highlands
- Farmers' training manual on sweet lupin production and management
- Cassava based Napier grass silage pamphlet
- Tree Lucerne for livestock feeding pamphlet
- Sunflower cake for livestock feed ration pamphlet
- Grow fodder sorghum for increased milk yield pamphlet
- Stop the spread of Napier stunt disease pamphlet
- Lucerne, a practical guide to production

5.8.2 References

Ogillo, *et al.* 2016. Leaflet on Hay making and storage available in: www.kalro.org/asal-aprp/

MoAL&F. 2014. Ministry of Agriculture, Livestock and Fisheries. Dairy Cattle Extension Manual. 151 pages

How to make mineral blocks for livestock de-worming and mineral supplementation

FAO and IFIF. 2020. Good practices for the feed industry – Implementating the codex Alimentarius code of practice on Good Animal Feeding. FAO Animal Production and Health Manual No. 9 Rome

MODULE 6: FEED FORMULATION

6.1 Introduction to the Module

This module provides information on the formulation of least cost dairy ration options based on locally available feed resources. Nutritionally balanced dairy rations, formulated using appropriate feed formulation software, would help smallholder dairy farmers improve dairy productivity, food security, household income, employment opportunities and reduce production costs. These rations minimize feed wastage and environmental pollution through reduction of greenhouse gas emissions and element fluxes. The module is also aimed at equipping dairy extension officers with adequate information and knowledge in dairy rations formulation to enable them to train farmers effectively.

6.2 Module Learning Outcomes

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

a) Nutrient requirements of dairy cattle and goats escribed and explained
b) Requirements to formulate dairy feed rations identified and shared
c) Knowledge on nutrient balanced dairy feed rations attained and shared
d) Guidelines on formulation of dairy feed rations explained and appreciated
e) Dairy feeds ration formulation methods described and shared
f) Knowledge on formulation of home-made concentrates and total mixed feed rations acquired and shared
g) Knowledge on feed mill equipment, capacities and their estimated costs enhanced and shared.

6.3 Target Group and Categories

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

6.4 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 dairy value chain target Counties. The facilitator using this module should thoroughly familiarize him/herself with the participants' Handouts (training materials).

6.5 Module Duration

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

6.6 Module Summary

Feed Formulation			
Sessions	**Training Methods**	**Training Materials**	**Time**
6.6.1 Module outline, introduction, expectations, and objectives	• Presentation • Plenary • Discussion	• Flip charts/ felt pens • Projector • Laptop • Participants Handouts	10 minutes
6.6.2 Nutrient requirements of dairy cattle and goats	• Presentation • Demonstration • Plenary • Discussion	• LCD projector • Laptop • Flip charts/ felt pens • Participant Handouts	10 minutes
6.6.3 Information required to formulate dairy feed rations	• Presentation • Demonstration • Plenary • Discussion	• LCD projector • Laptop • Flip charts/ felt pens	10 minutes
6.6.4 Nutrient balanced dairy feed rations	• Presentation • Demonstration • Discussion	• Flip charts/ felt pens • Projector • Laptop	10 minutes
6.6.5 Guidelines for the formulation of dairy feed rations	• Presentation • Demonstration • Discussion	• Flip charts/ felt pens • Projector • Laptop • Participant handouts	10 minutes

Feed Formulation			
Sessions	**Training Methods**	**Training Materials**	**Time**
6.6.6 Dairy feeds ration formulation methods	• Presentations • Demonstration • Discussion • Group assignments	• Projector • Laptop • Participants handouts • Feed formulation guides	2 hours
6.6.7 Exercise on the formulation of Homemade	• Practical Exercise • Discussion	• Weighing scale • Concentrate ingredients • Shovels • Packaging materials	10 minutes
6.6.8 Exercise on the formulation of total mixed rations (TMRs)	• Practical Exercise • Discussion	• Weighing scale • Concentrate ingredients • Forages • Shovels • Packaging materials	10 minutes
6.6.9 Feed mill equipment, capacities and their cost. (Utafiti Feed mill, DRI Naivasha)	• Presentations • Discussion	• Projector • Laptop • Photos	10 minutes
6.6.10 Practical mixing of HMCs (manual, automated)	• Practical Exercise • Discussions	• Weighing scale • Concentrate ingredients • Shovels • Packaging materials	15 minutes
6.6.11 Practical mixing of TMRs (manual, automated)	• Practical Exercise • Discussion	• Weighing scale • Concentrate ingredients • Forages • Shovels • Packaging materialS	15 minutes
6.6.12 Module Review	• Individual exercise	• Review questionnaire	10 minutes
TOTAL			**4 hours**

6.7 Facilitator Guidelines

6.7.0 Feed formulation	
6.7.1 Introduction and Levelling Expectations (10 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module feed formulation and invites the trainees to state their expectation for the module). **Module Objectives** The facilitator presents modules objectives. By the end of the module training the trainee should be able to: • Describe and explain nutrient requirements of dairy cattle and goats • Identify nutrient balanced dairy feed rations and the requirements for formulation of dairy feed rations. • Explain and appreciate the guidelines for the formulation of dairy feed rations • Describe the dairy feeds ration formulation methods • Explain the formulation of home-made concentrates and total mixed feed rations • Describe feed mill equipment, capacities and their estimated costs	• Summarizes Participants' Expectations and display. • PowerPoint presentation • Participants exercise • Participants flip chart presentations
6.7.2 Nutrient requirements of dairy cattle and goats (10 minutes)	**Session Guide**
(The facilitator explains what the feed standards/nutrient requirements are and their uses in benchmarking dairy feed formulation). **Presentation** • Concept of dry matter in the feeding of dairy animals • Guideline for dry matter intake of dairy animals • Factors affecting dry matter intake of dairy animals • Guideline for water requirements of dairy animals • Factors influencing water intake by dairy animals • The feeding standards for different classes of dairy cattle • The feeding standards for different classes of dairy goats **Discussion** *After the presentations allow trainees to raise any issues and discuss them*	• PowerPoint presentation • Plenary Discussion •

6.7.3 The information required to formulate dairy feed rations (10 minutes)	Session Guide
(The facilitator presents and leads discussion on information required to formulate feed rations). **Plenary Presentation** • Animal factors • Feed factors • Equipment • Formulator • Discussion After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
6.7.4 Nutrient balanced dairy feed rations (10 minutes)	**Session Guide**
(The facilitator presents and leads discussion on the role and benefits of nutrient balanced rations for dairy animal feeding and safe environment). **Presentation** • The difference between a ration and a diet • Consequences of feeding nutrient imbalance dairy feed rations • Importance of nutrient balanced rations • Nutrient balanced home-made concentrate • Nutrient balanced feed rations **Discussion** After the presentations allow participants to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
6.7.5 Guidelines for the formulation of dairy feed rations (10 minutes)	**Session Guide**
The facilitator presents on guidelines for formulation of dairy feed rations. **Presentation** • General guidelines on compounding concentrates • General guidelines on compounding TMRs **Discussion** After the presentations allow participants to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion

6.7.6 Dairy feeds ration formulation methods (2 hours)	
(The facilitator presents and leads trainees in discussing the various methods used in feed formulation to arrive at the desired feed ration that meets the dairy animal needs). **Presentation** • Pearson square • Excel spreadsheet trial and error • Excel spreadsheet solver • PC Dairy • Others include; Rumen 8, Ecomix, Winfeed, Best mix etc. **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
6.7.7 Exercise on the formulation of concentrates (10 minutes)	**Session Guide**
(The facilitator guides trainees in their exercises on formulating nutrient balanced home-made concentrates). **Exercise** The participants will gain experience on how to formulate home-made concentrate using available raw materials **Discussion** After the exercise, allow trainees to raise any issues and discuss them	• Practical exercise • Plenary discussion
6.7.8 Exercise on the formulation of total mixed rations (TMRs) (10 minutes)	**Session Guide**
The facilitator guides trainees in their exercises on formulating least-cost nutrient balanced total mixed rations. **Exercise** The trainees will gain experience on how to formulate least-cost and nutrient balanced TMR using locally available feed resources **Discussion** After the exercise, allow trainees to raise any issues and discuss them	• Practical exercise • Plenary discussion

6.7.9 Feed mill equipment, capacities and their estimated costs (10 minutes)	Session Guide
(The facilitator presents on the various equipment used in feed mills, their capacities and estimated costs). **Presentation** • Various equipment (hammer mill, mixers, weighing scales, packaging etc.), used for commercial feed manufacturing their capacities and costs • Various equipment (drums, spades etc.) used for small scale mixing of feeds at farm level **Discussions** After the presentation allow trainees to raise any issues and discuss them	• Practical exercise • Plenary discussion
6.7.10 Practical mixing of HMCs (15 minutes)	**Session Guide**
(The facilitator guides the trainees in the practical session on mixing rations using the formulations derived from activity 4.7.7 above). **Practical session** The facilitator guides trainees during the actual mixing of the formulated concentrate **Discussion (10 minutes)** After the mixing the concentrate, allow trainees to raise any issue and discuss.	• Practical exercise • Plenary discussion
6.7.11 Practical mixing of total mixed rations (TMRs) (15 minutes)	**Session Guide**
(The facilitator guides trainees on mixing a total mixed ration (TMR) using the formulations derived from activity 4.7.8 above). **Practical Exercise** The facilitator will guide trainees during the actual mixing of the formulated TMRs **Discussion** After the mixing of TMRs allow trainees to raise any issue and discuss	• Practical Exercise • Plenary Discussion

6.7.12 Module review (10 minutes)	
(The facilitator leads the trainees to present their views on each of the sessions covered under this module). Review the main points about dairy feeding by answering the following: • What new things did you learn from this topic? • What other important aspects/topics were omitted? • Any other comments	• Distribute handouts and questionnaire

6.8 Reference materials

6.8.1 Participants' Handouts

- Guidelines for the formulation of dairy cattle feed rations using PC Dairy software.
- Guidelines for the formulation of feed rations using Excel Solver software.
- Feeding standards for dairy cattle.
- Feeding standards for dairy goats.
- Total mixed rations for dairy cattle in Muranga Counties.
- Total mixed rations for dairy cattle in Machakos Counties.

6.8.2 References

MoAL&F. 2014. Ministry of Agriculture, Livestock and Fisheries. Dairy Cattle Extension Manual. 151 pages.

MODULE 7: FEEDING

7.1 Introduction to the Module

The module on feeding addresses appropriate dairy feeding practices that ensure all classes of dairy animals are fed adequately for both maintenance, production, and reproduction. Similarly, it provides additional information on the feeding of basal forages (pastures and fodder), supplements (supplementary forages, concentrates and minerals) and water.

7.2 Module Learning Outcomes

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

a) Dairy cattle and goat housing plan described and explained

b) Guidelines for feeding dairy cattle (calves, heifers & lactating) and goats (Kids, does, bucks & lactating) explained and understood.

c) Knowledge on early weaning diets for calves and kids enhanced and shared

d) Alternative milk replacers in calf and kid rearing described and explained.

e) Supplementation to improve performance of dairy cattle and goats described and shared.

f) Use of sweet potato vines as a milk replacer for kids explained and understood.

7.3 Target Group and Categories

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

7.4 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 dairy value chain target

Counties. The facilitator using this module should thoroughly familiarize him/herself with the participants' Handouts (training materials).

7.5 Module Duration

The module is estimated to take a minimum of 2 hours 30 minutes.

7.6 Module Summary

Feeding			
Sessions	**Training Methods**	**Training Materials**	**Time**
7.6.1 Module outline, introduction, expectations, and objectives	• Presentation • Plenary	• Flip charts • Projector • Laptop	5 minutes
7.6.2 Housing for dairy cattle	• Presentation • Plenary	• Flip charts • Projector • Laptop	15 minutes
7.6.3 Housing for dairy goats	• Presentation • Plenary	• Flip charts • Projector • Laptop	15 minutes
7.6.4 Feeding regime for calves	• Presentation • Discussions	• Flip charts • LCD projector • Laptop • Participants' Handouts	30 minutes
7.6.5 Feeding of heifers	• Presentation • Discussion	• Flip charts • Projector • Laptop • Participants' Handouts	15 minutes
7.6.6 Feeding of lactating cows	• Presentation • Discussions	• Flip charts • Projector • Laptop • Participants' Handouts	15 minutes

7.6.7 Feeding regime for kids	• Presentation • Discussions	• Flip charts • Projector • Laptop • Participants' Handouts	15 minutes
7.6.8 Feeding of doelings	• Presentation • Discussions	• Flip charts • Projector • Laptop	15 minutes
7.6.9 Feeding of lactating does	• Presentation • Discussion	• Flip charts • Projector • Laptop • Participants' Handouts	15 minutes
7.6.10 Feeding of bucks	• Presentation • Discussion	• Flip charts • Projector • Laptop	10 minutes
7.6.11 Module Review	• Individual exercise	• Review questionnaire	5 minutes
TOTAL			**2 hours 30 minutes**

7.7 Facilitator Guidelines

7.7.0 Feeding	
7.7.1. Introduction and Levelling Expectations (5 minutes)	**Session Guide**
Introduction (*The facilitator welcomes trainees to the module dairy feeding management and introduces him/herself by stating his/her profile and experience of working with farmers. and invites the trainees to state their expectation for the module).* **Module Objectives** The facilitator presents modules objectives. By the end of the module training the trainee should be able to: • Explain dairy cattle and goat housing • Describe the guidelines for feeding dairy cattle and goats • Early weaning diets for calves and kids described and shared	• Summarize Participants' Expectations and display • PowerPoint presentation • Participants exercise • Participants flip chart presentations

• Describe and explain the use of alternative milk replacers in calf rearing • Describe the supplementation to improve performance of dairy cattle and goats • Explain the use of sweet potato vines as a milk replacer for kids	
7.7.2 Housing for dairy cattle (15 minutes)	**Session Guide**
(The facilitator presents and discusses with trainees on the housing of dairy cattle). **Presentation** • Basic Principles of Cow Barn Design • Site Plan • Specific Aspects for Kenyan Cow Barn Design (Roofing, security & ventilation/climate control) • Parts of a Zero Grazing Unit **Discussion** After the presentations allow trainees to raise any issue and discuss.	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
7.7.3 Dairy goat housing (15 minutes)	**Session Guide**
(The facilitator presents and discusses with trainees on the guidelines and technologies used for feeding heifers). **Presentation** • Attributes of a good dairy goat house • Types of goat houses • Specific Aspects for dairy goat housing (Roofing, security & ventilation/climate control) • Parts of dairy goat house **Discussion** After the presentations allow trainees to raise any issue and discuss.	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
7.7.4 Dairy goat kid management guide (15 minutes)	**Session Guide**
The facilitator presents and discusses with trainees on the guidelines and technologies used for feeding heifers. **Presentation** • Explain the management of kids at birth • Discuss on routine management practices for kids **Discussion** After the presentations allow trainees to raise any issue and discuss.	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations

Practical demonstration • Routine management practices for kids (weighing, identification, kid housing, bottle feeding etc.)	
7.7.5 Feeding regime for calves (30 minutes)	**Session Guide**
The facilitator presents and discusses with trainees on the guidelines used in feeding calves. **Presentation** • Guidelines for feeding calves **Discussion** After the presentations allow trainees to raise any issue and discuss	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
7.7.6 Feeding of heifers (15 minutes)	**Session Guide**
The facilitator presents and discusses with trainees on the guidelines and technologies used for feeding heifers. **Presentation** • Opportunities and challenges of feeding heifers • Importance of feeding heifers on good quality rations • Recommended age/weight to the first service • Feeding to meet target growth rates • Suitable protein-rich forages and concentrates supplements for heifers • The need for minerals and water in heifer rearing **Discussion** After the presentations allow trainees to raise any issue and discuss.	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
7.7.7 Feeding of lactating cows (15 minutes)	**Session Guide**
(The facilitator presents and discusses with trainees on the guidelines and technologies used for feeding lactating cows). **Presentation** • Importance of feeding good quality rations to lactating cows • Role of minerals in relation to dam fertility and milk production • Steaming up of dams	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations

• Challenge feeding for milk production • Suitable protein-rich forages and concentrates supplements for lactating cows • Effect of diet on milk composition and flavour • Role of water in feeding lactating cows • Factors affecting milk production **Discussion** After the presentations allow trainees to raise any issue and discuss.	
7.7.8 Feeding of kids (15 minutes)	**Session Guide**
(The facilitator leads the trainees in understanding the guidelines and technologies for feeding kids). **Presentation** • Amount of milk for feeding kids • Use of sweet potato vines as a milk replacer for kids • Role of feeding roughage to stimulate rumen development • Age and weight of kids at weaning • The need for water in kids rearing **Discussion** After the presentations allow trainees to raise any issue and discuss.	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
7.7.9 Feeding of doelings (15 minutes)	**Session Guide**
The facilitator presents and discusses with trainees on the guidelines for feeding doelings. **Presentation** • Recommended age/weight to the first service • Flushing of doelings • Steaming up of doelings • The need for minerals and water in doeling rearing **Discussion** After the presentations allow trainees to raise any issue and discuss.	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations

7.7.10 Feeding of lactating does (15 minutes)	Session Guide
(The facilitator presents and guides discussion on the guidelines and technologies used for feeding lactating does). **Presentation** Importance of feeding good quality rations to lactating does • Use of protein-rich forages and concentrates supplements to improve performance of lactating does • Challenges in feeding lactating does for milk production • Unique qualities of goat milk • Role of water in feeding lactating does **Discussion** After the presentations allow trainees to raise any issue and discuss.	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
7.7.11 Feeding of breeding bucks (10 minutes)	**Session Guide**
The facilitator presents and leads discussion on guidelines used in feeding breeding bucks **Presentation** • Feeding of breeding bucks in preparation for mating • Suitable age of buck to be ready for breeding • Feeding of bucks during mating • The ratio of bucks : does **Discussion** After the presentations allow trainees to raise any issue and discuss.	• `
7.7.12 Module review (5 minutes)	**Session Guide**
(The facilitator leads the trainees to present their views on each of the sessions covered under this module.). Review the main points about dairy feeding by answering the following: • What new things did you learn from this topic? • What other important aspects/topics were omitted? • Any other comments	Distribute handout and questionnaire on module review

7.8 Reference materials

7.8.1 Participant handouts

- Processing cassava root for dairy cattle feeding pamphlet
- Rear your own heifers
- Feed calves with nutritious gruel
- Feed cassava leaves to dairy cattle in the dry season
- Learn how to rear dairy goats
- Rearing the milk goat
- Today's calf is tomorrow's cow

7.8.2 References

Farmers Dairy Goat Production Handbook. Farm Africa – Meru & Tharaka Nithi Dairy goat and animal health Project (1996 - 2003).

Handbook modular cow barn design for smallholder dairy entrepreneurs.

MODULE 8: ANIMAL HEALTH

Sub Module 8.1: Dairy Cattle Health

8.1.1 Introduction to the Sub Module

This sub module is designed for use in training facilitators on management of dairy cattle health constraints affecting productivity. This is necessary in order to improve their knowledge and skills to enable dairy cattle production become market oriented, competitive and profitable. There are many causes of poor health in dairy goats including presence of disease, pests and parasites. Knowledge of what causes the diseases and infestation of pests and parasites helps to design prevention and control strategies.

The facilitators benefiting from this training are expected to capacity build and backstop farmers practicing dairy cattle farming The module addresses the concept of health and disease in dairy cattle; dairy farm biosecurity measures; diagnosis and management/control of economically important diseases, pests and parasites affecting productivity; as well as control of infertility in dairy cattle. In addition, the module will also address issues of proper handling of veterinary drugs, chemicals and vaccines.

8.1.2 Sub Module Learning Outcomes

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

a) Concept of health and disease in dairy cattle is described and explained

b) Economically important diseases and parasites/pests affecting dairy cattle identified and described.

c) Knowledge on control of occurrence of infertility in dairy cattle enhanced and shared.

d) Techniques of proper handling of veterinary drugs, chemicals and vaccines (to ensure effectiveness and prevention of antimicrobial residues in dairy products) are described and explained.

e) Importance of biosecurity measures for dairy farms explained.

8.1.3 Sub Module Target Group

This sub module targets service providers and agri-prenuers in project counties. It will also be useful for private extension service providers dealing directly with farmer groups at the community level and lead farmers.

8.1.4 Sub Module Users

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

8.1.5 Sub Module Duration

The sub Module is estimated to take 7 hours 45 minutes.

8.1.6 Sub Module Summary

DAIRY CATTLE HEALTH			
Sessions	**Training Methods**	**Training Materials**	**Time**
8.1.6.1 Introduction to the module and leveling of expectations	• Buzz groups • Group Exercises	• Handouts • Felt pens, masking tape or sticker glue, notebooks and pens • Laptop • Projector	10 minutes
8.1.6.2 Concept of health and disease in farm animals	• Plenary presentation • Group Exercises	• Flip charts, felt pens • Laptop • Projector	30 minutes
8.1.6.3 Biosecurity measures in dairy farms	• Brainstorming • Plenary presentation	• Flip charts and felt pens • Laptop • Projector • Participants' handouts	20 minutes

8.1.6.4 Major diseases affecting dairy cattle and their control methods	• Brainstorming • Plenary presentation • Group exercises	• Flip charts, felt pens • Laptop • Projector PowerPoint images of animals showing symptoms of diseases • Participants' handouts	20 minutes
8.1.6.5 Major endo-parasites of affecting dairy cattle and their control methods	• Brainstorming • Plenary presentation • Group exercises	• Flip charts and felt pens • Laptop • Projector • PowerPoint images of parasites • Participants' handouts	30 minutes
8.1.6.6 Major ecto-parasites/pests affecting dairy cattle and their control methods	• Brainstorming • Plenary presentation • Group exercises	• Flip charts and felt pens • Laptop • Projector • PowerPoint images of pests • Participants' handouts	15 minutes
8.1.6.7 Proper handling of veterinary drugs and chemicals	• Brainstorming • Plenary presentation	• Flip charts and felt pens • Laptop • Projector • Participants' handout	15 minutes
8.1.6.8 Review of module	• Individual exercise	• Questionnaire for module review	10 minutes
TOTAL			**2 hours 30 minutes**

8.1.7 Facilitator Guidelines

8.1.7.0 Dairy cattle health	
8.1.7.1 Welcome and Levelling Expectations (10 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module, introduces him/herself by stating his/her profile and experience of working with farmers). **Introduction** The facilitator invites the trainees to introduce themselves and state their expectations. The facilitator presents modules objectives. **Module Objectives** By the end of the module training, the trainee should be able to: • Describe and explain difference between diseased and healthy farm animals. • Explain importance of biosecurity requirements dairy farms. • Identify major diseases of economic importance in dairy cattle and understand their diagnosis and how to control them. • Identify major ecto-parasites pests and endo-parasites of economic importance in dairy cattle and how to control them. • Appreciate proper handling of veterinary drugs and chemicals to ensure effectiveness and safety and environment conservation.	• Summarize Participants' "Expectations" and display them • PowerPoint presentations • Distribute participants' handouts
8.1.7.2 Concept of health and disease in farm animals (30 minutes)	**Session Guide**
(The facilitator introduces the concept of health and disease in farm animals by outlining the signs associated with health and disease). **Buzz Groups** • Discuss the concept of health and disease in farm animals by asking participants "*What is your understanding of the concept of health and disease in farm animals*?" **Plenary Presentation** • Summarize the definition by stating that health is the state of being free from illness or injury while disease is an abnormal condition that negatively affects the structure or function of part or whole of an organism (animal).	• List the responses on a flip chart • PowerPoint presentation • Distribute participants' handout on: signs of health and disease in farm animals.

Signs of good health • Highlight signs of good health which include vital parameters such as: Alertness, mobility, smooth hair coat, life parameters (e.g. feeding, breathing, excretion, temperature, production/performance) **Signs of disease (poor health)** • Dullness/depression, general weakness, rough hair coat, life parameters (e.g. loss of appetite, impaired breathing, watery or hard feces, abnormal temperature, reduced production/performance)	
8.1.7.4 Biosecurity measures in dairy farms (20 Minutes)	**Session Guide**
Brainstorming *(The facilitator guides the participants in identifying farm biosecurity measures for preventing introduction and spread of infectious agents within and between farms).* **Plenary Presentation** • Biosecurity measures necessary for securing dairy farms. **Plenary discussion** Lead trainees to share their experience with farmer practices in on-farm biosecurity	• Distribute handout on: Farm biosecurity • PowerPoint presentation
8.1.7.5 Major diseases affecting dairy cattle and their control methods (20 minutes)	**Session guide**
Brainstorming (*The facilitator guides the participants in identifying major diseases affecting dairy cattle and their control methods).* **Plenary Presentation** • Description of major diseases affecting dairy cattle and how to control them. • The diseases include but not limited to the following; East Coast Fever (ECF), Foot and Mouth Disease (FMD), LSD, anthrax, RFV, Mastitis, Contagious Bovine Pleuro-pneumonia (CBPP), Trypanosomosis, infertility. • Recognition of the diseases (based on symptoms) • Treatment/control methods for the diseases described. **Plenary discussion** Lead trainees in sharing the farmers' experience in managing these diseases	• List the names of diseases and how to treat/ control • Distribute participants' handouts: (notes and images of disease signs)

8.1.7.6 Major endo-parasites affecting dairy cattle and their control methods (30 minutes)	Session guide
Brainstorming The facilitator guides the participants in identifying major endo-parasites affecting dairy cattle and their control methods. **Plenary Presentation** • Description of major parasites affecting dairy cattle and how to control them. • The parasites include: endo-parasites;- roundworms (nematodes), tapeworms (cestodes) and flukes (trematodes) • Recognition of the endo-parasites (samples and photographs) • Treatment/control methods for the parasites In plenary discussion ask them to share the farmers' experience in managing these parasites	• List the names of parasites and how to control them • Distribute participants' handouts: (notes and images and samples of parasites)
8.1.7.6 Major ecto-parasites/pests affecting dairy cattle and their control methods (15 minutes)	**Session guide**
Brainstorming *The facilitator guides the participants in identifying major ecto-parasites/ pests affecting dairy cattle and their control methods.* **Plenary Presentation** Present in PowerPoint notes and images of ectoparasites/pests and control methods Inform the participants that the issues to be covered in this session are: • Description of major ecto-parasites/pests affecting dairy cattle and how to control them. • The ecto-parasites/pests include; ticks, lice, fleas, mites tsetse flies, mosquitoes, biting midges, stable flies, house flies • Recognition of the ecto-parasites/pests (samples and photos) • Control methods for the ecto-parasites/pests In plenary discussion ask them to share the farmers' experience in managing these pests	• List the names of pests and how to control them • Distribute participants' handouts: (notes and images and samples of pests)

8.1.7.7 Proper handling of veterinary drugs, chemicals and vaccines (15 minutes)	Session Guide
(The facilitator seeks opinions of trainees on proper handling of veterinary drugs, chemicals and vaccines and outline key issues on safety, effectiveness and impacts on the environment). **Plenary Discussion** • Candid and honest discussion on proper handling of veterinary drugs, chemicals and vaccines. He/she should also facilitate on how safe and effective use of drugs and chemicals can be taken up by dairy farmers. Ask the trainees to mention types of veterinary drugs and chemicals commonly used in dairy animals. They should also mention examples of their respective brands. 1) Veterinary drugs used in dairy animals include; antimicrobials, de-wormers, trypanocide, anti-protozoal, anaesthetics. 2) chemicals include; acaricides and insecticides 3) Vaccines include; live vaccines, killed vaccines and sub-unit vaccines. 4) Ask the trainees: o What they know about proper handling of veterinary drugs, chemicals and vaccines. o (Those with knowledge on health) what they know but do not practice (as farmers) and why they do not practice. o What opportunities exist in ensuring proper handling veterinary drugs, chemicals and vaccines. **Plenary Presentation** Overview of proper handling of veterinary drugs chemicals and vaccines. **Plenary discussion** Ask the trainees to list the precautions for proper handling of veterinary drugs, chemicals and vaccines in dairy farms)	• Distribute handout on: proper handling of veterinary drugs and chemicals • PowerPoint presentation • Plenary discussion

8.1.7.11 Module Review (10 minutes)	Session Guide
(The facilitator leads the trainees in reviewing the module). • Individual Exercises • Facilitator leads in review of the main points about dairy cattle health by answering the following: 1. What new things did you learn from this module? 2. What other important aspects/topics were omitted? 3. Any other comments	Review questionnaire

8.8 References Materials

8.8.1 Participants' Handouts

- Dairy Cattle Health Management: Training Package For Dairy Extension Workers
- Inventory of Dairy Cattle TIMPs

8.18.2 References

Draft National Livestock, Policy, Kenya
http://www.kilimo.go.ke/wp-content/uploads/2019/02/Draft-reviewed-National-Livestock-Policy-February-2019.pdf

Field manual of animal diseases by syndromes http://www.cldavis.org/ghpn/tools/syndromic_manual_en[1].pdf

Sub Module 8.2: Dairy Goat Health

8.2.1 Introduction to the Sub Module

This sub module is designed for use in training facilitators on management of dairy goat health constraints affecting productivity. The purpose of the training is to improve their knowledge and skills to enable dairy goat production become market oriented, competitive and profitable. There are many causes of poor health in dairy goats including presence of disease, pests and parasites. Knowledge of what causes the diseases and infestation of pests and parasites helps to design prevention and control strategies.

The trained facilitators are expected to capacity-build and backstop farmers practicing dairy goat farming This module addresses the concept of health and disease in dairy goats; dairy farm biosecurity measures; diagnosis and management/control of economically important diseases, pests and parasites affecting productivity; as well as control of infertility in dairy goats. In addition, the module will also address issues of proper handling of veterinary drugs, chemicals and vaccines.

8.2.2 Sub Module Learning Outcomes

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

a) Concept of health and disease in dairy goat is described and explained

b) Economically important diseases and parasites/pests affecting dairy goat identified and described.

c) Knowledge on control of occurrence of infertility in dairy goat enhanced and shared.

d) Techniques of proper handling of veterinary drugs, chemicals and vaccines (to ensure effectiveness and prevention of antimicrobial residues in dairy products) are described and explained.

e) Importance of biosecurity measures for dairy farms explained.

8.2.3 Sub Module Target Group

This sub module targets service providers and agri-prenuers in project counties. It will also be useful for private extension service providers dealing directly with farmer groups at the community level and lead farmers.

8.2.4 Sub Module Users

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

8.2.5 Sub Module Duration

The sub Module is estimated to take 2 hours 30 minutes.

8.2.6 Sub Module Summary

DAIRY GOAT HEALTH			
Sessions	**Training Methods**	**Training Materials**	**Time**
8.2.6.1 Introduction to the module and leveling of expectations	• Buzz groups • Group Exercises	• Handouts • Felt pens, masking tape or sticker glue, notebooks and pens • Laptop • Projector	10 minutes
8.2.6.2 Concept of health and disease in farm animals	• Plenary presentation • Group Exercises	• Flip charts, felt pens • Laptop • Projector	15 minutes
8.2.6.3 Biosecurity measures in dairy farms	• Brainstorming • Plenary presentation	• Flip charts and felt pens • Laptop • Projector • Participants' handouts	15 minutes
8.2.6.4 Major diseases affecting dairy goats and their control methods	• Brainstorming • Plenary presentation • Group exercises	• Flip charts, felt pens • Laptop • Projector PowerPoint images of animals showing symptoms of diseases • Participants' handouts	30 minutes
8.2.6.5 Major endo-parasites of affecting dairy goats and their control methods	• Brainstorming • Plenary presentation • Group exercises	• Flip charts and felt pens • Laptop • Projector • PowerPoint images of parasites • Participants' handouts	30 minutes

8.2.6.6 Major ecto-parasites/pests affecting dairy goats and their control methods	• Brainstorming • Plenary presentation • Group exercises	• Flip charts and felt pens • Laptop • Projector • PowerPoint images of pests • Participants' handouts	20 minutes
8.2.6.7 Proper handling of veterinary drugs, chemicals and vaccines	• Brainstorming • Plenary presentation	• Flip charts and felt pens • Laptop • Projector • Participants' handout	20 minutes
8.2.6.8 Review of module	• Individual exercise	• Questionnaire for module review	10 minutes
TOTAL			**2 hours 30 minutes**

8.2.7 Facilitator Guidelines

8.2.7.0 Dairy goat health	
8.2.7.1 Welcome and Levelling Expectations (10 minutes)	**Session Guide**
(The facilitator welcomes trainees to the module, introduces him/herself by stating his/her profile and experience of working with farmers). **Introduction** The facilitator invites the trainees to introduce themselves and state their expectations. The facilitator presents modules objectives. **Module Objectives** By the end of the module training, the trainee should be able to: • Describe and explain difference between diseased and healthy farm animals. • Explain importance of biosecurity requirements dairy farms. • Identify major diseases of economic importance in dairy goat and understand their diagnosis and how to control them.	• Summarize Participants' "Expectations" and display them • PowerPoint presentations • Programme • Distribute participants' handouts

• Identify major ecto-parasites pests and endo-parasites of economic importance in dairy goat and how to control them. • Appreciate proper handling of veterinary drugs and chemicals to ensure effectiveness and safety and environment conservation.	
8.2.7.2 Concept of health and disease in farm animals (15 minutes)	**Session Guide**
(The facilitator introduces the concept of health and disease in farm animals by outlining the signs associated with health and disease). **Buzz Groups** Start a discussion about the concept of health and disease in farm animals by asking participants "*What is your understanding of the concept of health and disease in farm animals*?" **Plenary Presentation** Summarize the definition by stating that health is the state of being free from illness or injury while disease is an abnormal condition that negatively affects the structure or function of part or whole of an organism (animal). **Signs of good health** Highlight signs of good health which include vital parameters such as: Alertness, mobility, smooth hair coat, life parameters (e.g. feeding, breathing, excretion, temperature, production/ performance), **Signs of disease (poor health)** Dullness/depression, general weakness, rough hair coat, life parameters (e.g. loss of appetite, impaired breathing, watery or hard feces, abnormal temperature, reduced production/ performance).	• List the responses on a flip chart • PowerPoint presentation • Distribute participants' handout on: signs of health and disease in farm animals.
8.2.7.3 Biosecurity measures in dairy farms (30 minutes)	**Session Guide**
Brainstorming *(The facilitator will guide the participants in identifying farm biosecurity measures for preventing introduction and spread of infectious agents within and between farms).* **Plenary Presentation** Plenary discussion • Ask trainees to share their experience with farmer practices on biosecurity.	• Distribute handout on: Farm biosecurity • PowerPoint presentation

Presentation • Biosecurity measures necessary for securing dairy farms.	
8.2.7.4 Major diseases affecting dairy goats and their control methods (30 minutes)	**Session guide**
Brainstorming *(The facilitator will guide the participants in identifying major diseases affecting dairy goats and their control methods).* **Plenary Presentation** • Description of major diseases affecting dairy goats and their control methods • The diseases include but not limited to the following; Peste des Petits Ruminants (PPR), Contagious Caprine Pleuro-pneumonia (CCPP), Trypanosomosis, Mastitis, Infertility. • Recognition of the diseases (based on symptoms) • Treatment/control methods for the diseases described. **Plenary Discussion** Guide the trainees to share the farmers' experience in managing these diseases	• List the names of diseases and how to treat/ control • Distribute participants' handouts: (notes and images of disease signs)
8.2.7.5 Major endo-parasites affecting dairy goats and their control methods (30 minutes)	**Session guide**
Brainstorming (The facilitator will guide the participants in identifying major parasites affecting dairy goats and their control methods). **Plenary Presentation** Present in PowerPoint notes and images of parasites and control methods Inform the participants that the issues to be covered in this session are: • Description of major endo-parasites affecting dairy goats and their control methods • The endo-parasites include: roundworms (nematodes), tapeworms(cestodes) and flukes (trematodes) • Recognition of the parasites (samples and photographs) • Treatment/control methods for the endo-parasites In plenary discussion ask them to share the farmers' experience in managing these endo-parasites	• List the names of endo-parasites and how to control them • Distribute participants' handouts: (notes and images and samples of parasites)

8.2.7.6 Major ecto-parasites/pests affecting dairy goats and their control methods (20 minutes)	Session guide
Brainstorming *(The facilitator will guide the participants in identifying major ecto-parasites/pests affecting dairy goats and their control methods).* **Plenary Presentation** • Description of major ecto-parasites/pests affecting dairy goats and their control methods • The ecto-parasites/pests include; ticks, lice, fleas, mites • tsetse flies, mosquitoes, biting midges, stable flies, house flies • Recognition of the ecto-parasites/pests (samples and photos) • Control methods for the pests **Plenary Discussion** Guide trainees to share the farmers' experience in managing these pests	• List the names of pests and how to control them • Distribute participants' handouts: (notes and images and samples of pests)
8.2.7.7 Proper handling of veterinary drugs, chemicals and vaccines (20 minutes)	**Session Guide**
(The facilitator seeks opinions of trainees on proper handling of veterinary drugs, chemicals and vaccines and outline key issues on safety, effectiveness and impacts on the environment). **Plenary Discussion** • Candid and honest discussion on proper handling of veterinary drugs, chemicals and vaccines. He/she should also facilitate on how safe and effective use of drugs and chemicals can be taken up by dairy farmers. Ask the trainees to mention types of veterinary drugs and chemicals commonly used in dairy animals. They should also mention examples of their respective brands. 1) Veterinary drugs used in dairy animals include; antimicrobials, de-wormers, trypanocide, anti-protozoal, anaesthetics. 2) chemicals include; acaricides and insecticides 3) Vaccines include; live vaccines, killed vaccines and sub-unit vaccines.	• Distribute handout on: proper handling of veterinary drugs and chemicals • PowerPoint presentation • Plenary discussion

4) Ask the trainees: o What they know about proper handling of veterinary drugs, chemicals and vaccines. o (Those with knowledge on health) what they know but do not practice (as farmers) and why they do not practice.) o What opportunities exist in ensuring proper handling veterinary drugs, chemicals and vaccines. **Plenary Presentation** Overview of proper handling of veterinary drugs chemicals and vaccines. **Plenary discussion** Ask the trainees to list the precautions for proper handling of veterinary drugs, chemicals and vaccines in dairy farms	
8.2.7.8 Module Review (10 minutes)	**Session Guide**
(The facilitator leads the participants in reviewing the module). • Individual Exercises • Review the main points about dairy goat health by answering the following: 1) What new things did you learn from this module? 2) What other important aspects/topics were omitted? 3) Any other comments	Review questionnaire

8.2.8 Reference materials

8.2.8.1 Participants' Handouts

- Inventory of Dairy Goat Health TIMPs
- Session notes

8.2.8.2 References

Draft National Livestock, Policy, Kenya
http://www.kilimo.go.ke/wp-content/uploads/2019/02/Draft-reviewed-National-Livestock-Policy-February-2019.pdfField manual of animal diseases by syndromes http://www.cldavis.org/ghpn/tools/syndromic_manual_en[1].pdf

MODULE 9: ONE HEALTH APPROACH FOR SUSTAINABLE DAIRY PRODUCTION

9.1. Introduction to the Module

This module is designed for use in training facilitators of FFS on the concept of One Health as an integrated and unifying approach that aims to sustainably balance and optimize the health of the people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent. The approach mobilizes multiple sectors, disciplines and communities to improve human, animal and environmental health outcomes. Climate change has increased health security risks of public health importance such as the infectious disease outbreaks that have increased significantly since 1980 and highlighting the need for pandemic preparedness and national plans for resilience. This module is designed for use in training facilitators of FFBS, the extension service, master trainers and lead farmers on the One Health for sustainable Dairy production.

Climate variance, emerging and re-emerging infectious disease threats has contributed to indiscriminate use of antimicrobials and emergence of antimicrobials resistance. Agricultural intensification has compromised on animal welfare and led to an increased disease burden. Effluent from low biosecurity farms, acaricides and pesticides spills, and antibiotic residues contaminates the environment with the resultant accumulation in the food chain and negatively impacting health of consumers. Deforestation, land degradation, inefficient water use and food wastage increase GHG emissions. Addressing these challenges together increases the likelihood of achieving sustainable food systems.

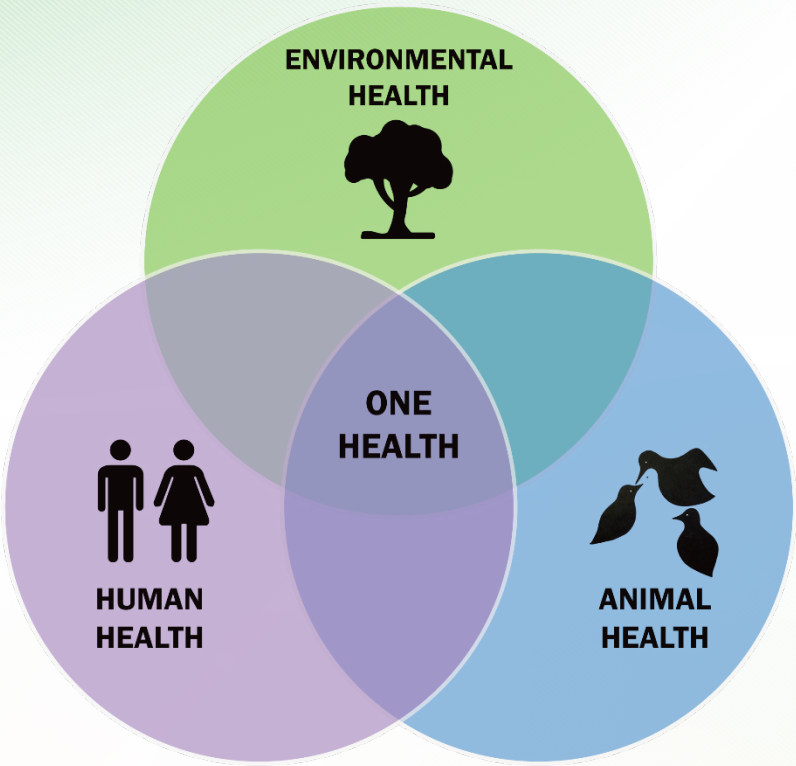


Figure 1: One Health Triad

Specific challenges requiring redress through OH include zoonoses, AMU/AMR, waste management, biosafety and biosecurity concerns. The top five priority zoonotic diseases affecting dairy sector in Kenya are anthrax, trypanosomiasis/HAT, rabies, brucellosis and Rift Valley Fever (RVF).

This calls for the understanding of the OH components to address and support sustainable food systems for a healthy nation.

9.2 Module Learning Outcomes

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

- The OH concept appreciated and explained.
- The components of OH triad identified.
- The role of the different collaborators appreciated.
- Appropriate OH practices for increased productivity and healthy ecosystem (sustainable agriculture) recommended.
- Knowledge and skills on zoonoses affecting dairy animals demonstrated.
- Antimicrobial resistance described and explained.
- Waste management in relation to OH appreciated.

9.3 Module Target Group

This module targets agricultural extension service providers based at sub county and ward level. It will also be used by private extension service providers.

9.4 Module Users

This module outlines the learning outcomes, the category of trainees targeted, module summary, facilitators guidelines and participants' handouts. The facilitator using this module should thoroughly familiarize themselves with the participants' handouts. This module can be used by master trainers who are members of the Core Trainers Team (CTT).

9.5 Module Duration

The module is estimated to take 2 hours 30 minutes.

9.6. Module Summary

ONE HEALTH APPROACH IN DAIRY SECTOR			
Sessions	**Training Methods**	**Training Materials**	**Time**
9.6.1. Introduction to the module and leveling of expectations	• Plenary presentation • Group discussions • Plenary presentations	• Laptop • Projector • PowerPoint presentation • Flip charts, Felt pens, sticky notes, note books and pens • Participants' handouts	10 minutes
9.6.2. Overview on climate variability and OH outcomes in dairy production	• Presentation • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts and felt pens • Participants 'handouts	30 minutes

9.6.3. Climate related zoonotic diseases affecting dairy	• Plenary Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts and felt pens • Participants 'handouts	30 minutes
9.6.4. AMU/AMR	• Plenary Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts and felt pens • Participants 'handouts	30 minutes
9.6.5 Environmental health » Waste management » GHG emissions » Carbon sink	• Plenary Presentation • Case study videos • Plenary discussions	• Laptop • Projector • PowerPoint presentation • Flip charts and felt pens • Participants 'handouts	30 minutes
9.6.6. Module review	• Participants' questions and comments • Facilitator's summary	• Flip charts • Laptop • Projector	20 minutes
TOTAL			**2 hours 30 minutes**

9.7. Facilitator Guidelines

9.7.1. Introduction And Levelling Expectations (10 minutes)	Session Guide
(The facilitator welcomes participants to the One Health module and introduces self and thereafter asks them to state their expectations on the module). **Module Objectives** The facilitator introduces the module objectives. By the end of the training on this module the trainee should be able to: • Appreciate and explain the OH concept. • Identify the components of OH triad. • Appreciate the role of the different collaborators. • Recommend appropriate OH practices for increased. productivity and healthy ecosystem (sustainable agriculture). • Demonstrate knowledge and skills on zoonoses affecting dairy animals. • Describe and explain antimicrobial resistance. • Appreciate waste management in relation to OH.	• PowerPoint presentation • Distribute participants' handouts • Refer to participants' expectations on a flip chart to track progress
9.7.2. Overview on climate variability and OH outcomes (30 minutes)	**Session Guide**
(Discussion On Participants' Experience)	
(*The facilitator will guide the participants in relating climate variability and OH outcomes that negatively impact health and dairy production. Participants will share their experiences on OH aspects they are familiar with)* **Plenary Presentation and discussion** • Basic terminologies used in the module (One Health, Human Health, Animal Health, Environmental Health, OH Triad) • Explain climate change and relationship with zoonotic diseases • Proposed adaptation measures *In plenary discussion ask the participants to relate climate variability and zoonotic diseases*	• PowerPoint presentation • Plenary discussion • List the names of diseases and pests/parasites as they are mentioned and their occurrence in relation to seasons

9.7.3. Climate related zoonotic diseases affecting dairy (30 minutes)	Session Guide
(Presentation and Discussion:	
(The facilitator will guide the participants in identifying climate related zoonotic diseases affecting dairy and their management options). **Plenary presentation** • Zoonotic diseases • Emerging and re-emerging Infectious Diseases (EID/REID) • Pandemic preparedness • Biosafety & Biosecurity *In plenary discussion ask them to share the farmers' experience in managing the zoonotic diseases*	• List the priority zoonotic diseases and their control • PowerPoint presentation • Participants' handouts • Group discussion
9.7.4. Antimicrobial use and antimicrobial resistance (AMU/AMR) (30 minutes)	**Session Guide**
(Presentation and Discussion)	
(The facilitator will guide the participants in identifying climate related challenges in AMR, treatment failure and preventive options). **Plenary presentation** • Indiscriminate antimicrobial use • Antimicrobial resistance • WHO classification of antibiotics – Critically important antibiotics • Problem of superbugs • Drug residues in animal source foods • Intensive production and animal welfare as drivers of AMR *In plenary discussion ask them to share the farmers' experiences with antimicrobials and treatment failure – antibiotics, acaricides, pesticides etc.*	• PowerPoint presentation • Participants' handouts
9.7.5. Environmental health (30 minutes)	**Session Guide**
(Presentation and Discussion)	
(The facilitator will guide the participants in identifying climate related adverse environmental health impacts).	• PowerPoint presentation

Presentation Environmental health • Deforestation and Land degradation • Waste management (including manure disposal) • GHG emissions • Carbon sink *In plenary discussion ask them to share the farmers' experience in managing their production environment*	• Participants' handouts
9.7.6. Module Review (20 minutes)	**Session Guide**
(Presentation and Discussion)	
The facilitator leads the trainees in summarizing the key points discussed in the One Health module	Plenary discussion

9.8 Reference

One Health Joint Plan of Action, 2022–2026. Working together for the health of humans, animals, plants and the environment. Rome: FAO; UNEP; WHO; World Organisation for Animal Health (WOAH) (founded as OIE). 2022. doi:10.4060/cc2289en. ISBN978-92-5-136957-9.

MODULE 10: MANURE MANAGEMENT FOR BIOENERGY AND SOIL FERTILITY IMPROVEMENT

10.1 Introduction to the Module

This module will address appropriate technologies in manure management for bioenergy and soil fertility improvement. It will deal with utilization of bio-slurry, farmyard, black soldier fly frass and compost manure for forage production and slurry for production of domestic biogas. The learners will be introduced to manure management practices and different types of biogas-digesters which include the following; fixed domes, floating drum or tubular models. They will also be trained on anaerobic digestion processes which converts organic wastes into biogas (combustible mixture of methane and carbon dioxide) and high-quality fertilizer as well as a mitigation strategy for GHG emission.

Dairy farmer scrapping slurry manure

Filling into a bio gas digester

Black soldier fly Frass

10.2 Module Learning Outcomes

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

a) Knowledge on use of manure for domestic bioenergy acquired and shared.

b) Knowledge on use of bio slurry from anaerobic digesters to improve soil fertility, soil structure and crop productivity acquired and shared.

c) Use of farmyard manure to improve soil fertility, soil structure and crop productivity described and explained.

d) Use of frass manure to improve soil fertility, structure and crop productivity described and explained.

e) Compost making and utilization for improving soil fertility, soil structure and crop productivity described and explained.

f) Importance of domestic biogas digesters in mitigating GHG emissions and reduction of biomass fuel consumption explained and appreciated.

g) Knowledge on handling, storage and application methods of bio-slurry, farmyard and compost manure acquired and shared.

h) Use of domestic biogas as a source of residential energy supply described and explained.

10.3 Target Group and Categories

This module targets County extension staff, private service providers and lead farmers

10.4 Module Users

This module is intended for use by Master trainers in dairy value chain who are members of the Core Team of Trainers (CTT).

10.5 Module Duration

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

10.6 Module Summary

MANURE MANAGEMENT FOR BIOENERGY AND SOIL FERTILITY IMPROVEMENT			
Sessions	**Training Methods**	**Training Materials**	**Time**
10.6.1 Introduction, objectives, expectations	• Personal introduction Presentation • Plenary	• Flip charts • Projector • Laptop • Handouts	10 minutes
10.6.2 Use of manure for bioenergy and soil fertility improvement.	• Presentation • Discussions	• Flip charts • Projector • Laptop • Participants' Handouts	20 minutes

10.6.3 Demonstration of bio digester installation technique and biogas production process	• Presentation • Discussion • Practical	• Display of various biogas installation techniques • Practical session	30 minutes
10.6.4 Domestic biogas as a source of residential energy supply	• Presentation • Discussion • Participants' practical involvement, • (exercise) questions, comments and observations	• Projector • Laptop • Flip charts • Participants handouts	20 minutes
10.6.5 Importance of domestic biogas digesters in mitigating GHG emissions and reduction of biomass fuel consumption	• Presentation • Demonstration by trainer • Discussions	• Flip charts • Projector • Laptop • Participant' Handouts	20 minutes
10.6.6 Methods of manure handling, management and storage technique for nutrient preservation	• Presentation • Discussion	• Flip charts • Projector • Laptop • Participants' Handouts	30 minutes
10.6.7 Use of bio slurry from anaerobic digesters to improve soil fertility, soil structure and crop productivity	• Presentation • Discussions	• Flip charts • Projector • Laptop • Participants' Handouts	20 minutes
10.6.8 Use of farm yard manure to improve soil fertility, soil structure and crop productivity	• Presentation • Discussions	• Flip charts • Projector • Laptop • Participants' Handouts	20 minutes

10.6.9 Black soldier fly (BSF) Frass to improve soil fertility, soil structure and crop productivity	• Presentation • Discussions	• Flip charts • Projector • Laptop • Participants' Handouts	1 hour
10.6.10 Compost making processes and use to improve soil fertility, soil structure and crop productivity	• Presentation • Discussion • Participants' questions and comments	• Flip charts • Projector • Laptop • Participants' Handouts	30 minutes
10.6.11 Methodologies of manure application- - Trench application - Surface application - Tumbukiza method	• Presentation • Discussion • Participants' questions and comments • Practical Session	• Farm Implements	30 minutes
10.6.12 Module Review	• Individual exercise	• Review questionnaire	10 minutes
TOTAL			**5 hours**

10.7 Facilitator Guidelines

10.7.0 Manure Management for Bio energy and soil fertility improvement.	
107.1. Introduction and Levelling Expectations (10 minutes)	**Session Guide**
Introduction *(The facilitator welcomes trainees to the module and invites them to state their expectations of the module training).* **Module Objectives** The facilitator presents modules objectives By the end of the module, trainee should be able to: • Explain the use of manure for domestic bioenergy. • Explain the use of bio slurry from anaerobic digesters to improve soil fertility, soil structure and crop productivity. • Describe the use of farmyard manure to improve soil fertility, soil structure and crop productivity.	• Summarize Participants' "Expectations" and display.

• Describe compost making and utilization for improving soil fertility, soil structure and crop productivity. • Explain the importance of domestic biogas digesters in mitigating GHG emissions and reduction of biomass fuel consumption. • Appreciate the use of domestic biogas as a source of residential energy supply. • Describe handling, storage and application methods of bio-slurry, farmyard and compost manure.	
10.7.2 Use of manure for bioenergy and soil fertility improvement (20 minutes)	**Session Guide**
(The facilitator presents and discusses with trainees on the use of manure for domestic bioenergy). **Presentation and discussion** • Importance of manure as fertilizer and for bioenergy • Soil fertility status • Effects of poor and good management of manure • Types of manure • Factors affecting quality of manure After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary Discussion
10.7.3 Demonstration of bio digester installation technique and biogas production process (30 minutes)	**Session Guide**
(The facilitator should demonstrate installation techniques of various bio-gas digesters). **Presentation and practical demonstrations** • Site identification • Safety precautions needed before, during and after the installation of bio-digester. • Discussion on biogas installation system • Different types of bio-digesters • Pros and cons of various types of bio-gas digester designs • Cost of different type of digesters and list accredited technicians • Display of various biogas installation techniques **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Practical demonstration • Plenary discussion

10.7.4 Domestic biogas as a source of residential energy supply (20 minutes)	Session Guide
(The facilitator presents and leads participants in discussing the important of domestic biogas as a source of energy supply). **Presentation** • Different sources of energy for domestic use • Pro and cons of other sources • Importance of biogas as source of residential energy • Uses of biogas and benefits • Energy demand and equations • Calorific values of different domestic fuels • Biogas production from different feed stocks • Distribution statistics of biogas systems in Kenya • Challenges limiting adoption of biogas in Kenya	• PowerPoint presentation • Plenary discussion
10.7.5 Importance of domestic biogas digesters in mitigating GHG emissions and reduction of biomass fuel consumption (20 minutes)	**Session Guide**
(The facilitator presents and guides participants in identifying sources of greenhouse gases and mitigation methods). **Presentation and Practical** • Livestock production as contributors of GHG emission • Quantification of emissions • Mitigation strategies **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
10.7.6 Methods of manure handling, management and storage technique for nutrient preservation (30 minutes)	**Session Guide**
(The facilitator should demonstrate various methods of manure handling and storage techniques). **Presentation** • Different types of manure • Factors affecting quality of different types of manure • Nitrogen cycle • Nutrient composition of different types of manure. **Discussion** After the presentations allow trainees to raise any issues and discuss the topic	• PowerPoint presentation • Plenary discussion

10.6.7 Use of bio slurry from anaerobic digesters to improve soil fertility, soil structure and crop productivity (20 minutes)	**Session Guide**
(The facilitator presents and guides participants in identifying potential use of bio slurry from anaerobic digesters to improve soil fertility, soil structure and crop productivity). **Presentation** • Bio slurry as fertilizer • Factors affecting nutrient composition of slurry manure: • Nutrient composition of bio-slurry • Application methods and rates of bio-slurry on Napier grass **Discussion** After the presentations allow trainees to raise any issues and discuss them.	• PowerPoint presentation • Plenary discussion
10.7.8 Use of farm yard manure (FYM) to improve soil fertility, soil structure and crop productivity (20 minutes)	**Session Guide**
(The facilitator presents and guides trainees in identifying the use of farmyard manure to improve soil fertility, soil structure and crop productivity). **Presentation** • FYM as fertilizer • Factors affecting nutrient composition of farm yard manure: • Nutrient composition of farm yard manure • Application methods and rates of farm yard manure on Napier grass **Discussion** After the presentations allow trainees to raise any issues and discuss them.	• PowerPoint presentation • Plenary discussion

10.7.9 Use of Black Soldier Fly Frass to improve soil fertility, soil structure and crop productivity (1 hour)	Session Guide
(The facilitator presents and guides trainees in identifying the use of BSF Frass to improve soil fertility, soil structure and crop productivity). **Presentation** • BSF Frass as fertilizer • Factors affecting nutrient composition of BSF Frass: • Nutrient composition of BSF Frass • Application methods and rates of BSF Frass **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
10.7.10 Compost making processes and utilization for soil fertility improvement. (30 minutes)	**Session Guide**
(The facilitator presents and guides trainees in identifying potential use of compost manure to improve soil fertility, soil structure and crop productivity). **Presentation** • Compost making demonstration • Compost manure as fertilizer • Factors affecting nutrient composition of compost manure • Nutrient composition of compost manure • Application methods and rates per unit of land **Discussion** After the presentations allow trainees to raise any issue and discuss.	• PowerPoint presentation • Plenary discussion
10.7.11 Methodologies of manure application (30 minutes)	**Session Guide**
(The facilitator guides trainees on the various application methods for different types of manure). **Practical demonstrations** • Method of manure application: After the presentations allow trainees to raise any issues and discuss them.	• Practical demonstration • Plenary discussion

10.7.12 Module Review (10 minutes)	
(The facilitator should let the trainees present their views on each of the sessions covered under this module). Review the main points about manure and bioenergy by answering the following: 1. What new things did you learn from this topic? 2. What other important aspects/topics were omitted? 3. Any other comments	Distribute handouts and questionnaire for module review

10.8 Reference material

Ayako, W. (2013). Manure management under smallholder dairy farmers' conditions in Kenya. 1st ed. Lambert academic publishers.

Gichangi, E., Kathuli, P., Nguluu, S. and Wambua, J. (2010). Conservation of nutrients in animal manures. 1st ed. KALRO- Katumani-Kenya, pp.1-3.

Lekasi, J.K., Tanner JC, Kimani S. K. Harris P.J. C. 2001. Managing manure to sustain smallholder livelihood in the East Africa highlands. HDRA publications.

Murage, A. W., Ilatsia, E.D., Ayako, W.O., Cheruiyot, B. K., and Ole Pulei, R.N. 2012. Manure management under smallholder conditions: a training manual. First Edition. Kenya Agricultural Research Institute, Nairobi, Kenya.

Murage, A. W., Ilatsia, E.D., Ayako, W.O., Cheruiyot, C. K. and Ole Pulei, R.N 2012. Manure management under smallholder condition: farmers' information leaflets. (EAAPP) Kenya Agricultural Research Institute, Nairobi, Kenya

Kanegeni, N.N, Muia, J.M.K., Sambu, S, Ndungu, M. Ndirangu, M. (2020) Rearing insects to provide an alternative and affordable protein source for livestock in Kenya.

Bram, D., Stefan, D., Bart, V and Christian, Z (2017) Black Soldier fly bio-waste processing (a step-by-step guide).

MODULE 11: MILK VALUE ADDITION

11.1 Introduction to the Module

Value addition is the modification or enhancement a commodity. Milk value addition is a great tool for enhancing the farmer's income and making more profit out of liquid milk with the use of certain techniques. It can work as a tool for increasing the inclination of farmers towards dairy industry. With increasing consumer awareness in recent times, people are more aware regarding healthy nutrition and diet which has increased the market scope of value added functional dairy foods.

There is a lot of diversity in manufacturing or production of value-added dairy products, out of which some are easy to produce where as others require greater investment in terms of equipment, machinery, training and production time. Some of the common value-added dairy products include pasteurized milk, UHT, yoghurt, *lala*, cheese, butter, ghee, kefir, ice cream, milk powder, milk shakes and milk smoothies.
This Training of Trainers' Manual is aimed at equipping participants with adequate technical knowledge on value adding milk into different products.

Lead farmers milk processing training for Shikomari ward in Kakamega county (L) and milk products at KALRO Ol Joro Orok (R)

11.2 Module Learning Outcomes

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

a) Different techniques of milk value addition described and explained.

b) Packaging, labelling and barcoding used in dairy value-added products described and explained.

c) Basic dairy enterprises records necessary for quality control and increased profitability identified and demonstrated.

d) Practical milk processing technologies (fermented and non-fermented milk products) demonstrated and explained.

11.3 Target Group and Categories

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

11.4 Module Users

This module is intended for use by Master trainers in dairy value chain who are members of the Core Team of Trainers (CTT), agripreneurs, dairy processors and Lead Farmers in the dairy value chain target counties.

11.5 Module Duration

The module is estimated to take a minimum of 2 hours 30 minutes.

11.6 Module Summary

MILK VALUE ADDITION			
Sessions	**Training Methods**	**Training Materials**	**Time**
11.6.1 Introduction, objectives, expectations	• Personal introduction • Presentation • Plenary	• Flip charts • Projector • Laptop • Participants' Handouts	20 minutes
11.6.2 Milk processing	• Presentation • Discussion • Practical	• Audio-visual clips • Projector • Laptop • Participants' handouts	1 hour
11.6.3 Packaging, labelling and barcoding	• Demonstration by trainer • Discussions	• Projector • Laptop • Flip charts, felt pens	30 minutes

11.6.4 Dairy business record keeping	• Discussions	• Projector • Laptop • Flip charts, felt pens	20 minutes
11.6.5 Module Review	• Individual exercise	• Review questionnaire	20 minutes
TOTAL			**2 hours 30 minutes**

11.7 Facilitator Guidelines

MODULE 11: MILK VALUE ADDITION	
11.7.1 Introduction and Levelling Expectations (20 minutes)	**Session Guide**
Introduction The facilitator welcomes trainees to the module milk value addition and introduces him/herself by stating his/her profile and experience of working with farmers. The facilitator invites the trainees to state their expectation for the module. **Module Objectives** The facilitator presents modules objectives. By the end of the module trainee should be able to: • Describe and explain the techniques involved in milk value addition. • Describe and explain the packaging, labelling and barcoding used in dairy value-added products • Identify and demonstrate the basic dairy enterprises records necessary for quality control and increased profitability • Explain and demonstrate the theorical and practical milk aspects of processing technologies (fermented and non-fermented milk products).	• Summarise Participants' "Expectations" and display. • PowerPoint presentation • Participants exercise • Participants flip chart presentations

11.7.2 Milk processing (1 hour)	Session Guide
(The facilitator presents and explains to the trainees the different milk value added products and the steps of milk processing). **PowerPoint presentation** • Quality verification tests of milk before processing • Ingredients and equipment necessary for value addition of various dairy products • Processing steps of various value-added products mainly pasteurized milk, UHT, yoghurt, mala/lala, cheese, butter and ghee and any others they may wish to learn • Setting up a cottage milk processing unit **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
11.7.3 Packaging, labelling and barcoding (30 minutes)	**Session Guide**
(The facilitator guides trainees in demonstrating the packaging steps of different milk value added products). **PowerPoint Presentation** • Packages for different products and their sources • Packaging equipment will be demonstrated • Labelling requirements in relation to regulatory provisions • Barcoding registration and barcode allocation requirements • Packing of finished value-added products viz pasteurized milk, UHT, yoghurt, mala/lala, cheese, butter and ghee • Proper storage of finished value-added products to minimize losses due to spoilage **Discussion (30 minutes)** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Participants exercise • Practical demonstration

11.7.4 Dairy business record keeping (20 minutes)	Session Guide
(The facilitator presents and demonstrates to the training the different records necessary for a profitable dairy enterprise). **PowerPoint Presentation** • Different types of records including production, sales, and other profitability records • Demonstrate different record entries • Records as decision making tools **Discussion (30 minutes)** After the presentations allow trainees to raise any issues and discuss them	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
11.7.5 Module review (20 minutes)	**Session Guide**
(The facilitator should let the trainees present their views on each of the sessions covered under this module). Review the main points in milk value addition by answering the following: 1. What new things did you learn from this topic? 2. What other important aspects/topics were omitted? 3. Any other comments	`

11.8 Reference materials

11.8.1 Participants' Handouts

- Farmers' guide on milk value addition - KALRO Ol Joro Orok.
- Kenya standards (Specifications for: raw milk, pasteurized milk, yoghurt, cultured milk, cheese, butter, ghee, ice cream, powdered milk etc.)

11.8.2 References

Adongo A. O., Miano D.M., Kariuki J. N., Kidake B. and Keya G.A. (2016). How to get fresh and hygienic milk from your cow. http://www.kalro.org/asal-aprp.

MoAL&F. (2014). Ministry of Agriculture, Livestock and Fisheries. Dairy Cattle Extension Manual. 151 pages.

Omondi S.P. (2008). How to avoid farm milk spoilage. KALRO information brochure 34/2008 (KALRO Muguga).

Otieno, K., Lanyasunya, T.P., Lokwaleput, I.K., Mutunga, T.K., Ondiek, J.O., Siamba, D.N., Msangi, B.S.J., Kibitok, N.K., Kassa, F., Ondoro, D.M, Maingi, P.M., Migwi, P.K. and Bwire, J.M. (2013). Protect your milk and dairy products from pathogenic microbial contamination and save life. KALRO. East Africa Agric. Productivity Project.

Yongo, D., Mwirigi, M., Nyongesa, D. and Makokha, S.N. (eds). (2014). *Training Guide for Trainers of Practitioners in the Dairy Value Chain*. Nairobi, Kenya.

MODULE 12. NUTRITIONAL BENEFITS OF DIFFERENT DAIRY PRODUCTS

12.1 Introduction

Dairy products are valuable sources of nutrition, playing a crucial role in enhancing food and nutritional security. Dairy products are considered nutrient dense food hence an excellent source of high-quality protein, containing all essential amino acids required by the human body. They are also rich in vitamins such as B_{12}, riboflavin, and selenium, contributing to the overall well-being and proper functioning of the body. Additionally, dairy products are a good source of choline, which is essential for brain health and development in children. Additionally, dairy products provide essential nutrients like iron, zinc, and B vitamins, including niacin and B_6 and vitamin C particularly from goat and camel milk. These nutrients are vital for maintaining energy levels, supporting the immune system, and promoting healthy metabolism. The accessibility and affordability of milk and some dairy products make them important contributors to food security, providing a cost-effective and nutritious dietary option for the population. Their versatility in cooking makes them an integral part of diverse diets, addressing nutritional needs and helping combat malnutrition on a global scale. This module is designed to educate trainers on the nutritional value of dairy products, with a focus on their influence on Kenyans' food and nutrition security.

12.2 Module Learning Outcomes

a) The nutrition composition of dairy product appreciated.

b) Food and nutrition security in Kenya and the role of dairy products in ensuring food and nutrition food security related and explained.

c) The nutrition importance of dairy products and their health benefits explained.

d) The role of dairy product diversification and complimentary feeding described.

e) Describe and explain how to make nutrition sensitive value-added products and product development of dairy product.

12.3 Module target group

This module is intended for agricultural extension service providers, nutritionists, community health workers, and food agripreneurs. It is also advantageous for private extension service providers that work directly with farmer cooperatives at the grassroots level. This information will also be useful to dairy products processors.

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, nutritionists /food scientists, community health workers and agripreneurs in the dairy value chain. The trainers using this module should thoroughly familiarize themselves with the participants' Handouts (training materials).

12.5 Module duration

The module is estimated to take 2 hours 20 minutes

12.6 Module summary

Module 12.0 Nutritional benefits of different dairy products			
Sessions	**Training methods**	**Training materials**	**Time**
12.6.1 Introduction to the module objectives and Expectations	• Participants introduction • Participants expectations • Group exercise	• Projector • Flip charts	10 minutes
12.6.2 Nutrition composition of milk from cattle and goat	• Power Point presentation • Group discussions	• Flip charts • Marker pens • Projector	15 minutes
12.6.3 The role of dairy products in food and nutrition security	• Power point presentation • Group discussions • Plenary presentation	• Projector • Flip charts • Marker pens • Leaflets	15 minutes
12.6.4 Nutritional importance of dairy products and their health benefits	• Power point presentation • Group exercise • Plenary presentation	• Flip charts • Felt pens • Projector	30 minutes

12.6.5 Explain role of dairy products in dietary diversification and complementary feeding of children	• Plenary presentation • Group exercise	• Projector • Flip charts • Felt pen • Pictorials	30 minutes
12.6.6 Nutrition based Value addition and product development of dairy products	• Plenary presentation • Practical demonstrations • Sensory evaluation	• Projector • Participants' handouts • Pictorials • Assorted value-added cooking equipment's and ingredients • Sensory evaluation forms	30 minutes
12.6.7 Module review	• Plenary presentations	• Flip charts • PowerPoint presentation • Module evaluation forms	20 minutes
TOTAL			**2 hours 30 minutes**

12.7 Facilitator's guidelines

Module 12: Nutritional benefits of different dairy products	
12.7.1 Introduction and climate setting (10 minutes)	**Session guide**
(The facilitator introduces the participants to the module on nutrition of dairy products). **Participants expectations** The facilitator then introduces the module objectives. **Module objectives** By the end of the module training, the trainee will be able to: • Appreciate the nutrition composition of dairy product. • Define and relate food and nutrition security in Kenya to the role of dairy products in ensuring food and nutrition food security.	• Participants' handouts • PowerPoint presentation • Summarize the trainees' expectations and display on the flip chart

• Explain the nutrition importance of dairy products and their health benefits. • Describe the role of dairy product diversification and complimentary feeding. • Describe and explain how to make nutrition sensitive value-added products and product development of dairy product.	
12.7.2 Nutritional benefits of different dairy products (15 minutes)	
(The facilitator leads the trainees in discussing the known nutrition aspects of milk and do a plenary presentation on the nutrition composition of the products). **Group exercise** • Nutrition awareness of dairy products **Plenary presentation** • Documented nutrition composition of dairy products based on both whole and skimmed milk	• Group exercise • Flip charts • PowerPoint presentation • Plenary discussion
12.7.3 The role of dairy products in ensuring improved nutrition status (15 minutes)	
(The facilitator defines and explains food and nutrition security and outlines the role of dairy products in ensuring improved nutritional status thus ensuring food and nutrition security). **Plenary presentations** • Define food and nutrition security • The current food security status in Kenya • Role of dairy products in ensuring food security in Kenya	• PowerPoint presentation • Plenary presentation • Participants' handouts
12.7.4 Nutritional importance of dairy products and its health benefits (30 minutes)	
Group exercise (The facilitators divide the trainees into groups to discuss nutrition importance of rice at different stages in lifetime) **Plenary presentation** *(The facilitators present the nutrition importance of dairy products and their health benefits among people with special conditions like people living with HIV/AIDS, diabetes and hypertensive persons and in weaning children).* • Nutrition importance of dairy products and their benefits to people with special conditions • Nutrition importance of dairy products and their benefits throughout the life cycle	• Participants' handouts • PowerPoint presentation • Group exercise

12.7.5 Role of dairy products in Dietary diversification and complimentary feeding (30 minutes0	
(The facilitator defines WHO dietary diversification and recommended complimentary feeding practice. Later on lead the discussion on types of foods that can be eaten with dairy products and finally define portion size and servings and do demonstration of each in ensuring healthy living). **Plenary presentation** • Defining dietary diversification and complementary feeding (local nutrient dense foods) **Group exercise** • Group discuss on types of food eaten with dairy products (My plate, SHARP diets, Balanced diets and DASH diets) **Plenary presentation** • Portion size and servings for different groups	• Participants' handouts • PowerPoint presentation • Group exercise
12.7.6 Nutrition based Value addition and product development of dairy products (30 minutes	
Plenary presentation *(The facilitator defines value addition and product development and later 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 dairy products **Group exercise** • Requirements for value addition of dairy products • Practices that reduce aflatoxin and bacterial contaminants in dairy products • Nutrition sensitive dairy product value addition processing demonstration and sensory evaluation	• Participants' handouts • PowerPoint presentation • Group exercise • Recipes • Pictorials • Sensory evaluation forms • Assorted value addition equipment's and ingredients

12.7.7 Module summary (20 minutes)	
Group exercise (20 minutes) *(The facilitator guides a group activity to review the participants' expectations and conduct a question-and-answer session based on their queries).* • Assess participants' expectations to determine if they were fulfilled. • Identify new insights gained from the module. • Address any questions related to the nutrition of dairy products.	• Summary of the main points from the module

12.8 Reference Materials

12.8.1 Participants handouts

- Dairy product processing manuals and leaflets
- Recipe handouts

12.8.2 References

FAO (2022). The state of food security and nutrition in the world.

IPC (2022) Integrated food security Phase Classification report. (2022). IPC Acute Malnutrition Scale.

WHO (2018). Infant and young child feeding. 2018. Available through https://www.who.int/news-room/fact-sheets/detail/infant-and-young-child-feeding.

USDA Nutrient Database.

USDA DRI Tables.

MODULE 13: HIDES AND SKINS VALUE ADDITION-WET SALTING TECHNOLOGY

13.1 Introduction to the Module

This training is aimed at equipping participants with adequate technical knowledge on preservation of hides and skins.

13.2 Module Learning Outcomes

By the end of the module training the follwing outcomes should be achieved:

a) The economic and cultural value of hides and skins appreciated
b) Potential of hides and skins as carriers of diseases and contaminants to the environment discussed and explained.
c) Pre-slaughter best management practices for quality hides and skins described and explained.
d) Slaughter practices between large and small ruminants distinguished.
e) Post-slaughter best management practices for quality hides and skins described
f) wet salting of a hide/skin demonstrated and explained.
g) Hides and skins evaluated and graded.
1) Marketing channels for hides and skins described.

13.3 Target Group and Categories

This module targets livestock keepers, slaughterhouse workers, hides and skins traders, and county extension staff.

13.4 Module Users

This module is intended for use by Master trainers in dairy value chain who are members of the Core Team of Trainers (CTT), agripreneurs and Lead Farmers in the dairy value chain target Counties.

13.5 Module Duration

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

13.6 Module Summary

WET SALTING TECHNOLOGY			
Sessions	**Training Methods**	**Training Materials**	**Time**
13.6.1 Introduction, objectives, expectations	• Personal introduction • Presentation • Plenary	• Flip charts • Projector • Laptop • Participants' Handouts	20 minutes
13.6.2 Hides and skins as valuable by-products of slaughter Contribution to household items, cultural regalia, fashion industry, food, international trade	• Presentation • Discussion	• Audio-visual clips • Projector • Laptop • Participants' handouts	20 minutes
13.6.3 Poor management of hides and skins 13.6.3.1 Hides and skins as carriers of diseases 13.6.3.2 Occupational Safety and Health of workers (PPEs and hygienic practices) 13.6.3.3 Hides and skins as contaminants to the environment 13.6.3.4 Waste management	• Presentation • Discussion	• Audio-visual clips • Projector • Laptop • Participants' handouts	20 minutes
13.6.4 Pre-slaughter management practices for quality hides and skins 13.6.4.1 Animal husbandry practices 13.6.4.2 Damages to hides and skins in living animals	• Presentation • Discussion	• Audio-visual clips • Projector • Laptop • Participants' handouts	20 minutes

13.6.5 Slaughter techniques for large and small ruminants 13.6.5.1 Ripping of cattle hide 13.6.5.2 Ripping of camel hide 13.6.5.3 Ripping and Fisting in goat and sheep 13.6.5.4 Wash water quality, Washing and fleshing 13.6.5.5 Triming and lacing 13.6.5.6 Tools and equipment for flaying/ skinning 13.6.5.7 Damages to hides and skins during slaughter and flaying	• Presentation • Discussions	• Projector • Laptop • Flip charts, felt pens	20 minutes
13.6.6 Post-slaughter management of hides and skins 13.6.6.1 Wet salting technology 13.6.6.2 Management of used salt 13.6.6.3 Bulking and Storage of preserved hides and skins 13.6.6.4 Folding and baling of preserved hides and skins 13.6.6.5 Quality Control of stored hides and skins 13.6.6.6 Transportation of preserved hides and skins 13.6.6.7 Damage of hides and skins after flaying	• Presentation • Discussions • Demonstrations	• Projector • Laptop • Flip charts, felt pens	30 minutes

13.6.6.8 Tools and equipment for preservation of hides and skins 13.6.7 Marketing of hides and skins 13.6.7.1 Grading of hides and skins 13.6.7.2 Cost implications of low grade hides and skins in the tannery 13.6.7.3 Contracting with local tanneries 13.6.7.4 Online marketing and export markets	• Presentation • Demonstrations • Discussions	• Projector • Laptop • Flip charts, felt pens	30 minutes
13.6.8 Module Review	• Individual exercise	• Review questionnaire	20 minutes
TOTAL			**3 hours**

13.7 Facilitator Guidelines

MODULE 13.0: WET SALTING TECHNOLOGY	
13.7.1 Introduction and Levelling Expectations (20 minutes)	**Session Guide**
Introduction The facilitator welcomes trainees to the module of wet salting technology and introduces him/herself and elcomes participats to introduce themselves and state their expectations on the module. The facilitator states the module objectives. **Module Objectives** By the end of the module training the trainee should be able to: • Appreciate both the economic and cultural value of hides and skins • Discuss and explain the potential of hides and skins as carriers of diseases and contaminants to the environment. • Describe and explain pre-slaughter best management practices for quality hides and skins.	• Summarise Participants' "Expectations" and display. • PowerPoint presentation • Participants exercise • Participants flip chart presentations

• Distinguish slaughter practices between large and small ruminants. • Describe post-slaughter best management practices for quality hides and skins • Demonstrate and explain wet salting of a hide/skin. • Evaluate and grade hides and skins. • Describe the marketing channels for hides and skins.	
13.7.2 Hides and skins as valuable by-products of slaughter	**20 minutes**
(The facilitator presents and explains to the significance hides and skins have in the society and economy). **PowerPoint presentation** • Portion of hides and skins per live weight of species • Colour variation and hair length of hides and skins • Traditional uses of hides and skins in Kenya and around the world • Hides as food in West Africa • Value of leather trade in Kenya and in International trade **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Plenary discussion
13.7.3 Poor management of hides and skins	**20 minutes**
(The facilitator guides trainees in understanding the potential public health and environmental risks of poor management of hides and skins at the slaughterhouse). **PowerPoint Presentation** • Hides and skins as carriers of diseases • Occupational Safety and Health of workers (PPEs and hygienic practices) • Hides and skins as contaminants to the environment • Waste management **Discussion** After the presentations allow trainees to raise any issues and discuss them	• PowerPoint presentation • Participants exercise • Practical demonstration

13.7.4 Pre-slaughter management practices for quality hides and skins	20 minutes
(The facilitator presents and demonstrates to the trainers the factors during the life of the animal that contribute to quality hides and skins). **PowerPoint Presentation** • Animal husbandry practices • Damages to hides and skins in living animals **Discussion (30 minutes)** After the presentations allow trainees to raise any issues and discuss them	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
13.7.5 Slaughter techniques for large and small ruminants	**20 minutes**
(The facilitator presents to the trainers the slaughtering, flaying and skinning techniques across livestock species). **PowerPoint presentation** • Ripping of cattle hide • Ripping of camel hide • Ripping and Fisting in goat and sheep • Wash water quality, Washing and fleshing • Triming and lacing • Tools and equipment for flaying/skinning • Damages to hides and skins during slaughter and flaying **Discussion** After the presentations allow trainees to raise any issues and discuss them	• Facilitator PowerPoint presentation • Participants exercise • Participants flip chart presentations
13.7.6 Post-slaughter management of hides and skins	
(The facilitator presents and demonstrates to the trainees the Wet salting technology and storage of preserved hides and skins0. • Wet salting technology • Management of used salt • Bulking and Storage of preserved hides and skins • Folding and baling of preserved hides and skins • Quality Control of stored hides and skins • Transportation of preserved hides and skins • Damage of hides and skins after flaying • Tools and equipment for preservation of hides and skins **Discussion** After the presentations allow trainees to raise any issues and discuss them	

13.7.7 Marketing of hides and skins

(The facilitator presents and demonstrates to the trainees the grading of hides and skins and outlines marketing avenues).

- Grading of hides and skins
- Cost implications of low grade hides and skins in the tannery
- Contracting with local tanneries
- Online marketing and export markets

Discussion

After the presentations allow trainees to raise any issues and discuss them

(The facilitator should let the trainees present their views on each of the sessions covered under this module).

Review the main points in Wet salting technology by answering the following:

1. What new things did you learn from this topic?
2. What other important aspects/topics were omitted?
3. Any other comments

13.8 Reference

Kagunyu, A., Matiri, F., and Ngari, E. 2016. Preserving Hides and Skins in Northern Kenya Using Wet Salting Technology. KALRO Website: https://www.kalro.org/alris/uploademimi/wet-salting-technology.pdf

Kimindu, V.A., Murithi, G.M., and Tura, I.A. 2021. Value Addition of Beef and Beef By-Products. Chapter 8 In: Red Meat Value Chain Handbook. Kenya Climate Smart Agriculture Project.

MODULE 14: DAIRY AGRIBUSINESS AND MARKETING

Sub Module14.1: Dairy Agribusiuness

This module focuses on the training competencies required to enable dairy farmers' transition from subsistence dairy farming to commercial and viable dairy enterprises. The module has 2 sub modules namely;

a) Dairy Agribusiness

b) Dairy Marketing

This module is designed for exposing facilitators and trainees to avenues of commercializing dairy enterprises produced under different types of production systems and at varying scales, for success and sustainability.

14.1.1. Introduction to the Sub module

Dairy agribusinesses remain as important economic activities for smallholder farmers in Kenya. However, farmers continue to face major economic challenges that limit their competitiveness. As a result, smallholder dairy farmers need the requisite knowledge and skills to assist them reduce production costs, improve productivity and thereby become more competitive. This sub module provides practical and relevant agribusiness information including Gross margin analysis (GMA). Gross Margin analysis equips the trainers with skills on how to estimate the type of costs in a dairy enterprise and the benefits that can be derived from it. It should be based on costs of materials, production system and the scale of production. GMA is an indicator of dairy profitability and is important for efficient production and management of cows and goats.

14.1.2 Sub-Module learning outcomes

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

a) Basics of dairy agribusiness and commercialization appreciated
b) Products, cost components and sources of income in a dairy enterprise identified.
c) Gross Margin for dairy production under different production systems analysed and computed.
d) Profit and losses and how to increase profits and minimize losses in dairy enterprise determined.

14.1.3 Sub-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

14.1.4 Sub-Module Users

This sub 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).

14.1.5 Sub-Module Duration

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

14.1.6 Sub-Module Summary

Dairy Agribusiness Sub Module			
Sessions	**Training methods**	**Training materials**	**Time**
14.1.6.1 Introduction and Levelling Expectations on Dairy business, marketing and Commercialization	• Personal introduction • Presentation • Plenary discussions	• Flip charts • PowerPoint Presentation • Hand outs	10 minutes
14.1.6.2 Identification of cost components in a dairy enterprise, dairy products produced at the farm and potential sources of income in the enterprise	• Plenary Discussion • Presentation • Practice by the trainee • Direct instruction	• PowerPoint Presentation • Flip charts • Felt pens	20 minutes

14.1.6.3 Introduction to Gross Margin Analysis and Practical session	• Presentation • Group exercise	• PowerPoint Presentation • Exercise guide	1 hour
TOTAL			**1 hour 30 minutes**

14.1.7 Facilitator's Guidelines

Dairy Agribusiness Sub Module	
14.1.7.1. Introduction and Levelling Expectations (10 minutes)	**Session Guide**
Introduction *The facilitator welcomes participants to the module dairy agribusiness and introductions done by participant stating their profile and experience of working with farmers.* (The facilitator invites the participants to state their expectation for the module). **Module Objectives** The facilitator presents modules objectives. By the end of the module training the trainee should be able to: • Appreciate the basics of dairy agribusiness and commercialization. • Identify products, cost components and sources of income in a dairy enterprise. • Analyse and compute Gross Margin for dairy production under different production systems. • Determine Profit and losses and how to increase profits and minimize losses in dairy enterprise.	• Summarize Participants' Expectations and display. • Distribute Participant Handouts on Module Objectives
14.1.7.2 Identification of products, cost components and sources of income in a dairy enterprise (20 minutes)	**Session Guide**
The facilitator should able to lead participants in understanding products, incomes, cost and expenditure elements in a dairy enterprise **Presentation** • Determination of cost components – Fixed/Variable/ Imputed • Sample herd structure and the production systems • Determine the income and expenditure avenues • Feeds requirements and costs using a sample herd structure	• PowerPoint presentation • Q& A session

• Workout farm running costs • Estimation of the quantity and sale of dairy products (milk, meat cows - culls, breeding cows) and Supplementary sources of income (manure, bulls, steers)	
14.1.7.3 Gross Margin analysis and computations for dairy production under different production systems, profit and loss assessment (1 hour)	**Session Guide**
The facilitator should able to lead participants in carrying out Gross margin analysis in a dairy enterprise Presentation and practical computation of: • Total fixed costs (TFC) • Total variable costs (TVC) • Total Cost (TC) • Net cash flow (Profit or Loss) • Gross Margin (GM) • Net profit (NP) • Gross Profit Margin (GPM) and its implication on a dairy enterprise.	• PowerPoint presentation • Use of a per unit cost analysis tool • Q& A session
14.1.7.9 Module review (10 minutes)	**Session Guide**
(The facilitator should let the participants present their views on each of the sessions covered under this module. On flip chart list and summarize the key points they should emphasize when training farmers) Review together the main points of this module • What new things did you learn from this module? • What are some of the issues that you have become more aware of? • What questions do you still have? **Discussion** After the presentations allow participants to raise any issues and discuss them	

14.1.8 Reference Materials

14.1.8.1 Participants handouts

- A sample of already worked out gross margin analysis for a dairy enterprise under different production systems
- Per unit cost analysis calculation tool (Annex 2)

14.1.8.2 Reference

Per unit cost calculation tool software available at https://www.thescanfoundation.org

Sub Module 14.2: Dairy Marketing

14.2.1. Introduction to the Sub module

Information on markets and market linkages, are crucial for success and sustainability of dairy enterprises. Such information includes development of a marketing plan, collective marketing approach, milk products markets, costing and pricing mechanisms; advertisement and promotion of dairy and dairy products to maximize profit margin and economic returns from dairy enterprises. Market players are largely dependent on the marketing opportunities available in both the formal and informal marketing channels. Such opportunities exist through investment in milk processing and value addition to serve the increased market for processed dairy products in Kenya and the region.

14.2.2 Sub Module learning outcomes

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

a) Different types of milk market its supply and demand patterns appreciated.

b) Marketing strategies, functions, marketing tools and marketing plan in the dairy milk value chain appreciated.

c) Milk and milk market channels, marketing principles, value chain and distribution networks mapped and identified.

d) Advertisement and promotion strategy of milk and milk products and appreciate the 8 P's of marketing designed.

e) Business plan and dairy records developed.

14.2.3 Sub 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

14.2.4 Sub Module Users

This sub 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).

14.2.5 Sub Module Duration

The sub module is estimated to take a duration of 1 hour

14.2.6 Sub Module Summary

Marketing sub module			
Sessions	**Training methods**	**Training materials**	**Time**
14.2.6.1 Introduction to Dairy marketing, Types of milk markets, supply and demand patterns - Marketing strategies, functions and market planning	• Presentations • Plenary discussions	• Flips charts • Felt pens • PowerPoint presentation • Handouts	20 minutes
14.2.6.2 Milk Market Channels, Value Chain and Distribution Networks Principles of marketing / 8 Ps of marketing Product differentiation and promotion of milk and milk products / Linking farmers to markets	• Presentations • Plenary discussions • Practical demonstrations • Role play	• Flips charts • Felt pens • PowerPoint presentation • Handouts	20 minutes
14.2.6.3 Business planning and Record keeping	• Presentations • Plenary discussions • Practical demonstrations	• Flips charts • Felt pens • PowerPoint presentation • Handouts	15 minutes
14.2.6.4 Module review	• Plenary Discussion	• Participants handout	5 minutes
TOTAL			**1 hour**

14.2.7 Facilitator's Guidelines

Marketing Sub Module	
14.2.7 1 Types of milk markets, supply and demand patterns (20 minutes)	**Session Guide**
(The facilitator to present on PowerPoint slides and flip charts on milk and milk products marketing • Milk and dairy product markets and marketing • Supply and demand and how they affect prices • Demand and supply shifts • Milk costs, incomes, prices and profits	• PowerPoint presentation • Q& A session

14.2.7 2 Marketing strategies, functions and marketing plan/ Marketing tools in the dairy milk value chain (20 minutes)	**Session Guide**
Present the following on PowerPoint slides and flip charts: Developing a marketing strategy involves three elements: • Analyzing the present market situation • Formulating final marketing goals • Evaluating and selecting suitable marketing alternatives **Discussion** Participants to consider all reasonable marketing alternatives. Consider the costs involved and other advantages and disadvantages of each alternative. Select a specific or a combination of marketing alternatives for discussion	• PowerPoint presentation • Marketing Basics Factsheet • Q& A session
14.2.7 3 Milk and milk Market Channels, Marketing principles, Value chain and Distribution Networks (20 minutes)	**Session Guide**
Present the following on PowerPoint slides and flip charts: • Different marketing channels and distribution networks • Choosing the right marketing channel as an essential tool to successful marketing • The price variations at each stage in accordance to value addition • Price margin; reflecting the percentage level of services provided at each stage through which the product passes, and the levels of demand and supply at different times of the year. • **Market functions** classified broadly into three groups: Exchange functions; Physical functions and Facilitating functions	• PowerPoint presentation • Group exercise – role play • Q& A session
14.2.7 4 Advertisement and promotion of milk and milk products - The 8 P's of Marketing (20 minutes)	**Session Guide**
The facilitator should be able to guide participants on an easy way to organize a marketing plan: • **Product:** What to produce? • **Price:** At what price to sell? • **Promotion:** How to promote the product? • **Place:** Where to sell it? • **People:** Who buys the product? • **Plan:** What is the plan for marketing?	• PowerPoint presentation • Q& A session

• **Process:** What is the standard operating procedure in delivering the service? • **Positioning:** What is the marketing positioning strategy?	
14.2.7 5 Business planning and records (20 minutes)	**Session Guide**
Presentation and practical (1 hour) • Business planning and format • Importance of record keeping • Characteristics of good records • Other types of records in dairy farming **Discussion** After the presentations allow participants to raise any issues and discuss them	• PowerPoint presentation • Q& A session
14.2.7 6 Module review (10 minutes)	**Session Guide**
(The facilitator should let the participants present their views on each of the sessions covered under this module. On flip chart list and summarize the key points they should emphasize when training farmers) Review together the main points of this module • What new things did you learn from this module? • What are some of the issues that you have become more aware of? • What questions do you still have? **Discussion** After the presentations allow participants to raise any issues and discuss them	

14.2.8 Reference Materials

14.2.8.1 Participants handouts

- Business plan format guideline.
- Marketing plan template (KALRO)

14.2.8.2. Reference

Marketing Basics: A SMART Skills Manual (USAID).

MODULE 15: CROSS-CUTTING THEMES IN DAIRY PRODUCTION

15.1 Introduction

This module consists of issues that influence the uptake and up-scaling of TIMPs in the Dairy Value Chain. These issues are Agricultural Innovation Platforms, Gender, vulnerable and marginalized groups (VMGs), and social-environmental concerns and Climate smart agricultural policies and regulations in the dairy industry. Agricultural Innovation Platforms provide a forum for stakeholders to interact and develop technical, institutional and organizational innovations to solve value chain challenges and it is a vehicle to make the system work and create a demand for innovations. Gender, vulnerable and marginalized groups (VMGs) and social-environmental concerns are considerations aimed at avoiding inappropriate solutions to value chain challenges. Finally, Climate smart agricultural policy and regulations creates awareness on policy formulation and the various regulations that are put in place to facilitate the development of dairy value chain. The methodology of delivery of each of these cross-cutting issues is presented.

Sub Module 15.2.l: Dairy Gender, Vulnerable And Marginalized Groups , Social, Environmental Concerns And Cohesion

15.2.1. Introduction to the Sub module

Dairy play an important role in household economies in ensuring food and nutritional security as well as reducing poverty. Dairy involve all the gender categories (men, women, youth vulnerable marginalized groups (VMGs) in its value chain from production, marketing and consumption. Women perform most of the Dairy production activities such as milking, and milk marketing.

Although women's contribution is substantial, gender inequalities still exist in all areas of the Dairy 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 is constrained by their low decision-making power, and inadequate access to resources such as credit, capital 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.

Dairy 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 Dairy value chain is enhanced by field agricultural practitioners, agripreneurs 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:

a) The concept of gender mainstreaming and social inclusion in Dairy value chain appreciated.

b) Youth empowerment in Dairy value chain explained.

c) Women empowerment in Dairy value chain explained and understood.

d) Strategies for inclusion of vulnerable and marginalized groups in Dairy value chain understood and applied.

e) 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, agripreneurs, lead farmers, and extension agents.

15.2.4 Sub-Module Users

This sub 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 hour 30 minutes

15.2.6 Sub-Module Summary

Sub module 15.2: Gender mainstreaming and social inclusion in the Dairy 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	5 minutes
15.2.6.2 Gender mainstreaming in Dairy value chain	• PowerPoint Presentations • Group Exercise • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
15.2.63 Youth empowerment in Dairy value chain	• PowerPoint Presentations • Group exercise • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	15 minutes
15.2.6.4 Women empowerment in Dairy value chain	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	15 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	20 minutes

15.2.6.6 Environmental and Social Management Framework	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	20 minutes
15.2.6.6 Sub module Review	• Plenary discussion	• Flips charts • Felt pens	5 minutes
Total			**1 hour 30 minutes**

15.2.7 Facilitator's Guidelines

Sub module 15.2: Gender mainstreaming and social inclusion in Dairy value chain	
15.2.7.1 Introduction, Objectives and Expectations (5 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** The facilitator presents sub modules objectives By the end of the sub module training, the trainee should be able to: • Appreciate gender mainstreaming and social inclusion, in the Dairy value chain. • Explain youth empowerment in the Dairy value chain. • Appreciate women empowerment in Dairy value chain. • Recognize strategies for inclusion of vulnerable and marginalized groups in Dairy value chain. • Explain the environmental and social management framework (ESMF) tool.	• Summarize trainees' expectations and display. • PowerPoint Presentation • Group exercise • Training Programme

15.2.7.2 Gender mainstreaming and social inclusion in Dairy value chain (10 minutes)	Session Guide
(The facilitator presents and explain what gender mainstreaming is, who does what activity, who has access to what resources and who makes what decisions among others, and why gender mainstreaming is important in Dairy value chain). **Plenary Presentation** • Definition of gender • What is gender mainstreaming and why it is important? • Who does what? (gender division of roles in Dairy value chain) • Who owns what? (access and control of resources & benefits) • Who makes which decisions? **Group exercise and discussion** *Let the trainees recall what they learnt 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 Dairy value chain s (15 minutes)	**Session Guide**
Plenary Presentation • Why agriculture is not attractive to youth • Youth's role in the dairy value chain • Strategies to empower youth in Dairy 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 Dairy value chain (15 minutes)	**Session Guide**
Plenary Presentation • 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 Dairy value chain (20 minutes)	Session Guide
Plenary presentation (30 minutes) • 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) (20 minutes)	**Session Guide**
Plenary presentation • Objective of ESMF in Dairy value chain • Environmental and social safeguards of Dairy **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 (5 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 Dairy value chain • Women empowerment in Dairy value chain • Strategies for inclusion of vulnerable and marginalized groups in Dairy value chain • Environmental and Social Management Framework of Dairy activities. *Let the trainees recall what they learned and discuss any issues that may arise.*	`

15.2.8 Reference Materials

15.2.8.1 Participants' handouts

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

15.2.8.2References

Sasmitha R., M. Pandiyan, M. Yuvaraj, T. Thilagavathi, M. Suganyadevi and M. Sivaji. (2020). Gender Mainstreaming and its Importance in Agriculture

Sub Module 15.3.1: Agricultural Innovation Platforms

15.3.1 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 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. These actors come together in an innovation platform to seek technical, institutional or organizational solutions to critical challenges hindering agricultural productivity within a value chain. The AIP facilitates actors to interact, innovate, learn and change with time as they seek solutions to the common challenges. It is important to go into the system, connect with actors, and ensure that they work together. The situational needs should determine the kind of actors to bring on board. Every actor's contribution is valued and benefits accrue to all in a win-win situation.

Therefore, the AIP is a useful methodology for development, testing and scaling of innovations in the Dairy Value Chain. The training module aims at enhancing practitioners' know-how in facilitating innovation platforms and it exposes the actors to an innovation systems-based configuration of stakeholders.

15.3.2 Sub Module learning Outcomes

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

a) Innovation platforms defined and explained

b) The characteristics of an AIP described and understood.

c) Process of mobilization of stakeholders for initiation, establishment, management and sustenance of an AIP explained and demonstrated

d) Business model development process of an AIP demonstrated

e) The innovation capacity building process of the AIP actors explained and understood

f) Benefits and challenges of AIP described

g) The sustainability of an AIP (exit strategy) explained and understood

15.3.3 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.

15.3.4 Sub module Users

This sub 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.

15.3.5 Sub module Duration

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

15.3.6 Sub module Summary

15.3. 6 Innovation platforms			
Sessions	**Training methods**	**Training materials**	**Time**
15.3.6.1 Introduction, objectives and expectations	• Personal introductions • Presentations • Plenary discussions	• Flips charts • PowerPoint presentation • Laptop • Projector	5 minutes
15.3.6.2 Definition of Agricultural Innovation Systems and different types of innovations	• PowerPoint Presentations • Flip charts • Plenary discussions	• Flip charts • PowerPoint presentation • Laptop • Projector • Participants' handouts	10 minutes
15.3.6.3. -Dissemination and scaling -Enhancing information flow and learning -Making value chain work -Enhancing resource efficiency -Enhancing innovation and creativity -Enhancing farmer capacity	• PowerPoint presentations • Plenary discussions • Role plays • Flips charts • PowerPoint presentation	• Laptop • Projector • Participants' hand outs	20 minutes
15.3.6.4 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

15.3.6.5 Case studies of a successful Innovation Platform (*Select the nearest to the training venue*) e.g. Mr. Kyalo (Machakos) -(analogy of African funeral)	• PowerPoint presentations • Plenary discussions • Role plays • Flips charts	• Laptop • Projector • Participants' hand outs	
15.3.6.6 Benefits and challenges of AIPS	• PowerPoint presentations • Plenary discussions	• Flip charts • Laptop • Projector • Participants' hand outs	15 minutes
15.3.6.7. Cross cutting factors -Gender issues for inclusivity -Scale: Need to factor this from outset -Policy influencing and advocacy -Communication and capacity strengthening	• PowerPoint presentations • Plenary discussions	• Flip charts • Laptop • Projector • Participants' hand outs	
15.3.6.8. Sub Module review	• PowerPoint presentations • Plenary discussions	• Flip charts • Laptop • Projector	5 minutes
TOTAL			**1 hours 30 minutes**

15.3.7 Facilitator's Guidelines

Sub Module 15.3.7 Agricultural Innovation Platform (AIP)	
15.3.7.1. Introduction, levelling of expectations and objectives (5 minutes)	**Session Guide**
Introduction *(The facilitator welcomes trainees to the module and then invites them to introduce themselves and state their expectations)* **Sub Module Objectives** *(The facilitator presents modules objectives and levels out expectations)* By the end of the sub 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. • Appreciate successful dairy innovation platforms • Appreciate benefits and challenges of agricultural innovation platforms.	• Summarize Trainees' "expectations" and display. • PowerPoint Presentation • Training Programme
15.3.7.2 Definition of Agricultural Innovation Systems and different types of innovations (technical, institutional and organizational) (10 minutes)	**Session Guide**
The facilitator presents an overview of innovation platforms and their main characteristics **Plenary Presentation** • Past progression of research and extension models and their shortcomings • Agricultural Innovation Systems perspective and Agricultural Innovation Platforms model • Comparison of Agricultural Innovation Platforms with social and technical events working through committees with different roles but common goals • Value chain actor linkages and other benefits **Discussion** *Let the trainees recall what they learned and discuss any issues that may arise.*	• PowerPoint Presentation • Participants' handouts

15.3.7.3. Characteristics of an Agricultural Innovation Platform (20 minutes)	Session Guide
Plenary Presentation (2hours. 30 mins) • 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 (30 minutes)** *Let the trainees recall what they learned and discuss any issue that may arise.*	• PowerPoint Presentation • Participants' handouts • Plenary discussion
15.3.7.4 Stages of an innovation platform (Initiation, Establishment, Management and Sustenance (20 minutes)	**Session Guide**
Plenary Presentation **Initiation or preformation phase** • Engagement or mobilization of stakeholders in the Dairy 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** *Let the trainees recall what they learned and discuss any issue that may arise.*	• PowerPoint Presentation • Distribute participants handouts • Short video clips
15.3.7.5 Case studies of successful AIPS (20 minutes)	**Session Guide**
e.g. Mr. Kyalo Farm (Machakos) -Analogy of African funeral • Invite a participant from the successful AIP to make a presentation • Plenary • Let the trainees recall what they learned and discuss any issue that may arise.	• Participants' handouts • Marketing models and pathways • Case study reports

15.3.7.6 Benefits and challenges of AIPS (15 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 dairy value chain that will ensure easy flow of operations.	• Plenary presentation • Champions selected to campaign for attitude change
15.3.7.7 Cross cutting issues (15 minutes)	**Session Guide**
• Gender issues – for inclusivity • Scale: Need to factor this from outset • Policy influencing and advocacy • Communication and capacity strengthening	• Presentations • General discussions
15.3.7.8. Module review (5 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 dairy 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

15.3.8 Reference materials

15.3.8.1 Participants' handouts

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

15.3.8.2 References

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.

Felister Makini, G. Kamau, M. Makelo, A. Adekunle, G. Mburathi. (2013). Operational field guide for developing and managing local agricultural innovation platforms

Hagmann, J, Connolly, M., Ficarelli, P., Ramaru, J. (2002): The Service Delivery Framework: Understanding the development of service systems as a systemic change and negotiation process within and across three levels of demand and supply. Published on www.picoteam.org

Kamau, G.M. and Makini F.W. (2019). Agricultural Innovation Platforms for knowledge exchange and learning for technical, economic, social and institutional changes

Sub Module 15.4.1: Dairy Policies And Regulations

15.4.1 Introduction to the Sub module

The training programme on dairy policies and regulations for smallholder farmers in Kenya is designed to empower dairy practitioners with essential knowledge and skills to effectively navigate the regulatory framework governing the dairy sector. As smallholder farmers play a vital role in Kenya's dairy industry, it is imperative to equip them with the understanding and tools needed to comply with policies, make informed decisions, and optimize their dairy enterprises. This training programme is structured into comprehensive modules that delve into various aspects of dairy policies and regulations, ranging from compliance and advocacy to market access and sustainability. By the end of this training, participants will be better equipped to embrace the opportunities and challenges presented by the dairy regulatory landscape, fostering a more sustainable and economically viable dairy sector in Kenya.

15.4.2 Sub module learning outcomes

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

a) Key dairy policies and regulations appreciated.

b) Compliance and record-keeping understood and applied

c) Quality and safety standards understood and applied

d) Environmental and sustainability regulations explained

e) Market access and trade regulations understood and applied

f) Health and animal welfare regulations understood and applied

g) Consumer protection regulations understood and applied

h) Policy advocacy and engagement explained

15.4.3 Sub module Target Group

This sub module is intended for service providers, agripreneurs, lead farmers, and extension agents.

15.4.4 Sub module Users

This sub 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).

15.4.5 Sub module Duration

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

15.4.6 Sub module Summary

Sub module 14.4.6.0: Policy options and regulations in the Dairy value chain			
Sessions	**Training methods**	**Training materials**	**Duration**
14.4.1 Introduction, expectations and objectives	• Personal introduction • Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Laptop	5 minutes
14.4.6.2 Introduction to Dairy Policies and Regulations	• PowerPoint Presentations • Plenary discussion	• PowerPoint projector, • Flip charts, felt pens • Laptop	5 minutes
14.4.6.3 Key Dairy Policies and Regulations	• PowerPoint Presentations • Plenary discussion	• PowerPoint projector, • Flip charts, felt pens • Laptop	10 minutes
14.4.6.4 Compliance and Record-Keeping	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	5 minutes
14.4.6.4 Quality and Safety Standard	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
14.4.6.5 Environmental and Sustainability Regulations	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes

14.4.6.6 Health and Animal Welfare Regulations	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
14.4.6.7 Market Access and Trade Regulations	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
14.4.6.8 Consumer Protection Regulations	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
14.4.6.9 Policy Advocacy and Engagement	• PowerPoint Presentations • Plenary discussion	• Flips charts • Felt pens • PowerPoint Presentation • Participants handouts	10 minutes
14.4.6.10 Sub module Review	• Plenary discussion	• Flips charts • Felt pens	5 minutes
Total			**1 hours 30 minutes**

15.4.7 Facilitator's Guidelines

Sub module 15.4.7: Policy options and regulations in the Dairy value chain	
15.4.7.1 Introduction, Objectives and Expectations (5 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** The facilitator presents modules objectives By the end of the module training, the trainee should be able to: • Appreciate the relevant policies, laws, and regulations governing the dairy sector. This includes knowledge of animal health, milk quality, environmental standards, and market access regulations. • Be aware of their responsibilities as outlined in the policies and regulations. • Appreciate what is expected of them in terms of compliance, reporting, and best practices	• Summarize trainees' expectations and display. • PowerPoint Presentation • Group exercise • Training Programme
15.4.7.2 Introduction to Dairy Policies and Regulations (5 minutes)	**Session Guide**
(The facilitator should able to lead participants in understanding the current policies and regulations related to dairy farming, which farmers need to be aware of as they practice dairy farming) **Plenary Presentation** The facilitator gives highlights on**:** • Key policies, regulations and the regulatory bodies involved. • Licensing procedures, and quality standards for dairy products. Emphasis should be placed on animal health, welfare regulations, and environmentally sustainable practices. • Pricing mechanisms, marketing channels, and relevant financial support programmes. • Government initiatives, compliance requirements, and potential penalties for non-compliance. **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

15.4.7.3 Compliance and Record-Keeping (10 minutes)	Session Guide
(The facilitator should able to lead participants in understanding how to be compliant with the set policies and regulations and the importance of record keeping) **Plenary Presentation** • The importance of adherence to regulatory requirements. • Specific documentation and record-keeping obligations imposed by relevant authorities. This includes maintaining comprehensive records related to animal health, milk production, and farm management practices. • The significance of accurate record-keeping for demonstrating compliance during inspections. • The types of records required for financial reporting, environmental impact assessments, and any other regulatory audits. Emphasizing the potential consequences of non-compliance, such as penalties or legal ramifications, is essential. **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Group exercise • Plenary discussion • Participants' handouts
15.4.7.4 Quality and Safety Standard (10 minutes)	**Session Guide**
(The facilitator should able to lead participants in understanding compliance with quality and safety standards) **Plenary Presentation** The facilitator will impact knowledge and information on: • Proper milk handling, storage, and transportation protocols to maintain quality and prevent contamination. Emphasize will be on hygiene and sanitation practices, milk testing, temperature control guidelines, packaging standards, and the importance of accurate labelling to ensure product integrity. • Regulatory compliance with national and international standards, and emphasis on consequences for non-compliance. • Produce traceability to ensure the safety and quality of dairy products. **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Participants' handouts • Plenary discussion

15.4.7.5. Environmental and Sustainability Regulations (10 minutes)	Session Guide
(The facilitator should able to lead participants understand sustainable and environmentally friendly practices) **Plenary presentation** • Facilitators should guide farmers in understanding the regulations related to observing practices that minimise environmental impacts including effective waste management and the recycling of waste materials, and other sustainable land use practices **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Plenary discussion • Participants' handouts
15.4.7.6. Health and Animal Welfare Regulations (10 minutes)	
(The facilitator presents the learning outcomes for the topic health and animal welfare regulations) **Plenary presentation** Facilitator will impact knowledge and information on: • The existing health and animal welfare regulation, and an emphasis on understanding and compliance. • Practical guidance on disease prevention, vaccination protocols, and proper animal care practices **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise	• PowerPoint Presentation • Plenary discussion • Participants' handouts
15.4.7.7. Market Access and Trade Regulations (10 minutes)	**Session Guide**
The facilitator should able to lead participants in understanding market access and trade regulations for dairy **Plenary presentation** The facilitator will impact knowledge and information on: • Local and international regulations governing dairy farming and trade. • Practical guidance on market entry requirements, including obtaining licenses and certifications. • Thorough coverage of quality standards, insights into tariffs, duties, and trade agreements, and practical tips on documentation and record-keeping **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise.	• PowerPoint Presentation • Plenary discussion

15.4.7.8. Consumer Protection Regulations (10 minutes)	
(The facilitator to present to participants the existing regulations on consumer protection) **Plenary presentation** The facilitator will impact knowledge and information on: • Existing regulations on consumer protection • Accurate product labelling, nutritional information and expiration dates, to provide consumers with transparent and informative choices. • Quality and safety standards to deliver products that meet or exceed regulatory requirements **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise	
15.4.7.9. Policy Advocacy and Engagement (10 minutes)	
The facilitator to present to participants the existing regulations on consumer protection **Plenary presentation** The facilitator will impact knowledge and information on: • Identifying the problem • Analysis and assessment of consequences of the identified problem/policy gap. • Articulating policy options • Stakeholders analysis and involvement. • Public awareness raising and actions • Policy monitoring and evaluation • Effective lobbying strategies, including building relationships with policymakers and participating in advocacy campaigns **Plenary discussion** Let the trainees recall what they learned and discuss any issues that may arise	

15.4.7.10 Sub module review (5 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 on the: • Relevant policies, laws, and regulations governing the dairy sector including knowledge of animal health, milk quality, environmental standards, and market access regulations. • Participants' responsibilities as outlined in the policies and regulations. • What is expected of them in terms of compliance, reporting, and best practices • 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

15.4.8 References

The Kenya Dairy Industry Regulations, 2021.

ANNEXES

Annex 1: Training Programme

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

DRAFT PROGRAMME Value chain Leader: Mr. N.N Kanegeni

Annex 1: Programme for ToTs Dairy Value Chain TIMPs

Dates: ……..

Cluster: ……..

Venue: ……

Time	**Day 0 (Sunday)**	**Duration**	**Remarks / Facilitator**
Day 0: Sunday	Travel to venue		All
Late Evening	Arrival 1 Setting up and prepare training venue and materials		The training venue and materials are ready for use
Close of Day 0			
Day 1			
Time	Day 1 (Monday)	Duration	Remarks / Facilitator
8.00 – 9.00 am	Registration		KALRO/NAVCDP secretariat
	SESSION I: Session Chair:		N.Kanegeni
	Climate Setting Welcome by host and Prayers (KALRO) 1. Opening payers 2. Self-introductions – (CTT) 3. Training in-house matters and setting norms (CTT) 4. Official opening Ceremony (KALRO/ NAVCDP) 5. Introduction to the training programme (Dairy VC Leader)		The trainees relax and set climate for **the 6-day training**
9.00-10.00 am			
		1 hour	
	6. Formation of groups		

10.00-10.30 am	The role of Dairy Sub-sector in Kenyan economy		N.N Kanegeni
10.30-11.00 am	**Tea Break (Group Photo)**	**30 minutes**	**Health Break**
11.00 a.m-12.30 pm	**Module 1: Climate Smart Agriculture Practices In Dairy Production Systems**	**1 hour 30 minutes**	
	Module Introduction, outcomes and expectations	10 minutes	Facilitator
	Understanding climate change	20 minutes	Facilitator
	The effects of climate change on the dairy industry and food security	30 minutes	Facilitator
	Climate smart agriculture and dairy value chain - specific practices	20 minutes	Facilitator
	Module review	10 minutes	Facilitator
	Module 2. Farmer Field And Business School (FFBS) Approach In Dairy Value Chain	2hours	Facilitator
12.35 – 1.00 pm	Introduction, Climate setting, levelling of expectations and objectives.	5 minutes	Facilitator
	Overview of FFBS key activities	20 minutes	Facilitator
1.00 - 2.00 P.M	**Lunch Break**	**1 hour**	**All**
2.00 – 3.35 pm	Introduction to Communication and communication skills	10 minutes	Facilitator
	Facilitation and leadership skills	10 minutes	Facilitator
	Organization and Management in FFBS	15 minutes	Facilitator
	Developing FFBS Curriculum for the Dairy valuechain	15 minutes	Facilitator
	FFBS marketing tools	20 minutes	Facilitator
	SMART County action plan of Dairy value chain on the transfer of TIMPS	20 minutes	Facilitator
	Module review	5 minutes	Facilitator
	Module 3: Good Agricultural Practices (GAPs) and Food Safety Management Systems (FSMS) in Dairy	**2 hours 30 minutes**	

3.40 – 5.30 pm	Introduction,objectives and levelling of expectations	5 minutes	Facilitator
	Understanding GAP and its application in the dairy value chain	20 minutes	Facilitator
	Good dairy farming practices	20 minutes	Facilitator
	Dairy animal feed production and handling	20 minutes	Facilitator
	GMPs for dairy product processing and handling	20 minutes	Facilitator
	Determination of food safety risk hazards in dairy value chain (hazard analysis)	10 minutes	Facilitator
	Determination of critical control points (CCP) and corrective measures in dairy value chain	20 minutes	Facilitator
	Module review	5 minutes	Facilitator
	End of day 1		
Day 2	**Module 4: Breeds And Breeding**		Facilitator
	Sub Module 4.1: Dairy Cattle Breeds And Breeding	**2 hours**	Facilitator
8.15 – 10.15 am	Introduction, objectives, expectations	10 Minutes	Facilitator
	Introduction to animal breeding	20 Minutes	Facilitator
	Selection and crossbreeding	20 Minutes	Facilitator
	Friesian x Sahiwal crossbred	20 Minutes	Facilitator
	ART using Sahiwal germplasm-Fixed time Artificial Insemination	20 Minutes	Facilitator
	Community Based Breeding Programme	20 Minutes	Facilitator
	Module Review	10 Minutes	All
	Sub Module 4.2: Dairy Goat Breeds And Breeding		Facilitator
10.20 – 10.30 am	1. Introduction, objectives, expectations	10 Minutes	Facilitator
10.30-11.00 am	**Tea Break**	**30 minutes**	**Health Break**

11.00 am – 1.00 pm	Introduction to dairy goat breeds and breeding	20 Minutes	Facilitator
	Selection of a breeding doe and buck	20 Minutes	Facilitator
	Methods of breeding system/strategies and breeding management	20 Minutes	Facilitator
	Identification and recording of dairy goats	20 Minutes	Facilitator
	Community Based Breeding Programme	20 Minutes	Facilitator
	Module Review	10 Minutes	Facilitator
1.00 - 2.00 P.M	**Lunch Break**	**1 hour**	**All**
	Module 5: Feed Resources	**4 hours**	
2.00 – 5.00 pm	Module outline, introduction, expectations, and objectives	5 minutes	Facilitator
	Classification of feed resources	15 minutes	Facilitator
	Forage ecological suitability, agronomic management, and biomass yields	30 minutes	Facilitator
	Factors affecting forage biomass yield and quality	20 minutes	Facilitator
	Forage pests and diseases	30 minutes	Facilitator
	Crop residues	30 minutes	Facilitator
	Anti-nutritive factors in dairy feeds	15 minutes	Facilitator
	Forage conservation	30 minutes	Facilitator
	End of day 2		
Day 3	**Feed Resources cont'**		
8.15 – 9.20 am	Dairy feeds quality and safety	15 minutes	Facilitator
	Budgeting of dairy feed	30 minutes	Facilitator
	Keeping of dairy records	15 minutes	Facilitator
	Module Review	5 minutes	All
	Module 6: Feed Formulation	**4 hours**	

9.25 – 10.30 am	Module outline, introduction, expectations, and objectives	10 minutes	Facilitator
	Nutrient requirements of dairy cattle and goats	10 minutes	Facilitator
	Information required to formulate dairy feed rations	10 minutes	Facilitator
	Nutrient balanced dairy feed rations	10 minutes	Facilitator
	Guidelines for the formulation of dairy feed rations	10 minutes	Facilitator
10.30-11.00 am	**Tea Break**	**30 minutes**	**Health Break**
11.00 – 1.00 pm.	Dairy feeds ration formulation methods	2 hours	Facilitator
1.00 - 2.00 P.M	**Lunch Break**	**1 hour**	**All**
2.00 – 3.10 pm	Exercise on the formulation of Homemade	10 minutes	Facilitator
	Exercise on the formulation of total mixed rations (TMRs)	10 minutes	Facilitator
	Feed mill equipment, capacities and their cost. (Utafiti Feed mill, DRI Naivasha)	10 minutes	Facilitator
	Practical mixing of HMCs (manual, automated)	15 minutes	Facilitator
	Practical mixing of TMRs (manual, automated)	15 minutes	Facilitator
	Module Review	10 minutes	All
	Module 7: Feeding	**2 hours 30 minutes**	
3.15 – 5.15 pm	Module outline, introduction, expectations, and objectives	5 minutes	Facilitator
	Housing for dairy cattle	15 minutes	Facilitator
	Housing for dairy goats	15 minutes	Facilitator
	Feeding regime for calves	30 minutes	Facilitator
	Feeding of heifers	15 minutes	Facilitator
	Feeding of lactating cows	15 minutes	Facilitator
	Feeding regime for kids	15 minutes	Facilitator
	Feeding of doelings	15 minutes	Facilitator
	End of day 3		
Day 4	**Feeding cont'**		
8.15 – 8.45 am	Feeding of lactating does	15 minutes	All
	Feeding of bucks	10 minutes	Facilitator
	Module Review	5 minutes	All

	Module 8: Animal Health	**5 hours**	
	Sub Module 8.1: Dairy Cattle Health		
8.50 – 10.30 am	Introduction to the module and levelling of expectations	10 minutes	Facilitator
	Concept of health and disease in farm animals	30 minutes	Facilitator
	Biosecurity measures in dairy farms	20 minutes	Facilitator
	Major diseases affecting dairy cattle and their control methods	20 minutes	Facilitator
	Major endo-parasites of affecting dairy cattle and their control methods	30 minutes	Facilitator
10.30-11.00 am	**Tea Break**	**30 minutes**	**Health Break**
11.00 – 11.40 am	Major ecto-parasites/pests affecting dairy cattle and their control methods	15 minutes	Facilitator
	Proper handling of veterinary drugs and chemicals	15 minutes	Facilitator
	Review of module	10 minutes	Facilitator
	Sub Module 8.2: Dairy Goat Health		
11.45 am – 1.00 pm	Introduction to the module and levelling of expectations	10 minutes	Facilitator
	Concept of health and disease in farm animals	15 minutes	Facilitator
	Biosecurity measures in dairy farms	15 minutes	Facilitator
	Major diseases affecting dairy goats and their control methods	30 minutes	Facilitator
1.00 - 2.00 P.M	**Lunch Break**	**1 hour**	**All**
2.00 – 3.20 pm	Major endo-parasites of affecting dairy goats and their control methods	30 minutes	Facilitator
	Major ecto-parasites/pests affecting dairy goats and their control methods	20 minutes	Facilitator
	Proper handling of veterinary drugs, chemicals and vaccines	20 minutes	Facilitator
	Review of module	10 minutes	Facilitator
	Module 9: One Health Approach For Sustainable Dairy Production		Facilitator

3.20 – 5.00 pm	Introduction to the module and levelling of expectations	10 minutes	Facilitator
	Overview on climate variability and OH outcomes in dairy production	30 minutes	Facilitator
	Climate related zoonotic diseases affecting dairy	30 minutes	Facilitator
	End of day 4		
Day 5	**One health cont'**		
8.15 – 9.35 am.	AMU/AMR	30 minutes	Facilitator
	Environmental health ✓ Waste management ✓ GHG emissions ✓ Carbon sink	30 minutes	Facilitator
	Module review	20 minutes	Facilitator
	Module 10: Manure Management For Bioenergy And Soil Fertility Improvement		
9.40 – 10.30 am	Introduction, objectives, expectations	10 minutes	Facilitator
	Use of manure for bioenergy and soil fertility improvement.	20 minutes	Facilitator
	Demonstration of bio digester installation technique and biogas production process	30 minutes	Facilitator
10.30 -11.00 am	**Tea Break**	**30 minutes**	**Health Break**
11.00 am - 1.00 pm	Domestic biogas as a source of residential energy supply	20 minutes	Facilitator
	Importance of domestic biogas digesters in mitigating GHG emissions and reduction of biomass fuel consumption	20 minutes	Facilitator
	Methods of manure handling, management and storage technique for nutrient preservation	30 minutes	Facilitator
	Use of bio slurry from anaerobic digesters to improve soil fertility, soil structure and crop productivity	20 minutes	Facilitator
	Use of farm yard manure to improve soil fertility, soil structure and crop productivity	20 minutes	Facilitator
1.00 - 2.00 P.M	**Lunch Break**	**1 hour**	**All**

2.00 – 4.10 pm	Black soldier fly (BSF) Frass to improve soil fertility, soil structure and crop productivity	1 hour	Facilitator
	Compost making processes and use to improve soil fertility, soil structure and crop productivity	30 minutes	Facilitator
	Methodologies of manure application- - - Trench application - Surface application - Tumbukiza method	30 minutes	Facilitator
	Module Review	10 minutes	All
	End of day 5		
Day 6	**Module 11 Milk Value Addition**		
8.15 – 10.30 am	Climate Setting for the new topic Welcome by host and Prayers Self-introductions –(CTT) Introduction, objectives, expectations	20 minutes	Facilitator
	Milk processing	1 hour	Facilitator
	Packaging, labelling and barcoding	30 minutes	All
	Dairy business record keeping	20 minutes	Facilitator
	Module Review	20 minutes	Facilitator
10.30-11.00 am	**Tea Break**	**30 minutes**	**Health Break**
	Module 12. Nutritional Benefits Of Different Dairy Products	**2 hours 30 minutes**	
11.00 am – 1.00 pm	Introduction to the module objectives and Expectations	10 minutes	Facilitator
	Nutrition composition of milk from cattle and goat	15 minutes	Facilitator
	The role of dairy products in food and nutrition security	15 minutes	Facilitator
	Nutritional importance of dairy products and their health benefits	30 minutes	Facilitator
	Explain role of dairy products in dietary diversification and complementary feeding of children	30 minutes	Facilitator
	Nutrition based Value addition and product development of dairy products	30 minutes	Facilitator
	Module review	20 minutes	All
1.00 - 2.00 P.M	**Lunch Break**	**1 hour**	**All**

	Module 13 Hides And Skins value addition - Wet Salting Technology		
2.00 – 5.00 pm	Introduction, objectives, expectations	20 minutes	Facilitator
	Hides and skins as valuable by-products of slaughter Contribution to household items, cultural regalia, fashion industry, food, international trade	20 minutes	Facilitator
	Poor management of hides and skins Hides and skins as carriers of diseases Occupational Safety and Health of workers (PPEs and hygienic practices) Hides and skins as contaminants to the environment Waste management	20 minutes	Facilitator
	Pre-slaughter management practices for quality hides and skins Animal husbandry practices Damages to hides and skins in living animals	20 minutes	Facilitator
	Slaughter techniques for large and small ruminants Ripping of cattle hide Ripping of camel hide Ripping and Fisting in goat and sheep Wash water quality, Washing and fleshing Triming and lacing Tools and equipment for flaying/ skinning Damages to hides and skins during slaughter and flaying	20 minutes	Facilitator
	Post-slaughter management of hides and skins Wet salting technology Management of used salt Bulking and Storage of preserved hides and skins Folding and baling of preserved hides and skins Quality Control of stored hides and skins Transportation of preserved hides and skins	30 minutes	Facilitator

	Damage of hides and skins after flaying Tools and equipment for preservation of hides and skins		
	Marketing of hides and skins Grading of hides and skins Cost implications of low grade hides and skins in the tannery Contracting with local tanneries Online marketing and export markets	30 minutes	Facilitator
	End of day 6		
Day 7	**Module 14: Dairy Agribusiness and Marketing**		
8.15 – 10.30 am	Introduction and Levelling Expectations on Dairy business and Commercialization	10 minutes	All
	Identification of cost components in a dairy enterprise, dairy products produced at the farm and potential sources of income in the enterprise	20 minutes	Facilitator
	Introduction to Gross Margin Analysis and Practical session	1 hour	Facilitator
	Marketing sub module		Facilitator
	Introduction to Dairy marketing, Types of milk markets, supply and demand patterns - Marketing strategies, functions and market planning	20 minutes	Facilitator
	Milk Market Channels, Value Chain and Distribution Networks Principles of marketing / 8 Ps of marketing Product differentiation and promotion of milk and milk products / Linking farmers to markets	20 minutes	Facilitator
	Business planning and Record keeping	20 minutes	Facilitator
	Module review		
10.30-11.00 am	**Tea Break**	**30 minutes**	**Health Break**
	Module 15: Cross-Cutting Themes In Dairy Production		
	Dairy Gender, Vulnerable And Marginalized Groups (VMGs), Socio, Environmental Concerns And Cohesion sub module	**1 hour 30 minutes**	

11.00 am – 12.30 pm	Introduction, expectations and objectives	5 minutes	
	Gender mainstreaming in Dairy value chain	10 minutes	
	Youth empowerment in Dairy value chain	15 minutes	
	Women empowerment in Dairy value chain	15 minutes	
	Strategies for inclusion of vulnerable and marginalized groups	20 minutes	
	Environmental and Social Management Framework	20 minutes	Facilitator
	Sub module Review	5 minutes	All
1.00 - 2.00 P.M	**Lunch Break**	**1 hour**	**All**
	Agricultural Innovation Platforms sub module		
2.00 – 3.30 pm	Introduction, objectives and expectations	5 minutes	Facilitator
	Definition of Agricultural Innovation Systems and different types of innovations	10 minutes	Facilitator
	Dissemination and scaling -Enhancing information flow and learning -Making value chain work -Enhancing resource efficiency -Enhancing innovation and creativity -Enhancing farmer capacity	20 minutes	Facilitator
	Phases of an innovation platform (Initiation, Establishment, Management and Sustenance	20 minutes	Facilitator
	Case studies of a successful Innovation Platform (*Select the nearest to the training venue*)		Facilitator
	Benefits and challenges of AIPS	15 minutes	Facilitator
	Cross cutting factors -Gender issues for inclusivity -Scale: Need to factor this from outset -Policy influencing and advocacy -Communication and capacity strengthening	15 minutes	Facilitator
	Module review	5 minutes	All
	Dairy Policies And Regulations sub module		

3.30 – 5.00 pm	Introduction, expectations and objectives	5 minutes	Facilitator
	Introduction to Dairy Policies and Regulations	5 minutes	Facilitator
	Key Dairy Policies and Regulations	10 minutes	Facilitator
	Compliance and Record-Keeping	5 minutes	Facilitator
	Quality and Safety Standard	10 minutes	Facilitator
	Environmental and Sustainability Regulations	10 minutes	Facilitator
	Health and Animal Welfare Regulations	10 minutes	Facilitator
	Market Access and Trade Regulations	10 minutes	Facilitator
	Consumer Protection Regulations	10 minutes	Facilitator
	Policy Advocacy and Engagement	10 minutes	Facilitator
	Sub module Review	5 minutes	All
	End of training		
	Training Evaluation	30 minutes	All
	Logistics and announcements		
	Official closing and prayer		
	Health Break		
	End of day 7		

Annex 2: General Reference Learning Materials

Annex 3: FFBS Learning Materials

PARTICIPATORY TECHNOLOGY DEVELOPMENT (PTD) ON DAIRY FEEDING MANAGEMENT:

Value Chain	Dairy
Learning Enterprise	Dairy
Funded Enterprise	Dairy VC at production level
Background Problem	Low milk production due to poor feeding
Objective	To increase milk production through use of improved feeds.

Factors to consider:

- Dairy Cattle of same size and age
- Same cattle production
- Same cattle disease management system
- Use of Fodder and commercial feeds

Setting the P.T.D blocks:

- 4 dairy cows as treatments of same breed or type and age
- Different feeds treatments for each of the four dairy cows
- Data collections done from each of the 4 dairy cows
- Other TIMPs should be applied for each cow equally.
- Parasitic control and disease management should also be done equally.

Parameters Measurement

- Milk yields per day
- Milk butter fat content
- Weight of cow

Setting of Blocks

Plot 1 Cow 1 Napier grass		Plot 2 Cow 2 Napier + desmodium		Plot 3 Cow 3 Napier + Commercial supplement (Probiotic)

Annex 4: Livestock Ecosystems Analysis (Lesa) On Dairy Cattle

LESA NO ……

General information

Breed …….

Production System ……

Calving date……

Vaccination date

Time of observation: ……..…..

Production data

Weight of Milk……

Weight of Cow…...…

Butter fat content…..……..

Diagram of pests and natural enemies observed:

Natural enemies of Parasites	Parasites Observed
1	1.
2.	2
3.	3
4.	4.
Observations	Recommendations
Parasites	Spray against ticks
Diarrhea	Control woms

Annex 5 Per Unit Cost Analysis Tool

COST PER UNIT ANALYSIS
PRODUCT -

	Input
Quantity Sold/Served	
Time Frame	

FIXED COSTS		
Item	**Total Cost**	**Allocated Unit Cost**
Average Fixed Cost per Unit		**KES 0.00**
TOTAL FIXED COSTS	**KES 0.00**	

VARIABLE COSTS		
Item	**Total Cost**	**Cost per Unit**
	KES 0.00	
	KES 0.00	
	KES 0.00	
	KES 0.00	
	KES 0.00	
	KES 0.00	
Average Variable Cost per Unit		**KES 0.00**
TOTAL VARIABLE COSTS	**KES 0.00**	

AVERAGE TOTAL COST PER UNIT		**KES 0.00**
TOTAL COSTS	**KES 0.00**	
TOTAL COST PER UNIT		
TOTAL REVENUE	-	
TOTAL COST		
GROSS MARGIN / Month	-	

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