





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

TRAINING OF TRAINERS' MANUAL



Kasina, M., Kimitei, R., Toroitich, D., Kimani C, Mulwa, J., Guantai, M., Kilonzo, J., Kinyanjui. J.M., Ndungu, N., Makelo, M., Murage, A., Ndubi, J., Wambua, S.M., Maichomo, M., Mungube E, Nyambati E, Kirigua V.O., Changwony K., and Ilatsia E

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Compiled by: Kasina, M., Kimite. R., Toroitich, D., Kimani, C, Mulwa, J., Guantai, M., Kilonzo, J., Kinyanjui, J, M., Ndungu, N., Makelo, M, Murage, A., Ndubi. J., Wambua, S., Maichomo, M., Mungube E, Nyambati, E., Kirigua, V.O., Changwony, K., and Ilatsia, E.

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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 develop and update the Apiculture TIMPs inventory to cover the honey bee and also the stingless bees. To disseminate the TIMPs, this Training of Trainers' Manual has been developed and 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 Apiculture 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 Apiculture ToT Manual, which is expected to herald new ways of delivering training content in a changing agricultural environment.

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

PREFACE

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

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

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

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

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

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

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ABBREVIATIONS AND ACRONYMS

ABIRI	Apiculture and Beneficial Insects Research Institute
AEZ	Agroecological zone
AIP	Agricultural Innovation Platform
ASAL	Arid and Semi-Arid Land
CA	Conservation Agriculture
ССР	Critical Control Point
CIG	Common Interest Group
CL	Critical Limit
CTT	Core Team of Trainers
ESMF	Environmental and Social Management Framework
FFBS	Farmer Field and Business School
FSMS	Food Safety Management System
GBP	Good Beekeeping Practice
Ha	Hectare
НАССР	Hazard Analysis Critical Control Points
ICIPE	International Centre of Insect Physiology and Ecology
IPDM	Integrated Pest and Disease Management
INRM	Integrated Natural Resource Management
IPM	Integrated Pest Management
ISFM	Integrated Soil Fertility Management
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	Kenya Climate Smart Agriculture Project
NBI	National Beekeeping Institute
ОН	One Health
SDLD	State Department for Livestock Development
TIMPs	Technologies, Innovations and Management Practices
ТоТѕ	Trainer of Trainers
VMG	Vulnerable and Marginalized Group



INTRODUCTION

About this manual

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

PART I

This part consists of four sections: Background of the Apiculture Value Chain, Content of the Training, Training Design and Facilitators Guidelines.



SECTION 1: BACKGROUND

1.1 The Role of Apiculture in the Kenyan Economy

Apiculture, the art and science of beekeeping, is an important and integral industry that Kenya relies on to expand the economy. The country has an estimated annual production potential of 100,000 MT. However, the actual production is still low. Data from State Department for Livestock (SDL) Development for the year 2021 indicates that the country produced 17,265 MT of honey and 5,800 MT of beeswax. This was from an estimated 846,384 traditional log hives, 305,228, Kenya Top Bar Hives (KTBH), 264,121 Langstroth hives and 23,857 Box hives. The national honey consumption is estimated at 47,500 MT (FAO (2019). There is therefore an annual supply deficit of about 30,235 MT. This implies that Kenya is a net importer of honey.

- i. Apart from direct contribution to the income through hive products, apiculture has a diversified role in the Kenyan economy. For example, the following can describe some of its impacts:
- ii. Supporting food production through provision of pollination service for both crops and forage plants. The average contribution is about 30% of the yield of the plants of interest, with some depending totally on bees to work.
- iii. Among the agriculture and livestock enterprises, apiculture is one of the easiest to integrate because it does takes up minimal land space, time and finances.
- iv. Apiculture is a climate smart enterprise. It integrates well with activities geared towards protection and maintenance of the environment. The pollination services are required in both agricultural and wild environments.
- v. Communities bordering wildlife continue to benefit from protection by bees since wildlife is scared of bees, which thus provide natural protection, minimizing human-wildlife conflict.
- vi. Apiculture industry has seen progressive expansion since independence. In 2021, it contributed approximately KES 13.5 billion from honey and 1.06 billion from beeswax thus demonstrating its potential to contribute to economy and employment opportunities in the country.
- vii. Most of the Kenyan land mass is arid and semi-arid, which is best suited for apiculture. The increasing government intervention on the sub-sector is likely to tilt its growth to better, considering the recent creation of an apiculture research institution within KALRO.

1.2 Role of Apiculture in Food and Nutrition Security

The frontline apiculture product, honey, is rich in nutrition and provides carbohydrates, proteins, fats, vitamins and diverse minerals which are important for human health (Figure 1). Honey is a product highly valued as food and used in preparing various diets, across the globe. It is also known to play a major role in times of food shortage especially in beekeeping regions where it is used to provide energy and other nutritional values to the affected communities.

Honey is further used as a medicine or tonic and as a special treat for children. In the advent of COVID-19 pandemic, honey played a major role to relieve pains either alone or in combination with herbs such as garlic, lemon and ginger.



Figure 1: Nutritional Value of Honey

Source: FAO (2019)

1.3 Climate Smart Perspectives in Apiculture

Apiculture has an impact on both crops and livestock production systems directly through the provision of pollination service which in turn is responsible for reproductive success and ensuing productivity. Advance climatic conditions that negatively affect plants have a direct impact on bees since they depend on plants for their feed and nutrition resources. Thus, apiculture is a valued sub-sector that contributes to climate change interventions through protection of their resources as well as being an indicator of ecosystem health. It is appreciable that communities that have adopted apiculture are more receptive to implementing climate smart innovations and management practices. The apiculture technologies, innovations and management practices developed, target enhancement of productivity and commercialization of the value chain, while ensuring communities are resilient to climate challenges.

1.4 One Health Perspectives in Apiculture

One Health (OH) approach recognizes the health of humans, animals (domestic and wild) and Environment (cultivated/wild plants, ecosystems) are closely linked and interdependent (Figure 1). Through this approach, multiple sectors, disciplines and communities are mobilized to understand drivers of one health and thus contribute to improving human, animal and environmental health outcomes. It recognizes that climate change has increased health security risks of public health importance such as the infectious disease outbreaks that have increased significantly since 1980s and

highlights the need for pandemic preparedness and national plans for resilience. Apiculture, the art and science of beekeeping, is both an animal and environmental enterprise considering that bees are animals while honey, the main hive product, is a plant-based product. Further, bees are pollinators of both cultivated and wild plants, impacting directly to the health of humans and environment. Its production and marketing system has some vulnerabilities associated with one health. Stakeholders across the value chain are called upon to understand their role in contributing to one health positivity.



Figure 2: One Health Triad

Source: One Health concept. © HIOH / UNA[H]RT DESIGN

1.5 Commercialization Perspectives in Apiculture

Apiculture value chain is highly robust in Kenya where consumption of honey is estimated at 47 million metric tons annually while production is a paltry 17 million metric tons annually. This shows the country is importing large quantities of honey to meet the demand. It provides impetus for investment in production systems that support trade. The government Bottom up Economic Transformation Agenda (BETA), 2022-2027, categories honey as one of the commodities that should work towards reduction of exports. As such, beekeeping practices that are compliant to the market needs are more desirable. Training beekeepers on agribusiness skills thus will contribute immensely to a commercial-oriented beekeeping enterprise development in the country. The focus is ensuring commercial products are fully expounded and included in the value chain promotion from production to consumption. Apiculture has diversified products and services ranging from production, food, cosmetics to medicinal as well as protection. Only honey seems to have advanced commercial lines, hence the need to improve on the value chain diversification.

1.6 Objectives of the Training

The purpose of the training is to empower and refresh trainees with knowledge and skills needed to commercialize the apiculture value chain. This manual provides guidance to the master trainers on how to deliver the training programme and ensure maximum skill development for the trainees. The trainees are expected to customize their training back in their counties to ensure lead beekeepers and beekeeping groups are fully updated on beekeeping practices as well as available market access opportunities.

This skill empowerment and refresher course will be delivered through theoretical and practical sessions for five (5) days, ensuring the trainees are equipped with necessary apiculture skills to cascade to other training levels.

1.7 Reference

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SECTION 2: TRAINING CONTENT

2.1 Orientation of the Modules

The training content is organized into 14 modules, 21 sub modules with a total of 209 sessions, inclusive of introduction and review.

2.3 Modules Outline

Each of the modules or sub modules has an outline consisting of eight parts as follows:

- a. Introduction to the module 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
- i. Reference materials for trainees

The 13 modules and submodules are described below in Table 1:

Table 1: Summary	of the 14 module	outlines for the A	piculture value chain

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
1	Climate Smart Agriculture			
2	Farmer Field and Business School	Skills for exploratory learning to enhance adoption and uptake of TIMPS	FFBS approach and concepts in pyrethrum value chain outlined	6 hours 30 minutes
3	Good Beekeeping Practices and Food safety	Knowledge on good beekeeping and food safety practices	Good beekeeping and food safety practices described	35 minutes
4	Introduction to Beekeeping			
	4.1: Honey bees	Knowledge of basic bee biology and domestication	Awareness of how bees live understood and explained	1 hour 45 minutes

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
	4.2: Bee Breeding	Know-how on how to increase bee colonies	Methods of increasing hive occupancy outlined	1 hour 25 minutes
	4.3: Bee Hives	Knowledge on various hive types and their specifications	Best hive technologies elaborated	1hours 40 minutes
5	Management of bee colonies			
	5.1: Apiary	Knowledge on how to house and protect bee colonies	Types of housing and protection of colonies described	1 hour 30 minutes
	5.2: Bee handling	Know-how on bee handling	Bee handling understood and described	1 hour
	5.3: Husbandry practices	Knowledge on provisioning of bees	bee provisioning described	1 hour 30 minutes
	5.4: Bee health	Knowledge on bee pest and disease management	Bee pests and diseases and their management described	1 hours 5mins
6	One health	Understanding of one health in relation to apiculture value chain	One health concept defined and described	5 hours 20 minutes
7	Harvest and post- harvest practices	Skills in harvesting and post-harvest activities	Harvest and post- harvest practices outlined	1 hours 40 minutes
8	Apiculture Products and Services			
	8.1: Quality Assurance	Knowledge on products quality assurance	All aspects of quality assurance defined and explained	50 minutes

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
	8.2: Value Addition	Know-how on value addition in apiculture value chain	Value addition in apiculture described	1 hours 45 minutes
	8.3: Apiculture Services	Knowledge on pollination services by bees	Pollination services by bees described	45 minutes
9	Stingless beekeeping			
	9.1: Stingless bees	Knowledge on stingless bees biology and domestication	Stingless bee biology and domestication described	1 hour
	9.2: Stingless bee Hives	Knowledge on stingless bee hives	Types of stingless bee hives listed and described	35 minutes
10	Management of stingless bee colonies			
	10.1:Stingless bee apiary	Know how on housing and protecting stingless bee colonies	Housing and protection of stingless bee colonies explained	30 minutes
	10.2: Stingless bee husbandry	Knowledge on provisioning and protection of stingless bees	Provisioning and protection practices for stingless bees outlined	35 minutes
11	Stingless beekeeping harvest and post- harvest practices			
	11.1: Stingless bee harvest and post-harvest	Know-how on harvest and post- harvest practices in stingless beekeeping	Harvest and post- harvest practices in stingless beekeeping demonstrated	35 minutes
	11.2: Stingless bee honey value addition	Skills in stingless bee honey value addition	Value addition for stingless bee honey articulated	35 minutes

No.	Module Name	Need Addressed	Expected Training Outcomes	Duration
12	Nutritional Benefits of Apiculture Products	Knowledge on the nutritional benefits of honey and other hive products	Nutritional Benefits of honey and other hive products outlined	55 minutes
13	Agribusiness and Marketing	Awareness of business options available in apiculture Value chain	Agribusiness opportunities and empowerment described	2 hrs
14	Cross Cutting Themes in Apiculture			
	14.1 Apiculture Gender, Vulnerable And Marginalized Groups (VMGS), Socio, Environmental Concerns and Cohesion	Understanding of the women, youth and VMGS equal access to and benefits to resources (credit, land technologies, Innovations, management practice, voice decision making)	Youth, women and VMGs empowerment to access the resources understood and explained	1 hours 30 mins
	14.2: Apiculture Innovation Platforms	Knowledge on innovation platforms	Definition and attributes of innovation platforms identified and described.	hours
	14.3: Policy Issues in Apiculture	Understanding of impact of policy environment on apiculture value chain	Policy issues governing apiculture value chain business environment explained and described	
ΤΟΤ	'AL			35 hours 58 minutes

SECTION 3: TRAINING DESIGN

3.1 Delivery System

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

- a) Establishment of a team of facilitators
- b) A Core Team of Trainers (CTT) (Master Trainers) who will be the trainers of the farmer trainers (service providers). They will be the facilitators of this ToT course. The master trainers will use this manual and modules therein to implement the training course. Each of the Master trainers will facilitate trainers of farmers and other stakeholders to acquire knowledge and skills in facilitating Farmer-led Field and Business Schools through practical demonstrations.
- c) Up scaling This will be done by identifying and 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 will be drawn from KALRO, relevant Universities, Tertiary Institutions and State Department of Livestock Development to facilitate initial trainer of trainers (ToTs) and other stakeholders. They will also provide backstopping services.
- b) County Government The County Government through NAVCDP Coordinating Unit will select teams to be trained as TOTs. This will include County technical staff, service providers (SPs), CBFs and other experts who will further cascade the training to CIGs and VMGs. The CPCU will be expected to follow up and backstop the TIMPs training.
- c) Community Based Facilitators -The CBFs will facilitate the CIGs and VMGs. They will be expected to follow up to ensure appropriate adoption at farmers' level. The CBFs will also plan and organize exchange visits to learn best practices.
- d) Lead farmers -These are early adopters or role models at the community level. They are supposed to mentor the CIG and VMG members and to allow their farms to be used as learning sites.
- e) Agripreneurs- Business people whose investments in parts of the value chain is important in spurring social change and conduct of business therein.

3.3 Training Duration

This proposed Apiculture ToT course with 14 modules and 18 sub modules is planned to take a total of 36 hours of training period, excluding 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 such that the facilitator, paying attention to the proposed methods and sessions guidelines shall:

- i) Introduce the module;
- ii) Draw out the participant's expectations;
- iii) Relate participants' expectations with module objectives or learning outcomes;
- iv) Explore the concept and content, switching to different methods of delivery of the content (e.g., group exercise, brainstorming, excursions, plenary discussions and role plays) as the session progresses;
- v) Review the module at the end using participatory approaches such as, one participant reads one summary message and its application; and,
- vi) Distribute the participants' handouts.

SECTION 4: FACILITATOR GUIDELINES

4.1 **Preparation of Training Materials**

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

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

4.2 **Preparation of Training Venue and Sites**

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

- **a.** Training Room Should have adequate space for 25 participants seated in a semi-circle or U shape arrangement and socially distanced 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, a flip chart holder and white wall to act as a projector screen.
- **b. Demonstration Site** Should be within a walking distance from the training venue.
- c. Market Sites These include honey retail outlets (kiosks, stalls, shops and supermarkets), wholesale and aggregation points and processing sites if any. The operators should be informed in advance about the visits. These should not be very far away, preferably less than 10 minutes' drive.

4.3 The Trainees

The trainees who will participate are extension officers, agri-preneurs, lead farmers, educators, service providers and researchers with elaborate training backgrounds in extension and advisory services. They will be drawn from the public and private sector based on considerable experience in training farmers but with minimal facilitative advisory or technology transfer skills. The facilitator should therefore act more of

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

4.4 Training Program

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

4.5 Training Methods

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

Training Method	Description of Method
Plenary presentations	Use of PowerPoint or flip charts and plenary discussions in situations where knowledge and opinion or consensus is required
Group exercises, buzz groups, visits and brainstorming sessions	To be considered where skills are an issue requiring sharing and trying
Role plays and problem-solving exercises	Involves acting, performing or dramatising 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
Farmer Field and Business School Approach	To be a lead method considered most of the time where farmers have organized themselves into groups that have a regular program

Table 2: Description of Training Method

4.6 Planning Schedule and Guideline for ToT Preparation

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

- 1. Six weeks recruit master trainers, compose CTT and identify demonstration plots/sites with appropriate apiculture activities
- 2. Four weeks send out invitation letters to participants and special guests detailing purpose, venue and program. Follow up on demonstration sites. Brief CTT members.
- **3.** Two weeks confirm names of participants; reproduce training materials for facilitators and package, confirm preparedness of the field sites to be visited. Hold briefing of CTT members to finalize training plan. Confirm special guests if any
- 4. Four days Confirm training sites preparedness, prepare sitting arrangements, and brief assistants
- 5. One day arrange training room furniture, place materials, equipment and stationery on the tables. Arrange for reception of trainees at residence proposed.
- 6. On first day arrange for reception of trainees at the training venue. Ensure climate setting is done before the course is officially opened. This includes:
 - Registration
 - Welcoming to venue by host
 - Elaborate introduction of CTT and participants
 - Introduction to the project and training course
 - Ground rules
 - Group formation

4.7 Evaluation of the Training

Half a day has been allocated for planning for the way forward and evaluation of the ToT on the last day of the training. This is as presented in the program just presented in section 4.4. The evaluation strategy should take two directions, the first being the individual trainees being evaluated through evaluation forms without conferring or refereeing to each other. The evaluation forms are then collected and analyzed by the CTT members.

Aspect / Module	Rating		
	Very Useful (3 marks)	Useful (2 marks)	Of Limited Use (1 marks)
Module 1: Climate Smart Agriculture			
Module 2: Farmer Field and Business School			

Table 3: Sample Evaluation Form

Module 3: Good beekeeping practice and Food safety		
Module 4: Introduction to Beekeeping		
Sub Module 4.1: Honeybees		
Sub Module 4.2: Bee breeding		
Sub Module 4.3: Bee hives		
Module 5: Management of bee colonies		
Sub Module 5.1: Apiary		
Sub Module 5.2: Bee handling		
Sub Module 5.3: Husbandry practices		
Sub Module 5.4: Bee Health		
Module 6: One Health		
Module 7: Harvest and post-harvest practices		
Module 8: Apiculture Products and Services		
Sub Module 8.1: Quality Assurance		
Sub Module 8.2: Value Addition		
Sub Module 8.3: Apiculture Services		
Module 9: Stingless beekeeping		
Sub Module 9.1: Stingless bees		
Sub Module 9.2: Stingless bee Hives		
Module 10: Management of stingless bee colonies		
Sub Module 10.1:Stingless bee apiary		
Sub Module 10.2:Stingless bee husbandry		
Module 11: Stingless beekeeping harvest and post-harvest practices		
Sub Module 11.1: Stingless bee harvest and post-harvest		
Sub Module 11.2: Stingless bee honey value addition		
Module 12: Nutritional benefits of apiculture Products		

Module 13: Agri- business and Marketing		
Module 14: Cross Cutting Themes in Apiculture		
Sub Module 14.1 Apiculture Gender, Vulnerable and Marginalized Groups (VMGS), Socio, Environmental Concerns and Cohesion		
Sub Module 14.2: Apiculture Innovation Platforms		
Sub Module 14.3: Policy Issues in apiculture		
Sub Module 14.1 Apiculture Gender, Vulnerable and Marginalized Groups (VMGS), Socio, Environmental Concerns and Cohesion Sub Module 14.2: Apiculture Innovation Platforms Sub Module 14.3: Policy Issues in apiculture		

The second direction for evaluation is trainee's group evaluation. They retreat to one room and elect a chair and a secretary. Ask them to objectively and constructively evaluate the training in about 45 minutes, in the absence of the CTT members. They then present their evaluation to the CTT members and as they present, the CTT members should only give points of clarifications if any misunderstanding occurred but not try to be defensive. The CTT members then use the two evaluation results to write a report highlighting aspects that went on well and can be replicated, challenges that were encountered, and opportunities for future ToT's improvement.

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

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, 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 available as electronic copies – mainly PDFs. The service providers are strongly advised to keep these electronic copies on a memory stick, compact disc or portable hard drive to enable farmers to easily access and if necessary, print any of them out at a local internet café. Trainers will be advised to issue one general beekeeping manual to be accompanied by two other publications e.g. information sheets, brochures, factsheets and posters. With subsequent training modules, they can develop their collection of publications.





PART II: TRAINING MODULES



MODULE 1: CLIMATE SMART AGRICULTURE PRACTICES IN APICULTURE PRODUCTION SYSTEMS

1.1 Introduction to the Module

Climate change is a barrier to sustainable global development, with many regions experiencing negative effects on agricultural and livestock systems. Developing countries, particularly those in Sub-Saharan Africa, such as Kenya, have experienced 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 sector is not only impacted upon by climate change but also contributes to the problem through human activity. Apiculture has low carbon emission foot print estimated at $0.38-0.48 \text{ kg CO}_2\text{e/kg}$ (Pignagnoli et al., 2021). this is negligible compared with the livestock emissions, e.g. 20 Mt CO₂e in 2010. 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.

Kenyan apiculture contributes significantly to family income generation, helping not just the general population but also women and youth. Thriving in diverse environments, apiculture demonstrate efficiency in converting plant-based nectar into high-quality food, with a smaller environmental footprint compared to most agriculture enterprises. Despite concerns about their susceptibility to shifting weather patterns, the use of appropriate breeds can enhance their adaptability to a changing climate. This highlights the need for 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.

1.2 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.

1.3 Importance of CSA

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. Fourthly, 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, the limited awareness among farming communities about the potential impacts of climate change necessitates urgent efforts to create awareness and enhance their capacity for adaptation.

1.4 Module objectives

This module on climate-smart agriculture practices seeks to explain the fundamental principles of climate science and outline the current scenario of climate change in relation to the apiculture industry. It highlights the factors contributing to the adverse impacts of climate change on apiculture productivity. Additionally, the module emphasizes positive Technological Innovations and Management Practices (TIMPs), that enhance adaptation to climate change. These interventions contribute to increased resilience and improved food security in the face of evolving climatic conditions. Specifically, this module intends to answer the following questions:

- What is climate change and what are its causes?
- How will climate change affect the apiculture industry?
- What is climate smart agriculture within the apiculture industry?

What are practical solutions that apiculture producers can put into practice to deal with climate change effects?

1.3 Module Learning Outcomes

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

- Define climate change
- Explain the causes of climate change

- Describe the principles of climate-smart agriculture •
- Identify climate change impacts along the apiculture value chain and food security
- Define apiculture TIMPs and some basic approaches to their validation and . dissemination
- Describe some climate smart agriculture practices in the apiculture value chain e.g. value addition.
- Indicate by clear examples of how climate smart agriculture practices along ٠ the apiculture value chain resulting with increased adaptation and resilience to climate change; and, in the reduction of GHG emissions.

1.4 **Module Target Groups**

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

1.5 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 participant's handouts and training reference materials.

1.6 **Module duration**

The Module is estimated to take 1 hour

1.7 Module Summary							
Climate Smart Agriculture Practices							
Sessions	Training methods	Training materials	Time				
1.7.1 Module Introduction, outcomes and expectations	 Personal introductions Power-Point slides 	 Flips charts Felt pens LCD Projector 	5 minutes				
1.7.2 Understanding climate change	 Power-Point slides Plenary discussion 	 Flips charts Felt pens LCD Projector Upload Handouts 	15 minute				
1.7.3 The effects of climate change on the apiculture industry and food security	 Power-Point slides Group work Plenary discussion 	 Flips charts Felt pens LCD Projector Upload 	10 minute				

Handouts

1

minutes

minutes

1.7.4 Climate smart agriculture and apiculture value chain -specific practices	 Power-Point slides Group work Plenary discussion 	 Flips charts Felt pens LCD Projector Upload Handouts 	25 minutes
1.7.5. Module review	 Power-Point slides Plenary discussion 	 Flips charts LCD Projector Upload Handouts 	5 minutes
TOTAL			

1.8 Facilitator's Guidelines

Climate Smart Apiculture Management Practices				
1.8.1 Introduction, outcomes and expectations (5 minutes)	Session Guide			
The facilitator introduces the module and invites participants to introduce themselves and state their expectations. The facilitator presents modules	Summarize participants "expectations" using cards/ flip charts.			
learning outcomes and expectations.	PowerPoint presentation			
	Upload handouts at the end of the module			
1.8.2 Understanding climate change (15 minutes)	Session guide			
The facilitator makes a presentation on climate	PowerPoint presentation			
change; - causes, effects, and mitigation) (10 minutes)	Plenary discussion			
Plenary discussion (5 minutes)				
The participants recall what they learnt and discuss any issues that may arise.				
Questions are answered during this session.				
1.8.3 Climate change impacts on Apiculture systems and food security (10 minutes)	Session guide			
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The facilitator makes a presentation on the effects of climate change on apiculture systems and food security and guides the participants in discussing the impact of climate change on food security (5 minutes)	PowerPoint presentation Plenary discussion			
Effects of climate change on apiculture				
How does agriculture contribute to climate change?				
The link between climate change and food security				
Plenary discussion (5 minutes)				
Question and answer session.				
Sharing of experiences and practical discussions on climate change in livestock systems and food security				
1.8.4 Climate Smart Apiculture TIMPs Definitions and Context-Specific Practices (25 minutes)	Session guide			
Climate smart Apiculture TIMPs definitions and	PowerPoint presentation			
context specific practices (15 minutes)	Flip charts			
The facilitator makes a PowerPoint presentation	Group work			
through adaptive research and their dissemination. The presentation will also address the CSA practices that ameliorate climate change effects on the apiculture value chain	Plenary discussions			
Characteristics of CSA and why CSA?				
Principles of climate-smart agriculture (Triple wins)				
Plenary discussion (5 minutes)				
Group Work (5 minutes)				
Participants to conceptualize and provide examples of CSA TIMPs and climate smart apiculture practices				
1.8.5 Module review (5 minutes)	Session guide			
<i>The facilitator leads the participants in reviewing the module</i> Summarize and review the main points of the module	Recap of the key take- home points using any of the following participatory			
with the participants.	methods:			
Identify new concepts in the module?	Q & A session			
What are the problems and issues addressed.	Discussions			
Highlight the take-home messages?	Questionnaires			
	Any other			

1.9 Participants' Handouts and Training 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.
- Pignagnoli, A., Pignedoli, S.; Carpana, E.; Costa, C. and Dal Prà, A. (2021) Carbon Footprint of Honey in Different Beekeeping Systems. Sustainability 2021, 13, 11063. https://doi.org/10.3390/su131911063

MODULE 2: FARMER FIELD AND BUSINESS SCHOOL (FFBS) APPROACH IN APICULTURE 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" means that all stakeholders need to participate and gain ownership of the process. The vision inherent in Farmer Field and Business Schools is that trainers work alongside farmers as advisors and facilitators, encouraging independence, analysis and organization.

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

2.2 Module Learning Outcomes

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

- 1. Concept of Farmer Field and Business School approach in the Apiculture value chain, teaching and facilitating described and explained.
- 2. Approaches on facilitating FFBS participatory learning process and developing FFBS curriculum, in Apiculture value chain, demonstrated and explained
- 3. Knowledge and analytical skills to design simple experiments for testing and selecting the best option to mitigate the constraints of the Apiculture value chain mapped identified and explained.

- 4. Knowledge on engaging FFBS to shift from the subsistence production and focus on improving productivity towards farming business described and demonstrated
- 5. Knowledge and skills on disseminating TIMPS through a well-defined action plan that is specific, measurable, achievable realistic and time bound (SMART) identified and explained in Apiculture value chain

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 directly with farmer groups at community level and lead farmers

2.4 Module Users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT), Lead Farmers and agri-prenuers in the Apiculture 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.

Module 2. 7 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 Flip charts and Marker pens 	5 minutes	
2.6.2 Overview of FFBS key activities	Presentations and plenary discussions	Pictorials,Projector	15 minutes	
2.6.3 Introduction to Communication and communication skills	Plenary presentation, group discussions	 Laptop Projector Flip charts and felt pens 	15 minutes	
2.6.4 Facilitation and leadership skills	Presentation and plenary	LaptopProjector.	15 minutes	
2.6.5 Organization and management in FFBS	Plenary Presentation	LaptopProjector.	15 minutes	

2.6 Module Summary

2.6.6 Developing FFBS Curriculum for the Apiculture value chain	Group discussion and presentation, and plenary presentation	 Laptop Projector Flip charts Felt pens 	25 minutes
2.6.7 FFBS marketing tools	Group discussion and presentation and plenary presentation	LaptopProjectorFlip chartsFelt pens	10 minutes
2.6.8 SMART County action plan of Apiculture value chain on the transfer of TIMPS	Group discussion and presentation and plenary presentation	LaptopProjectorFlip chartsFelt pens	15 minutes
2.6.9 Module review	Discussions Conclusions and way forward	Flip chartsLaptopProjector	5 minutes
Total			2 hours

2.7 Trainers Guidelines to FFBS establishment and operations

 (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 Apiculture 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. 	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

•	Describe and explain the shift from the traditional focus on subsistence farming to improving productivity for enhanced farming business Identify and explain a well-defined action plan for TIMPs dissemination that is specific, measurable, achievable realistic and time bound (SMART)	
2.7 mi	.2 Overview of FFBS key activities (15 nutes)	Session guide
Ple	nary presentation	• PowerPoint
The	e facilitator takes the trainees through the main	presentation
<i>cor</i> • •	acepts and pillars of FFBS which includes: Definition of FFBS Participatory technology development (PTD) for the Apiculture value chain TIMPS Livestock Ecosystems Analysis (LESA) of the Apiculture value chain Concept of what is this what is that FFBS principle of Integrated production and pest management (IPPM)	
•	FFBS Business concept and opportunities in the Apiculture value chain stages	
• 2.7 Co	FFBS Business concept and opportunities in the Apiculture value chain stages .3 Introduction to Communication and mmunication skills (15 minutes)	Session guide
• 2.7 Co Gr	FFBS Business concept and opportunities in the Apiculture value chain stages .3 Introduction to Communication and mmunication skills (15 minutes) oup exercise	Session guide Group exercise
2.7 Co Gr Ga • • • Ple	FFBS Business concept and opportunities in the Apiculture value chain stages .3 Introduction to Communication and mmunication skills (15 minutes) oup exercise uge the understanding of trainees on: What communication is, Communication channels, Barriers to effective communication How to effectively communicate. mary presentation Communication and communication skills	 Session guide Group exercise and presentations on flip charts and PowerPoint presentation Participants' handouts
2.7 Co Gr Ga • • • Ple • 2.7	FFBS Business concept and opportunities in the Apiculture value chain stages .3 Introduction to Communication and mmunication skills (15 minutes) oup exercise uge the understanding of trainees on: What communication is, Communication channels, Barriers to effective communication How to effectively communicate. nary presentation Communication and communication skills .4 Facilitation and leadership skills (15	 Session guide Group exercise and presentations on flip charts and PowerPoint presentation Participants' handouts
2.7 Co Gr Ga • • • Ple • 2.7 min	FFBS Business concept and opportunities in the Apiculture value chain stages .3 Introduction to Communication and mmunication skills (15 minutes) oup exercise uge the understanding of trainees on: What communication is, Communication channels, Barriers to effective communication How to effectively communicate. mary presentation Communication and communication skills .4 Facilitation and leadership skills (15 nutes)	 Session guide Group exercise and presentations on flip charts and PowerPoint presentation Participants' handouts Session guide

• • •	Difference between facilitation and teaching Definition of leadership Elements of leadership Types of leadership Characteristics of a good leader	So	scion guido
2.7 mi	nutes)	565	ssion guide
Pla	nary presentation on FFRS implementation	•	PowerPoint
an	d framework (30 minutes)		presentation
•	Ground working	•	Participants'
•	Training of Facilitators		handouts
•	Establishing PTDs at the FFBS		
•	Season long FFBS sessions		
•	Evaluation of PTDs		
•	Field days		
•	Graduation		
•	Establishment of Lead FFBS		
•	Follow ups.		
2.7	.6 Developing FFBS Curriculum for the	Ses	ssion guide
Ap	iculture value chain (25 minutes)		
Ple	enary presentation	•	PowerPoint
	ng of Doutiningtowy to she alsory days low mont on the		nrecentation
Ste	ps of Participatory technology development on the		
Ste Ap	iculture value chain production	•	Group exercises
Ste Ap	Identify the major constraints to increased	•	Group exercises
Ste Ap	iculture value chain production Identify the major constraints to increased yields of hive products in Apiculture value	•	Group exercises
Ste Ap	Identify the major constraints to increased yields of hive products in Apiculture value chain production	•	Group exercises
Ste Ap	Identify the major constraints to increased yields of hive products in Apiculture value chain production Ranking of constraints in order from highest.	•	Group exercises
Ste Ap	Identify the major constraints to increased yields of hive products in Apiculture value chain production Ranking of constraints in order from highest. Identify list of TIMPS to address the constraints	•	Group exercises
Ste Ap	Identify the major constraints to increased yields of hive products in Apiculture 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	•	Group exercises
Ste Ap •	Identify the major constraints to increased yields of hive products in Apiculture 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	•	Group exercises
Ste Ap	Identify the major constraints to increased yields of hive products in Apiculture 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	•	Group exercises
Ste Ap • •	Identify the major constraints to increased yields of hive products in Apiculture 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	•	Group exercises
Stee Ap	Identify the major constraints to increased yields of hive products in Apiculture 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 Apiculture	•	Group exercises
Stee Ap	Identify the major constraints to increased yields of hive products in Apiculture 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 Apiculture developmental stages	•	Group exercises
Stee Ap	Identify the major constraints to increased yields of hive products in Apiculture 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 Apiculture developmental stages Calendar for the Apiculture value chain	•	Group exercises
Stee App • • • • • • • • • • • • • • • • •	ps of Participatory technology development on the iculture value chain production Identify the major constraints to increased yields of hive products in Apiculture 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 Apiculture developmental stages Calendar for the Apiculture value chain oup exercises	•	Group exercises
Stee App • • • • • • • • • • • • • • • • • •	ps of Participatory technology development on the iculture value chain production Identify the major constraints to increased yields of hive products in Apiculture 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 Develop FFBS curriculum using Apiculture developmental stages Calendar for the Apiculture value chain oup exercises Pairwise matrix ranking of constraints and	•	Group exercises
Stee App • • • • • • • • • • • • • • • • •	ps of Participatory technology development on the iculture value chain production Identify the major constraints to increased yields of hive products in Apiculture 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 Apiculture developmental stages Calendar for the Apiculture value chain oup exercises Pairwise matrix ranking of constraints and TIMPs in Apiculture value chain	•	Group exercises
Stee App • • • • • • • • • • • • • • • • • •	ps of Participatory technology development on the iculture value chain production Identify the major constraints to increased yields of hive products in Apiculture 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 Apiculture developmental stages Calendar for the Apiculture value chain oup exercises Pairwise matrix ranking of constraints and TIMPs in Apiculture value chain Curriculum development based on the	•	Group exercises
Ste Ap	ps of Participatory technology development on the iculture value chain production Identify the major constraints to increased yields of hive products in Apiculture 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 Develop FFBS curriculum using Apiculture developmental stages Calendar for the Apiculture value chain oup exercises Pairwise matrix ranking of constraints and TIMPs in Apiculture value chain Curriculum development based on the Apiculture value chain	•	Group exercises
Stee App • • • • • • • • • • • • • • • • • •	Identify the major constraints to increased yields of hive products in Apiculture 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 Develop FFBS curriculum using Apiculture developmental stages Calendar for the Apiculture value chain oup exercises Pairwise matrix ranking of constraints and TIMPs in Apiculture value chain Curriculum development based on the Apiculture value chain developmental stages	•	Group exercises

 Plenary presentation on curriculum development Constraint identification and ranking TIMPS options identification and ranking Identification of the growth stages of the Apiculture value chain Development of Apiculture FFBS training curriculum 	
 2.7.7 FFBS Marketing tools 10 Minutes Plenary presentation Introduction to marketing concept Marketing planning Market survey Group exercise Profitability determination 	 PowerPoint presentation, projector, flip charts, felt pen Group exercise on using market information for margin determination
2.7.8 Module review (5 minutes)	Session guide
 (Facilitator leads the trainees in reviewing the module) Plenary Presentation and Discussion Participants Questions and answers Facilitators Summary 	• PowerPoint presentation,

2.8 Reference Materials

2.8.1 Participants' handouts

- FFBS factsheets
- Training notes
- PowerPoint presentations

2.8.2 Reference

- 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 BEEKEEPING PRACTICE AND FOOD SAFETY

3.1 Introduction

Apiculture can provide a source of income to many smallholder farmers. Good beekeeping practices (GBPs) and biosecurity measures in beekeeping are those integrative activities that beekeepers apply to obtain optimal health for humans (consumers), honeybees and the environment. Therefore, the implementation of GBPs would have a positive effect on colony health and society, and at the same time could favour high production standards. Such practices are general measures, valid for beekeeping activities and are globally accepted. They are not disease-specific and are meant to be implemented by beekeepers in primary production of hive products. They are the tools for beekeepers to successfully address the challenges they face in day-to-day apiary management. Biosecurity measures in beekeeping are all the operational activities implemented by beekeepers to reduce the risk of introduction and spread of specific honeybee disease agents. Good beekeeping practices and biosecurity measures are the basis for a sustainable and resilient beekeeping sector.

3.2 Module Learning Outcomes

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

- Threats to bees' performance and food safety understood and discussed
- Good beekeeping practices explained
- Impact of good bee keeping practices described
- Biosecurity measures in beekeeping identified

3.3 Module Target Group

This module targets service providers who include county extension staff and private service providers, and lead beekeepers.

3.4 Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT) and farmer (bee keepers) trainers. The trainers using this module should thoroughly familiarize themselves with the participant's handouts and training reference materials.

3.5 Module Duration

The duration of the sub module is estimated to be 1 hour.

Module 4: Good beekeeping practices and food safety					
Sessions Training Methods		Training Materials	Duration		
3.6.1 Introduction and leveling of expectations	 Discussions Plenary presentations 	 Projector Copy of Module Objectives 	10 minutes		
3.6.2 Threats to bee performance and food safety	 Discussions Plenary presentations 	 Projector Handouts Notebooks	15 minutes		
3.6.3 Impact of good beekeeping practices	 Plenary discussions Discussion	 Projector Handouts Notebooks	15 minutes		
3.6.4 Biosecurity measures in beekeeping	 Plenary discussions Discussion	 Projector Handouts Notebooks	10 minutes		
3.6.5 Module review	 Plenary discussions Discussion	Q&A session	5 minutes		
TOTAL			1 hour		

3.6 Module Summary

3.7 Facilitator's Guidelines

3.7.1. Introduction and Leveling Expectations 105	Session Guide
minutes)	
Introduction (The facilitator welcomes trainees to the module Good beekeeping practice and food safety, then asks the trainees introduce themselves and state their expectation for the module). The facilitator then presents the module objectives.	• Summarize Participants' "Expectations" and display them through PowerPoint presentation
 Module Objectives By the end of the module trainees should be able to: Identify main threats to bee performance Outline some of the good beekeeping practices and their impact Describe some of the biosecurity measures in beekeeping 	 Distribute to Participants' Handouts on module objectives
3.7.2 Threats to bee performance and food safety (15 minutes)	Session guide
Plenary discussion (The facilitator describes the main threats to bee performance, their sources and food safety) The facilitator makes a PowerPoint presentation on threats to bee performance	PowerPoint presentation and discussion
 The presentation highlights: Importance of bees to the ecosystem Threats to bee performance Sources of threats to bees Food safety Discussion 	• Distribute
• Let the trainees recall what they learned and discuss any issues that may arise	Participant's
2.7.2 Impact of good hashessing mosting (15	nandout
minutes)	Session Guide
Plenary discussion(The facilitator should describe the impact of good bee keeping practices)The facilitator makes a PowerPoint presentation on impact of good beekeeping practices	• PowerPoint presentation and discussion

 The presentation highlights: Good beekeeping practices Positive impact of good bee keeping practices Discussion Let the trainees recall what they learned and discuss any other issue that may arise 	• Distribute Participant's handout
3.7.4 Biosecurity measures in beekeeping (10 minutes)	Session Guide
Plenary discussion (5 min)	• PowerPoint
(The facilitator describes some of the biosecurity measures in beekeeping)	discussion
The facilitator makes a PowerPoint presentation on impact of good beekeeping practices	
The presentation should highlight:	
• Introduction to Biosecurity measures in beekeeping	
 List of some of the Biosecurity measures 	
Discussion (5 min)	• Distribute
• Let the trainees recall what they learned and discuss any other issue that may arise	Participant's handout
3.7.5 Module Review (5 minutes)	Session Guide
Plenary Presentation and Discussion (20 minutes)	Recap of the key take
 (The facilitator should let the trainees present their views on each of the sessions covered under this module. On flip charts, list summarize the key points they should emphasize when training farmers). Review together with the trainees the main points good beekeeping practices and food safety module. 	 home points using any of the following participatory methods: Q & A session Discussions Any other
 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? 	Distribute Participants' handout on module review

3.8 Reference Materials

3.8.1 Participants Handouts

- List of harmonized good beekeeping practices
- List of harmonize biosecurity measures in beekeeping.

3.8.2 References

- FAO. 2020. Good beekeeping practices: Practical manual on how to identify and control the main diseases of the honeybee (*Apis mellifera*). TECA – Technologies and practices for small agricultural producers, 1. Rome. <u>https://doi.org/10.4060/ ca9182en</u>
- FAO, IZSLT, Apimondia and CAAS. 2021. Good beekeeping practices for sustainable apiculture FAO Animal Production and Health Guidelines No. 25. Rome. https://doi.org/10.4060/cb5353en
- Winfree, R., Reilly, J.R., Bartomeus, I., Cariveau, D.P., Williams, N.M. & Gibbs, J. 2018. Species turnover promotes the importance of bee diversity for crop pollination at regional scales. Science, 359(6377): 791–793. https://doi. org/10.1126/science. aao2117.

MODULE 4: INTRODUCTION TO BEEKEEPING

Sub Module 4.1: Honey Bees

4.1.1 Introduction

Bees are part of the biodiversity on which we all depend for survival. There are many different species of bees in the world. A few species of bees are kept to produce honey. This module aims to introduce beekeeping, the advantages of beekeeping, and different honey bee species used in honey production. This module also covers bee biology, colony transfer, estimating colony strength and attracting and retaining bees.

4.1.2 Sub Module Learning Outcomes

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

- Importance of beekeeping explained
- Bee biology discussed
- Honey bee types in Kenya explained and described
- Bee colony transfer defined and explained
- Estimating bee colony strength in a bar hive elaborated and explained
- Attracting and retaining bees in hives discussed and explained

4.1.3 Sub Module Target Group

This module targets service providers who include county extension staff and private service providers and lead farmers

4.1.4 Sub Module Users

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

4.1.5 Sub Module Duration

This module is estimated to take a minimum of 1 hour and 45 minutes.

Sub Module 4.1: Honey Bees				
Sessions	Training methods	Training materials	Duration	
4.1.6.1 Introduction, objectives and expectations	 Self- introductions Presentation Discussion 	 Felt pens, masking tapes and glue Flip charts LCD projector Handouts 	5 minutes	
4.1.6.2 Introduction to beekeeping	 Discussion Plenary presentation 	 Felt pens, masking tapes and glue Flip charts LCD projector Handouts 	5 minutes	
4.1.6.3 Bee Biology	DiscussionPlenary presentation	 Flip charts Felt pens LCD projector Handouts 	30 minutes	
4.1.6.4 The East African lowland honey bee	DiscussionPlenary presentation	 Flip charts Felt pens LCD Projector Handouts 	5 minutes	
4.1.6.5 The East African mountain honey bee	DiscussionPlenary presentation	 Flip charts Felt pens Participants' handouts 	5 minutes	
4.1.6.6 The East African Coastal Honey Bee	 Discussion Plenary presentation 	Flip chartsFelt pensHandouts	5 minutes	
4.1.6.7 Sahelian honey bee	DiscussionPlenary presentation	 Flip charts Felt pens LCD projector Handouts 	5 minutes	
4.1.6.8 Colony transfer	 PowerPoint presentations Plenary discussion 	 Flip charts Felt pens LCD projector Handouts 	15 minutes	

4.1.6 Sub Module Summary

4.1.6.9 Estimating colony strength in a bar hive	 PowerPoint presentations Plenary discussion 	 Flips charts PowerPoint projector Handout 	10 minutes
4.1.6.10 Attracting and retaining bees in hives	PresentationDiscussion	 Felt pens, masking tapes and glue Flip charts LCD projector Handouts 	10 minutes
4.1.6.11 Sub Module Review	 Group exercise Presentation of group exercise Discussions 	 Flip charts Felt pens Participants' handouts 	10 minutes
TOTAL			1 hour 45 minutes

4.1.7 Facilitator's Guidelines

Sub Module 4.1: Honey Bees	
4.1.7.1 Introduction, Objectives and Expectations (20 minutes)	Session Guide
 Introduction (The facilitator welcomes trainees to the module on honey bees. They are then invited to introduce themselves and state their expectations) Module Objectives (The facilitator presents sub-module objectives) By the end of the training module the trainee should be able to: Describe the importance of beekeeping Explain the different castes found in a bee colony and the lifespan of each (bee biology) Differentiate the species of bees used for honey production in Kenya Understand and explain colony transfer Demonstrate how to estimate bee colony strength in a bar hive Explain how to attract and retain bees in hives discussed and explained 	 Summarize trainees' "expectations" and display. PowerPoint presentation Distribute participants' handouts Training Program

4.1.7.2. Introduction to beekeeping (5 minutes)	Session Guide
 Plenary Presentation The facilitator makes a presentation on: The importance of beekeeping Social and economic importance of bees 4.1.7.3 Bee biology (30 minutes) Plenary Presentation highlighting: Different honey bee castes Characteristics of the different honey bee castes Discussion Let the participants recall what they learned and discuss any issues that may arise	 PowerPoint presentation Distribute participants' hand- outs Session Guide PowerPoint presentation Plenary Discussion
4.1.7.4. The East African lowland honey bee (5 minutes)	Session Guide
 Plenary Presentation Characteristics of the East African lowland honey bee Regions where the East African lowland honey bee is found 	 PowerPoint presentation Distribute participants' hand- outs
4.1.7.5 The East African mountain honey bee (5 minutes)	Session Guide
 4.1.7.5 The East African mountain honey bee (5 minutes) Plenary presentations highlighting: Characteristics of the East African mountain honey bee Regions where the East African mountain honey bee is found 	 Session Guide PowerPoint presentation Distribute participants' hand- outs
 4.1.7.5 The East African mountain honey bee (5 minutes) Plenary presentations highlighting: Characteristics of the East African mountain honey bee Regions where the East African mountain honey bee is found 4.1.7.6 The East African Coastal Honey Bee (5 minutes) 	 Session Guide PowerPoint presentation Distribute participants' hand- outs Session Guide
 4.1.7.5 The East African mountain honey bee (5 minutes) Plenary presentations highlighting: Characteristics of the East African mountain honey bee Regions where the East African mountain honey bee is found 4.1.7.6 The East African Coastal Honey Bee (5 minutes) Plenary presentations highlighting: Characteristics of the East African coastal honey bee Regions where the East African coastal honey bee Regions where the East African coastal honey bee Regions where the East African coastal honey bee 	 Session Guide PowerPoint presentation Distribute participants' hand- outs Session Guide PowerPoint presentation Distribute participants' hand- outs
 4.1.7.5 The East African mountain honey bee (5 minutes) Plenary presentations highlighting: Characteristics of the East African mountain honey bee Regions where the East African mountain honey bee is found 4.1.7.6 The East African Coastal Honey Bee (5 minutes) Plenary presentations highlighting: Characteristics of the East African coastal honey bee Regions where the East African coastal honey bee Regions where the East African coastal honey bee in the East African coastal honey bee 4.1.7.7 Sahelian honey bee (5 minutes) 	 Session Guide PowerPoint presentation Distribute participants' hand- outs Session Guide PowerPoint presentation Distribute participants' hand- outs Session Guide

4.1.7.8 Colony transfer (15 minutes)	Session Guide
 Plenary presentations highlighting: The facilitator presents on: What is colony transfer Objectives of colony transfer How to transfer colonies How to settle bees after settling in a new site Discussions Questions/answers and comments 	 PowerPoint presentation Distribute participants' hand- outs
4.1.7.9 Estimating bee colony strength in a bar hive	Session Guide
(10 minutes)	
 Plenary presentations highlighting: How to estimate bee colony strength Importance of estimating bee colony strength 4.1.7.10 Attracting and Retaining bees in hives (10 minutes) Plenary presentations highlighting: 	 PowerPoint presentation Distribute participants' hand- outs Session Guide PowerPoint presentation
 Methods that can be used to attract bees Important practices that help to retain bees in a hive 	 Distribute participants' hand- outs
4.1.7.11 Sub Module review (10 minutes)	Session Guide
The facilitator leads the trainees in reviewing the module Randomly (average of 10 cases), trainees indicate new lessons learned from the module. The results are recorded	 The last participants' handouts Summarize the main points from the module ona a flip chart and display

4.1.8. Participants' handouts

- Brochure on bee castes
- Colony transfer training notes

4.1.9 References

- GoK (2011). Beekeeping in Kenya Beginners guide. Ministry of Livestock Development, 2011.
- Carroll, T. (2006). A beginner's Guide to Beekeeping in Kenya. The Regal Press Kenya Ltd. ISBN 9966-7078-6-7

- Mann I. (1991). Bees are wealth/Nyuki ni Mali. Kenya Literature Bureau, Nairobi. ISBN 9966-44-090-9
- Peterson P.D. (2006). The Tropical Apiculturist: Beekeeping. Macmillan publishers. ISBN 13:978-0-333-60084-9

Sub Module 4.2: Bee Breeding

4.2.1 Introduction

Bee breeding is the rearing and multiplication of queen bees, which can be achieved through the use of various methods. Over the years, there has been a decline in the bee population, which has in turn resulted in a decrease in productivity in the honey value chain. To achieve bee breeding, desirable properties such as thriving colonies that are disease-resistance, pest-resistance, and high productivity are selected. Learning these breeding methods will help beekeepers to increase the number of colonies in their apiaries.

4.2.2 Module Learning Outcomes

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

- Queen rearing by grafting explained.
- Queen rearing by cell punch discussed.
- Bee breeding by colony splitting outlined.
- Bee breeding by overcrowding explained.
- KTBH Breeder box described.
- Bar and framed hive breeder Box described.

4.2.3 Module Target Group

This module targets service providers who include county extension staff and private service providers and lead farmers in the apiculture value chain.

4.2.4 Module Users

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

4.2.5 Module Duration

This module is estimated to take a minimum of 1 hour 25 minutes.

4.2.6 Module Summary

Sub Module 4.2: Bee Breeding			
Sessions	Training methods	Training materials	Duration
4.2.6.1 Introduction, objectives and expectations	 Self-introduction Plenary Presentation Plenary discussions 	Flips chartsFelt pensLaptopProjector	5 minutes
4.2.6.2 Queen rearing by grafting	 Plenary presentation Plenary discussions Case study video 	Flips chartsFelt pensLaptopProjector	15 minutes
4.2.6.3 Queen rearing by cell punch	 Plenary Presentation Plenary discussion Case study video 	 Flips charts Felt pens Laptop Projector Participants' handouts 	10 minutes
4.2.6.4 Bee breeding by colony splitting	 Plenary Presentations Plenary discussions 	 Flips charts Felt pens Laptop Projector Participants' handouts 	15 minutes
4.2.6.5 Bee breeding by Overcrowding	 Plenary Presentations Plenary discussions 	 Flips charts Felt pens Laptop for PowerPoint presentation Projector Participants' handouts 	10 minutes
4.2.6.6 KTBH Breeder box	 Group Exercise Plenary Presentations Plenary discussions Field demonstration 	 Flips charts Felt pens Laptop Projector 	10 minutes

4.2.6.7 Bar and framed hive breeder Box	 Plenary Presentations Discussions 	 Flip charts Felt pens PowerPoint Projector 	10 minutes
4.2.6.8 Module Review	Discussions/ conclusion and the way forward	Flip chartsLaptop	10 minutes
TOTAL			1 hour 25 minutes

4.2.7 Facilitator's Guidelines

Sub Module 4.2: Bee Breeding			
4.2.7.1 Introduction, Objectives and Expectations (5 minutes)	Session Guide		
 Introduction (The facilitator welcomes trainees to the module on honey bees. They are then invited to introduce themselves and state their expectations) Sub-Module Objectives (The facilitator presents sub-module objectives) By the end of the training module the trainee should be able to: • Explain what is queen rearing and the importance of queen-rearing	 Summarize trainees' "expectations" and display. PowerPoint presentation Distribute participants' handouts Training Program 		
 Demonstrate queen rearing by grafting Demonstrate queen-rearing by cell punch Demonstrate colony-splitting Demonstrate overcrowding method of bee breeding Explain the role and importance of the KTBH Breeder Box Outline the role and importance of Bar and framed hive breeder Box. 			
4.2.7.2. Queen rearing by grafting (15 minutes)	Session Guide		
 Plenary presentation highlighting: What is queen rearing Importance of queen rearing What is queen rearing by grafting How to identify mother colonies Traits to be considered when selecting mother colonies 	 PowerPoint presentation Distribute participants' hand-outs Discussion 		

 Procedures to be followed when performing grafting Tools required when performing grafting Advantages and disadvantages of queen rearing by grafting Discussion Let the participants recall what they learned and discuss 	
any issues that may arise	
4.2.7.3. Queen rearing by cell punch (10 minutes)	Session Guide
 Plenary presentation Highlighting: What is queen rearing by cell punch How to identify mother colonies Procedures to be followed when performing rearing by cell punch Tools required when using the cell punch method. Advantages and disadvantages of queen rearing by cell punch Discussion Let the participants recall what they learned and discuss any issues that may arise 	 PowerPoint presentation Distribute participants' hand-outs Discussion
4.2.7.4 Bee breeding by colony splitting (15 minutes)	Session Guide
 4.2.7.4 Bee breeding by colony splitting (15 minutes) Plenary presentation Highlighting: What is bee breeding by colony splitting How to identify mother colonies Requirements when carrying out colony splitting Advantages and disadvantages of colony splitting 	 Session Guide PowerPoint presentation Distribute participants' hand-outs Discussion
 4.2.7.4 Bee breeding by colony splitting (15 minutes) Plenary presentation Highlighting: What is bee breeding by colony splitting How to identify mother colonies Requirements when carrying out colony splitting Advantages and disadvantages of colony splitting Discussion Let the participants recall what they learned and discuss any issues that may arise 	 Session Guide PowerPoint presentation Distribute participants' hand-outs Discussion
 4.2.7.4 Bee breeding by colony splitting (15 minutes) Plenary presentation Highlighting: What is bee breeding by colony splitting How to identify mother colonies Requirements when carrying out colony splitting Advantages and disadvantages of colony splitting Discussion Let the participants recall what they learned and discuss any issues that may arise 4.2.7.5 Bee Breeding by Overcrowding (10 minutes) 	 Session Guide PowerPoint presentation Distribute participants' hand-outs Discussion

4.2.7.6 KTBH Breeder box (10 minutes)	Session Guide
 Plenary presentation highlighting: What is a KTBH Breeder Box Uses of a KTBH Breeder Box Advantages of using a KTBH Breeder Box Discussion Let the participants recall what they learned and discuss any issues that may arise 	 PowerPoint presentation Distribute participants' hand-outs Discussion
4.2.7.7 Bar and framed hive breeder Box (10 minutes)	Session Guide
 Plenary presentation Highlighting: What is a Bar and framed hive breeder Box Uses of a Bar and framed hive breeder Box Advantages of using a Bar and framed hive breeder Box Discussion Let the participants recall what they learned and discuss any issues that may arise	 PowerPoint presentation Distribute participants' hand-outs Discussion
4.2.7.8 Sub module review (10 minutes)	Session Guide
 (The facilitator leads the trainees in reviewing the module) Together with trainees discuss and summarize the main points from the training. Discuss with trainees about new lessons learned from this Module and issues that need clarification 	 The last participants' handouts Summarize the main points from the module on a flip chart and display

4.2.8 Reference Materials

4.2.8.1 Participants' handouts

- Pamphlet on queen-rearing
- Training notes on Queen Rearing

4.2.8.2 References

Morris Ostrosky – Graft-Free Queen Rearing - <u>https://openbooks.library.umass.edu/</u> <u>radicalizethehive/wp-content/uploads/sites/15/2019/08/Graft-Free-Queen-</u> <u>Rearing-Morris-Ostrofsky.pdf</u>

Queen Rearing by cell punch method <u>https://youtu.be/ uUp9gaYIzQQ?si=8b6Sgo</u> <u>Vwk2AhYxRF</u>

Queen rearing by Grafting https://youtu.be/sM-80-H0rR0?si=bGKb8Pyl-kQocsey

Sub Module 4.3: Bee Hives

4.3.1 Introduction

This sub module aims at creating awareness of different hive types in Kenya. It will also concentrate on innovations as well as technologies leading to the production and use of improved behives that promote high honey production as well as simplified handling operations leading to enhanced livelihoods of the bee-keeping community.

4.3.2 Sub Module Learning Outcomes

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

- 1. Different types of beehives discussed and explained.
- 2. Advantages and disadvantages of different hive types outlined.

4.3.3 Sub Module Target Group

This sub module targets agricultural extension service providers and agri-preneurs in apiculture value chain dealing directly with farmer groups at community level or community facilitators.

4.3.4 Sub Module Users

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

4.3.5 Sub Module Duration

The sub module is estimated to take 1 hour 40 minutes.

Sub module 4.3: Beehives			
Sessions	Training Methods	Training Materials	Duration
4.3.6.1 Introduction, objectives and expectations	 Self- introduction Self introductions Plenary Presentation Plenary discussions 	 Flips charts Felt pens Laptop LCD projector 	5 minutes

4.3.6. Module Summary

4.3.6.2 Improved Kapkuikui super log hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
4.3.6.3 Improved Kenya Top Bar hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
4.3.6.4 Improved single box hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
4.3.6.5 Improved Box hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
4.3.6.6 Warre hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes

4.3.6.7 Two- Queen hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
4.3.6.8 Framed box hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
4.3.6.9 Improved complete log hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
4.3.6.10 Flow hive	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
4.3.6.11 Timber Production for hives	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes

4.3.6.12 Sub	 PowerPoint	 Laptop LCD projector Felt pens Masking tapes	10 minutes
Module	presentation Plenary	and glue Flip charts Participants'	
Review	discussions	handouts	
TOTAL			1 hour 40 minutes

4.3.7 Facilitator's Guidelines

Beehives	
4.3.7.1 Introduction and Leveling Expectations (5	Session Guide
minutes)	
 Introduction (The facilitator introduces the sub module and invites trainees to introduce themselves and state their expectations). The facilitator then presents module objectives and levels out expectations Sub Module Objectives By the end of the sub module trainees should be able to: Identify different types of beehives Explain the advantages and disadvantages of different beehive types Demonstrate knowledge on timber production for bee hives. 	 Summarize trainees expectations using cards or any appropriate method. PowerPoint presentation Distribute participants' handouts on sub module objectives.
4.3.7.2 Improved Kapkuikui super log hive (10 minutes)	Session guide
 Plenary Presentation (5 minutes). (The facilitator makes a presentation on Improved Kapkuikui super log hive) Advantages of using the Improved Kapkuikui super log hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise, 	 PowerPoint presentation and discussion Distribute participants' handouts

4.3.7.3 Improved Kenya Top Bar Hive (10 minutes)	Session Guide
 Plenary Presentation (5 minutes). (The facilitator makes a presentation on Improved Kenya Top Bar Hive) Advantages of using Improved Kenya Top bar Hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise. 	 PowerPoint presentation and discussion Distribute participants' handouts
4.3.7.4 Improved Single Box Hive (10 minutes)	Session Guide
 Plenary Presentation (5 minutes). (The facilitator makes a presentation on Improved Single Box Hive) Advantages of using Improved Single Box Hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 	 PowerPoint presentation and discussion Distribute participants' handouts
4.3.7.5 Improved Box hive (10 minutes)	Session Guide
 Plenary Presentation (5 minutes). (<i>The facilitator makes a presentation on Improved Box hive</i>) Advantages of using Improved Box hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 	 PowerPoint presentation and discussion Distribute participants' handouts
4.3.7.6 Warre hive (5 minutes)	Session Guide
 Plenary Presentation (5 minutes). (<i>The facilitator makes a presentation on Warre hive</i>) Advantages of using Warre hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any 	 PowerPoint presentation and discussion Distribute participants' handouts

4.5.7.7 Two-Queen mye (5 minutes)	Session Guide
 Plenary Presentation (<i>The facilitator makes a presentation on Two - Queen hive</i>) Advantages of using Two - Queen hive in beekeeping Plenary discussion Let the participants recall what they learned and discuss any issues that may arise. 	 PowerPoint presentation and discussion Distribute participants' handouts
4.3.7.8 Framed Box hive (10 minutes)	Session Guide
 Plenary Presentation (5 minutes). (<i>The facilitator makes a presentation on Framed Box hive</i>) Advantages of using Framed Box hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise. 	 PowerPoint presentation and discussion Distribute participants' handouts
4.3.7.9 Improved Complete log hive (10 minutes)	Session Guide
Plenary Presentation (5 minutes). (<i>The facilitator makes a presentation on Improved Complete</i> log hive)	• PowerPoint presentation and discussion
 Advantages of using Improved Complete log hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 	• Distribute participants' handouts
 Advantages of using Improved Complete log hive in beekeeping Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 4.3.7.10 Flow hive (5 minutes) 	Distribute participants' handouts Session Guide

4.3.7.11 Timber production for hives (10 minutes)	Session Guide
 Plenary Presentation (5 minutes). (The facilitator makes a presentation on Timber production for hives) Best trees for production of timber for hives Establishment and care for trees for hive timber production 	 PowerPoint presentation and discussion Distribute participants' handouts
Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise	
4.3.7.12 Module Review (10 minutes)	Session Guide
 Plenary Presentation (10 minutes) (The facilitator leads the trainees in presenting their views on each of the sessions covered under this sub module) Review the sessions' main points together with the trainees What new things did they learn from this sub module? What are some of the issues that they have become more aware of? What questions do they still have? 	Recap of the key take home points using any of the following participatory methods: • Q & A session • Discussions • Any other • Distribute participants' handouts on sub

4.3.8 Reference materials

4.3.8.1 Participants' handouts

- Handout on Improved Kapkuikui super log hive
- Handout on Improved Kenya Top Bar Hive
- Handout on Improved Single Box Hive
- Handout on Improved Box hive
- Handout on Warre hive
- Handout on Two Queen hive
- Handout on Framed Box hive
- Handout on Improved Complete log hive
- Handout on Flow hive
- Handout on Timber production for hives

NB: Could have one handout on types of Beehives and timber production for hives

4.3.8.2 References

- Alexander McMenamin, Fiona Mumoki, Maryann Frazier, Joseph Kilonzo, Bernard Mweu, Tracey Baumgarten, Harland Patch, Baldwyn Torto, Daniel Masiga, James Tumlinson, Christina Grozinger, Elliud MULI (2017). The impact of hive type on the behavior and health of honey bee colonies(*Apis mellifera*) in Kenya. Available from: <u>https://www.researchgate.net/publication/317588108</u> <u>The_impact_of_hive_type_on_the_behavior_and_health_of_honey_bee_ colonies_Apis_mellifera_in_Kenya</u> [accessed Dec 13 2023].
- GoK (2011). Beekeeping in Kenya Beginners guide. Ministry of Livestock Development, (2011).
- Carroll, T. (1997). Beekeeping: a beginner's guide. Baraka Agricultural College, Baraka, Kenya.
- Bees for wealth and health: (Brochure) Ministry of Agriculture & Rural Development, 2000 Nairobi, Kenya.

MODULE 5: MANAGEMENT OF BEE COLONIES

Sub Module 5.1: Apiary

5.1.1 Introduction

This sub-module aims to address issues of apiary housing types and management of predators/bee stressors in apiaries.

5.1.2 Sub-Module Learning Outcomes

By the end of the Sub module, participants will have acquired knowledge and skills on apiary housing types and apiary management aspects. The following outcomes are expected:

- Permanent housing for beehives defined
- Semi-permanent housing for beehives described
- Temporary housing technology for beehives defined
- Open apiary for beehives defined and described
- Swinging wire for honey badger prevention described and explained
- Use of iron sheet against honey badger described
- Hive stand against honey badger described
- Management of predators, wasps and ants in bee colony explained

5.1.3 Sub Module Target groups

This sub module targets beekeepers, County extension staff and private Service providers

5.1.4 Sub Module Users

This sub module is intended for use by Master trainers/trainer of trainers (ToT) in beekeeping/Apiculture value chain who are members of the Core Team of Trainers (CTT).

5.1.5 Sub Module Duration

The Sub Module is estimated to take a maximum of 1 hour 35 minutes.

Sub Module 5.1: Apiary			
Sessions	Training Methods	Training materials	Time
5.1.6.1 Introduction and leveling expectations	PresentationDiscussion	 Participants' handouts Felt pens, masking tapes and glue 	5 minutes
5.1.6.2 Permanent housing for bee hives	PresentationDiscussion	 Participants' handouts Felt pens, masking tapes and glue 	10 minutes
5.1.6.3 Semi- Permanent housing for bee hives	 Group exercise Presentation of group exercise Discussions 	Flip chartsProjector	10 minutes
5.1.6.4 Temporary housing technology for bee hives	 Group exercise Presentation of group exercise Discussions 	 Flip charts Participants' handouts 	10 minutes
5.1.6.5 Open apiary	 Plenary presentation Group discussions 	Flip chartsProjector	10 minutes
5.1.6.6 Swinging wire for honey badger prevention	Plenary presentation	Flip chartsProjector	10 minutes
5.1.6.7 Iron sheets (<i>Mabati</i>) against honey badger	Plenary presentation	Flip chartsProjector	5 minutes
5.1.6.8 Hive stand against honey badger	Plenary presentation	Flip chartsProjector	5 minutes
5.1.6.9 Management of birds and wasps	Plenary presentation	Flip chartsProjector	5 minutes
5.1.6.10 Management of ants	Plenary presentation	Flip chartsProjector	5 minutes

5.1.6 Sub Module summary

5.1.6.11	Plenary	Flip charts	5 minutes
Management of	presentation	Projector	
snakes, lizards and			
rodents			
5.1.6.12	Plenary	Flip charts	5 minutes
Management of	presentation	Projector	
baboons			
5.1.6.13 Sub	Plenary	Flip charts	10 minutes
module review	presentation	Projector	
Total			1 hour 35
			minutes

5.1.7 Facilitator Guidelines

Sub Module 5.1: Apiary	
5.1.7.1 Introduction and Levelling Expectations (5	Session Guide
minutes)	
Introduction	
The facilitator welcomes participants to the Apiary module then invites them to introduces themselves by stating their profile and experience of working with farmers.	 Summarize participants' expectations and display them
(The facilitator invites the participants to introduce themselves and state their expectation for the sub modules).	
Sub Module Objectives	Distribute participant handouts on sub
The facilitator presents modules objectives	module objectives.
By the end of the Sub module participants should be able to:	
 Explain what an apiary is and different approaches in establishing an apiary including housing types Beekeeper's capacity to start up an apiary through different approaches using different housing types Explain apiary site selection Explain the requirements and conditions favorable for a successful apiary 	

5.1.7.2 Permanent housing for bee hives (10	Session Guide
minutes)	
 Plenary presentation Permanent housing for bee hives Features of permanent bee house Plenary discussion	Recap of the key take- home points using any of the following participatory methods:
Let the trainees recall what they learned and discuss any issue that may arise	 Discussions` Distribute participants' handout on module review
5.1.7.3 Semi-Permanent housing for bee hives (10	Session Guide
minutes)	
 Plenary presentation Semi-permanent housing for bee hives Features of semi-permanent bee house 	Recap of the key take home points using any of the following participatory methods:
Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise	 Q & A session Discussions Any other Distribute participants' handout on module review
5.1.7.4 Temporary housing technology for bee	Session Guide
hives (10 minutes)	
 Plenary presentation Temporary housing for bee hives Features of temporary bee house 	Recap of the key take- home points using any of the following participatory methods:
Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise	 Q & A session Discussions Any other Distribute participants' handout on module review
5.1.7.5 Open apiary (10 minutes)	Session Guide
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Plenary presentationFeatures of open apiary	Recap of the key take- home points using
Plenary discussion Let the trainees recall what they learned and discuss	participatory methods:
any issue that may arise	 Q & A session Discussions Any other
	Distribute participants'
	review
5.1.7.6 Swinging wire for honey badger prevention	Session Guide
(10 minutes)	
Plenary Presentation	Recap of the key take-
• Management of honey badger using swinging	home points using
wires	any of the following
Planary discussion	participatory methods:
	• Q & A session
Let the trainees recall what they learned and discuss	 Discussions
any issue that may arise	Any other
	Distribute participants'
	handout on module review
5.1.7.7 Mabati against honey badger (5 minutes)	Session Guide
Plenary Presentation	Recap of the key take-
• Management of noney badger using iron sneets	nome points using
(mabali)	any of the following
Planary discussion	participatory methods.
	• Q & A session
Let the trainees recall what they learned and discuss	 Discussions
any issue that may arise	Any other
	Distribute participants'
	handout on module review
5.1.7.8 Hive stand against honey badger (5 minutes	Session Guide
 Plenary Presentation Management of honey badger using hive stand 	Recap of the key take- home points using any of the following participatory methods:
Plenary discussion	• 0 & A session
Let the trainees recall what they learned and discuss	Discussions
any issue that may arise	Any other
	Distribute participants'
	handout on module review

5.1.7.9 Management of birds and wasps (5 minutes)	Session Guide
Plenary PresentationManagement of birds and wasps	Recap of the key take- home points using
Plenary discussion	participatory methods:
Let the trainees recall what they learned and discuss any issue that may arise	 Q & A session Discussions Any other Distribute participants' handout on module review
5.1.7.10 Management of ants (5 minutes)	Session Guide
 Plenary Presentation Management of ants Plenary discussion 	Recap of the key take- home points using any of the following participatory methods:
Let the trainees recall what they learned and discuss any issue that may arise	 Q & A session Discussions Any other Distribute participants' handout on module review
5.1.7.11 Management of snakes, lizards and	Session Guide
rodents (5 minutes)	
 Plenary Presentation Management of snakes, lizards and rodents 	Recap of the key take- home points using any of the following
Let the trainees recall what they learned and discuss any issue that may arise	 Q & A session Discussions Any other Distribute participants' handout on module review
5.1.7.12 Management of baboons(5 minutes)	Session Guide
Plenary Presentation (The facilitator guides the trainees on the management of baboons).	Recap of the key take- home points using any of the following participatory methods:
Plenary discussion	• Q & A session
Let the trainees recall what they learned and discuss any issue that may arise	 Discussions Any other Distribute participants' handout on module review

5.1.7.13 Review of Sub Module (10 minutes)	Session Guide
• Let's review together the main points as	Distribute
discussed and covered in the Sub module	participants' handouts
• What new things did you learn from this sub	which summarizes
Module?	the main points from
• What are some of the problems and issues that	the Sub Module.
you have become more aware of in key critical	Distribute
areas of the subject matter	participants' handouts
• What questions do you still have on the topic	on sub module
covered in the sub module	review

5.1.8 Reference materials

5.1.8.1 Participants Handouts

• Summary of training notes

5.1.8.2 References

- Carroll, T. 1997. *Beekeeping: a beginner's guide*. Baraka Agricultural College, Baraka, Kenya.
- **DFID.** 2000. *Bees for wealth and health: Wambui finds out.* Ministry of Agriculture & Rural Development, Nairobi, Kenya.

Sub Module 5.2: Bee Handling

5.2.1 Introduction

This sub module aims at addressing matters to do with handling and care of honey bee colonies. The purpose is to ensure secure and peaceful co-existence of bees with humans and livestock. It prepares the beneficiaries of the manual to lessen animosity or fear of bees. It dispels fears of bees and enhances their role in the livelihood of handlers.

5.2.2 Sub Module learning outcomes

By the end of the Sub module, the following should have been achieved:

- How to prevent bee stings described
- How to control attack of bees to people and animals, explained
- How to relocate active bee colony from houses and buildings outlined
- How to avoid livestock and bee conflicts explained

5.2.3 Sub Module Target groups

This Sub module targets practicing beekeepers, individuals interested and desiring to start beekeeping, extension staff and service providers

5.2.4 Sub Module Users

This Sub module is intended for use by Master trainers/trainer of trainers (ToT) in beekeeping/Apiculture value chain who are members of the Core Team of Trainers (CTT).

5.2.5 Sub Module Duration

The Sub Module is estimated to take a maximum of 1 hour.

Sub Module 5.2: Bee handling			
Sessions	Training Methods	Training materials	Time
5.2.6.1 Introduction and leveling expectations	PresentationDiscussion	 Participants' Handouts Felt pens, masking tapes and glue 	5 minutes

5.2.6 Sub Module summary

5.2.6.2 Bee stings prevention	 Presentation Discussion	 Participants' Handouts Felt pens, masking tapes and glue 	10 minutes
5.2.6. Attack on people and animals	 Group exercise Presentation of group exercise Discussions 	 Flip charts Participants' handouts 	10 minutes
5.2.6.4 Honey bee colony relocation from houses and buildings	 Plenary presentation Group discussions 	 Flip charts Participants' handouts 	15 minutes
5.2.6.5 Livestock/ bee conflict management	Plenary presentation	Flip chartsPowerPoint projector	10 minutes
5.2.6.6 Sub module Review	Plenary presentation	Flip chartsPowerPoint projector	10 minutes
Total			1 hour

5.2.7 Facilitators Guidelines

Sub Module 5.2 Bee Handling			
5.2.7.1 Introduction and Levelling Expectations (5	Session Guide		
minutes)			
Introduction			
(The facilitator welcomes participants to the bee handling module and invites the participants to introduce themselves and state their expectation for the sub module).	• Summarize participants' expectations and display them		
Sub Module Objectives			
The facilitator presents sub modules objectives			
By the end of the Sub module participants should be able	• Distribute		
to:	participants'		
• Explain what bee handling entails as listed below	handouts on sub		
• Describe transfers of bee colonies,	module objectives.		
• Demonstrate managing bee stings to both people and animals			
• Elaborate on how to avoid bees/man/livestock conflicts			

5.2.7.2. Bee stings Prevention (10 minutes)	Session Guide
 Procedure to follow when handling bees to avoid stings Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation Distribute participants' hand- outs Discussion
5.2.7.3 Managing honeybees attack to people and animals (10 minutes)	Session Guide
 (The facilitator should be able to guide trainees on how to manage honeybees attack to people and animals) How to site apiaries to prevent attacks Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise	 PowerPoint presentation Distribute participants' hand- outs Discussion
5.2.7.4 Honey bee colony relocation from houses and buildings (15 minutes)	Session Guide
 Plenary presentation Highlighting: Steps to follow when relocating bees (pre- removal preparation, personal protection, timing of removal) How to safely transfer relocated bees to an apiary How to chemically treat a nested area to prevent re-infestation Discussion Let the participants recall what they learned and discuss any issues that may arise 	 PowerPoint presentation Distribute participants' hand- outs Discussion
5.2.7.5 Livestock/bee conflict management (10	Session Guide
Minutes)	
 Management practices that ensure that bees and livestock coexist safely. Site selection for apiary establishment that considers livestock activity Importance of fencing off of apiaries Importance of grazing around hives only at times of bee inactivity. Discussion Let the participants recall what they learned and discuss any issues that may arise	 PowerPoint presentation Distribute participants' hand- outs Discussion

5.2.7.6 Sub module review (10 minutes)	Session Guide
 (The facilitator leads the trainees in reviewing the module) Together with trainees discuss and summarize the main points from the training. Discuss with trainees about new lessons learned from this Module and issues that need clarification 	 The last participants' handouts Summarize the main points from the module on a flip chart and display Distribute participants' handouts on sub module review

5.2.8 Reference materials

5.2.8.1 Participants' Handouts

• Summary of training notes

5.2.8.2 References

- Carroll, T. (2006). A beginner's Guide to Beekeeping in Kenya. The Regal Press Kenya Ltd. ISBN 9966-7078-6-7.
- Mann I. (1991). Bees are wealth/Nyuki ni Mali. Kenya Literature Bureau, Nairobi. ISBN 9966-44-090-9.
- Peterson P.D. (2006). The Tropical Apiculturist: Beekeeping. Macmillan publishers. ISBN 13:978-0-333-60084-9.

Sub Module 5.3: Beekeeping Husbandry Practices

5.3.1 Introduction

This sub module is geared towards equipping users with skills to manage bee feed and nutrition needs as well as supporting hive products productivity. It brings out aspects of farming practices that can enhance floral improvement hence contributing to retaining bees and thus reducing absconding.

5.3.2 Sub Module learning outcomes

By the end of the Sub module, participants will have been achieved:

- Importance of Integrated bee pasture management in high potential areas of Kenya elaborated
- Importance of Integrated bee pasture management in ASALs of Kenya explained
- Integrated bee pasture management for commercial plantations outlined
- Water and Feed supplementation elaborated
- Importance of using floral calendar specific for regions outlined
- Establishment of Bee forage plants for pest management explained

5.3.3 Sub Module Target groups

This Sub module targets beekeepers, farmers, individuals, public and private extension staff, individuals and organizations/Institutions desirous of establishing apiaries

5.3.4 Sub Module Users

This Sub module is intended for use by Master trainers/trainer of trainers (ToT) in beekeeping/Apiculture value chain who are members of the Core Team of Trainers (CTT).

5.3.5 Sub Module Duration

The Sub Module is estimated to take a maximum of 1 hour 35 minutes

Sub Module 5.3: Beekeeping Husbandry Practices			
Sessions	Training Methods	Training materials	Time
5.3.6.1 Introduction and leveling expecta- tions	PresentationDiscussion	 Participants' handouts Felt pens, masking tapes and glue 	5 minutes
5.3.6.2 Integrated bee pasture management for high potential areas	 Presentation Discussion	 Participants' Handouts Felt pens, masking tapes and glue 	15 minutes
5.3.6.3 Integrated bee pasture management for ASALs	 Group exercise Presentation of group exercise Discussions 	 Flip charts Participants' handouts 	15 minutes
5.3.6.4 Integrated bee pasture management for commercial plan- tations	 Plenary presentation Group discussions 	Flip chartsProjector	15 minutes
5.3.6.5 Water and Feed supplementation	Plenary presentation	Flip chartsProjector	10 minutes
5.3.6.6 Floral calendar regional specific	Plenary presentation	Flip chartsProjector	20 minutes
5.3.6.7 Establishment of Bee forage plants for pest management	Plenary presentation	Flip chartsProjector	10 minutes
5.3.6.8 Sub module Review	Plenary presentation	Flip chartsProjector	5 minutes
Total			1 hour 35 minutes

5.3.6 Sub Module summary

5.3.7 Facilitators Guidelines

Sub Module 5.3 Beekeeping Husbandry Practices	
5.3.7.1 Introduction and Levelling Expectations (5 minutes)	Session Guide
Introduction (The facilitator welcomes participants to the sub-module on Beekeeping Husbandry Practices and then invites them to introduces themselves). Sub Module Objectives The facilitator presents sub module objectives	• Summarize Participants' expectations and display them
 By the end of the Sub module trainees should be able to: Explain what Beekeeping Husbandry Practices are elaborate on Integrated bee pasture management for high-potential areas Explain Integrated bee pasture management ASALs Outline water and feed supplementation Develop a floral calendar for specific regions in various Agro-ecological zones Demonstrate establishment of bee forage for pest management. 	• Distribute participant Handouts on sub module objectives.
5.3.7.2 Integrated bee pasture management for high	Session Guide
 Plenary Presentation (The facilitator guides the trainees in integrated bee pasture management for high-potential areas) Establishing of bee flora plants for high potential areas Reseeding of pastures with bee flora Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation Distribute participants' hand-outs Discussion
5.3.7.3 Integrated bee pasture management for ASALs (15 minutes)	Session Guide
 Plenary Presentation (The facilitator guides the trainees in integrated bee pasture management for ASAL areas) Establishing of bee flora plants for ASALs areas Reseeding of pastures with bee flora Plenary discussion Let the trainees recall what they learned and discuss any issues that may rise. 	 PowerPoint presentation Distribute participants' hand-outs Discussion

5.3.7.4 Integrated bee pasture management for commercial plantations (15 Minutes)	Session Guide
 Plenary Presentation (The facilitator should be able to guide the trainees in integrated bee commercial plantations) Cultivation and conservation of bee forage resources in commercial plantations Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise	 PowerPoint presentation Distribute participants' hand-outs Discussion
5.3.7.5 Water and Feed supplementation (10 Minutes)	Session Guide
 Plenary presentation highlighting: What is water and feed supplementation When is water and feed supplementation necessary Feed supplements that can be used/provided Plenary discussion Let the participants recall what they learned and discuss any issues that may arise	 PowerPoint presentation Distribute participants' hand-outs Discussion
5.3.7.6 Region-specific Beekeeping Floral Calendar (15 Minutes)	Session Guide
 Plenary presentation highlighting: How to develop a region-specific floral calendar Plenary discussion Let the participants recall what they learned and discuss any issues that may arise 	
5.3.7.7 Establishment of Bee forage plants for pest management (10 Minutes)	Session Guide
 Plenary presentation Highlighting: Plant species that have pesticidal attributes and are good bee forage plants 	
Discussion Let the participants recall what they learned and discuss any issues that may arise	

5.3.7.8 Sub module review (5 minutes)	Session Guide
 (The facilitator leads the trainees in reviewing the module) Together with trainees discuss and summarize the main points from the training. Discuss with trainees about new lessons learned from this sub module and issues that need clarification 	 The last participants' handouts Distribute participants' handouts on sub module review Summarize the main points from the sub module on a flip chart and display

5.3.8 Reference materials

5.3.8.1 Participants Handouts

• Summary of training notes

5.3.8.2 References

- Carroll, T. (2006). A beginner's Guide to Beekeeping in Kenya. The Regal Press Kenya Ltd. ISBN 9966-7078-6-7.
- Mann I. (1991). Bees are wealth/Nyuki ni Mali. Kenya Literature Bureau, Nairobi. ISBN 9966-44-090-9.

Peterson P.D. (2006). The Tropical Apiculturist: Beekeeping. Macmillan publishers. ISBN 13:978-0-333-60084-9.

Sub-Module 5.4: Bee Health

5.4.1 Introduction to the Sub-module

Bee pests and diseases are one of the major challenges affecting hive occupation, colony strength and productivity. It contributes to over 30% of production losses. While pests feed on bee resources and the bees themselves, they also contaminate the hive environment leading to absconding by bees. Diseases have similar effects, also causing infirmities, deformities and deaths, thereby greatly affecting the colonies and their ability to thrive.

With increasing agricultural activities across the counties, pesticide contamination of the environment is becoming a threat to colony health and general bee population. This has an effect on pollination services thereby affecting food production and biodiversity conservation. It also affects the quality and safety of honey and other bee products.

In order to maintain high production of safe and healthy products of the bees, it is important to focus on maintaining healthy bee colonies. This module will build the capacity of trainees in management of healthy bee colonies.

5.4.2 Sub Module Learning Outcomes

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

- Use of Wax moth and hive beetles traps understood and explained
- Use of open bottom board for managing moths and small hive beetles in bar-hives demonstrated
- Management of Nosema diseases of bees understood and explained
- Management of bacterial diseases of bees described
- Management of bee pesticide poisoning understood and discussed
- Use of Mobile application for bee health surveillance and reporting downloaded and demonstrated

5.4.3 Sub Module target group

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

5.4.4 Sub Module users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT), lead beekeepers, extension service providers and agri-preneurs in apiculture value chains within target counties. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

5.4.5 Sub Module duration

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

Sub-Module 5.4: Bee Health			
Sessions	Training Methods	Training Materials	Duration
5.4.6.1 Introductions, expectations and objectives	 Introductions Plenary Presentation Plenary discussion 	 Flip charts Projector Participants' handouts 	5 minutes
5.4.6.2 Wax moths and hive beetles trap	 Group work Brainstorming sessions Plenary presentation Practical demonstration Video clip Group work 	 Projector Laptop Participants' handouts Honey combs Specimen – Wax moth infested hive Projector 	10 minutes
board for managing moths and small hive beetles in bar-hives	 Oroup work Practical demonstration installing and inspection of open bottom board Video show Brainstorming sessions Plenary presentation 	 Laptop Participants' handouts Hive with open bottom board 	5 minutes
5.4.6.4 Management of <i>Nosema</i> diseases of bees	 Group work Plenary presentation Practical demonstration Video clip 	 Projector Laptop Participants' handouts 	5 minutes

5.4.6 Module Summary

5.4.6.5 Management of bacterial diseases of bees	 Group work Video clip Practical demonstration Plenary presentation 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, honey press, etc.) 	5 minutes
5.4.6.6 Management of bee pesticide poi- soning	 Group work Plenary presentation 	 Projector Laptop Participants' handouts 	10 minutes
5.4.6.7 Mobile app for bee health	 Practical demonstration Brainstorming sessions Plenary presentation 	 Projector Laptop Participants' handouts Android device (phone) Internet connectivity 	15 minutes
5.4.6.8 Sub Module Review	 Facilitator's summary Group exercise 	 Flip charts Projector Laptop Module evaluation forms 	10 minutes
TOTAL			1 hour 5 minutes

5.4.7 Facilitator's Guidelines

Bee Health		
5.4.7.1 Introduction and Levelling of Expectations and Objectives (5 minutes)	Session Guide	
(The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations)	 Participants' handouts Training Program 	
 Introduction and Module Objectives (10 minutes) (<i>The facilitator presents the module's objectives</i>) By the end of the module trainees should be able to: Describe management of wax moths and hive beetles trap 	 PowerPoint presentation 	

 Describe use of open bottom board for managing moths and small hive beetles in bar-hives Explain management of Nosema diseases of bees Describe management of bacterial diseases of bees Explain the management of bee pesticide poisoning Demonstrate the use of a Mobile application for bee health surveillance reporting Expectations Assist the trainees to state their expectations based 	• Summarize trainees' expectations and display them on a flip chart/ board
on the objectives	
5.4.7.2 Management of wax moths and hive beetles	Session guide
trap (10 minutes)	
 Trainees watch clips on hive beetles and wax moths 	 PowerPoint presentation Participants'
Brainstorming	handouts
• Trainees discuss the effect of beetles and wax moths on hive productivity	
5.4.7.3 Open bottom board for managing moths and	Session guide
	Ŭ
small hive beetles in bar-hives (5 minutes)	
 small hive beetles in bar-hives (5 minutes) Group Discussion Trainees to discuss wax moths and hive beetles' identity and effects on bee colonies Practical Demonstration Trainer and trainees to demonstrate the use of the bottom board in management of moths and small hive beetles 	 PowerPoint presentation Participants' handouts Practical demonstration
 small hive beetles in bar-hives (5 minutes) Group Discussion Trainees to discuss wax moths and hive beetles' identity and effects on bee colonies Practical Demonstration Trainer and trainees to demonstrate the use of the bottom board in management of moths and small hive beetles 5.4.7.4 Management of Nosema diseases of bees (5 	 PowerPoint presentation Participants' handouts Practical demonstration
 small hive beetles in bar-hives (5 minutes) Group Discussion Trainees to discuss wax moths and hive beetles' identity and effects on bee colonies Practical Demonstration Trainer and trainees to demonstrate the use of the bottom board in management of moths and small hive beetles 5.4.7.4 Management of Nosema diseases of bees (5 minutes) 	 PowerPoint presentation Participants' handouts Practical demonstration

5.4.7.5 Management of bacterial diseases of bees (5 minutes)	Session guide
 Group Discussion Trainees to discuss bacterial diseases and their predisposing factors Plenary Presentation Trainees to discuss management of bacterial diseases in honeybees 	 PowerPoint presentation Participants' handouts Practical demonstration
5.4.7.6 Management of bee pesticide poisoning (10 minutes)	Session guide
 Group Discussion Trainees to discuss causes and signs of bee pesticide poisoning Plenary Presentation Trainees to discuss prevention of pesticide poisoning in bees 	 PowerPoint presentation Participants' handouts Practical demonstration
5.4.7.7 Mobile application for bee health (15 minutes)	Session guide
 Plenary Presentation Trainees to discuss the mobile based application for surveillance and reporting of bee diseases Practical Demonstration Trainees to download and test run the mobile application on their android devices 	 PowerPoint presentation Participants' handouts Practical demonstration
5.4.7.11 Sub Module review (10 minutes)	Session guide
 (The facilitator leads the trainees in reviewing the module) Plenary presentation Together with the trainees, summarize the main points of the training. Group Exercise Together with the trainees review the main points 	 Summary of the main points from the Module PowerPoint Presentation Distribute participants' handouts on sub
about Bee Health	module review

5.4.8 Reference Materials

5.4.8.1 Participants Handouts

- Bee Health brochures and leaflets
- Bee Health factsheets
- Training Notes on Bee Health

5.4.8.2 References

- Carroll, T. (2006). A beginner's Guide to Beekeeping in Kenya. The Regal Press Kenya Ltd. ISBN 9966-7078-6-7
- Mann I. (1991). Bees are wealth/Nyuki ni Mali. Kenya Literature Bureau, Nairobi. ISBN 9966-44-090-9.
- Peterson P.D. (2006). The Tropical Apiculturist: Beekeeping. Macmillan publishers. ISBN 13:978-0-333-60084-9.

MODULE 6: ONE HEALTH APPROACH FOR SUSTAINABLE APICULTURE

6.1 Introduction to the Module

This module is designed for use in training facilitators of FFBS on the concept of One Health (OH), which is an integrated, unifying approach that aims to sustainably balance and optimize the health of 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 interdependent. 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.

Climate variance, emerging and re-emerging infectious disease threats has contributed to indiscriminate use of antimicrobials and emergence of anti microbial resistance. Agricultural intensification has compromised 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 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 collaboratively increases the likelihood of achieving sustainable food systems.



Figure 3: One Health Triad

Specific challenges requiring redress through OH include zoonoses, anti microbial use/ anti microbial resistance, waste management, biosafety and biosecurity concerns. The production environment for apiculture is exposed to extensive use of antimicrobials that affect bee health and their productivity. Antimicrobial residues find their way to the honey product which compromises its medicinal value and has ill consequences on human health. Besides, antibiotic resistant genes (ARGs) are transferable within the OH Triad components and mitigation is only possible within the OH lens.

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

6.2 Module Learning Outcomes

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

- The OH concept understood and explained
- Components of OH triad identified
- The role of the different collaborators understood and explained
- Appropriate OH practices for increased honey productivity and healthy ecosystem (sustainable apiculture system) identified and recommended
- Knowledge and skills on zoonoses affecting apiculture demonstrated
- Knowledge and skills on AMR demonstrated
- Waste management in relation to OH explained

6.3 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.

6.4 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).

6.5 Module Duration

The Module is estimated to take 55 minutes

One Health Approach In Apiculture			
Sessions	Training Methods	Training Materials	Time
1. Introduction to the module and leveling of expectations	 Plenary presentation Group discussions Plenary presentations 	 Laptop Projector Flip charts and felt pens Sticky notes Note books and pens Participants' handouts 	5 minutes
2. Overview on climate variability and OH outcomes in Apiculture	 Presentation Plenary discussions 	 Laptop Projector Flip charts and felt pens Participants 'handouts 	15 minutes
3. Climate related zoonotic diseases af- fecting Apiculture	 Plenary Presentation Case study videos Plenary discussions 	 Laptop Projector Flip charts and felt pens Participants' handouts 	10 minutes

6.6 Module Summary

4. AMU/AMR	 Plenary Presentation Case study videos Plenary discussions 	 Laptop Projector Flip charts and felt pens Participants' handouts 	10 minutes
5 Environmental health » Waste management » GHG emissions » Carbon sink	 Plenary Presentation Case study videos Plenary discussions 	 Laptop Projector Flip charts and felt pens Participants' handouts 	10 minutes
6. Module review	 Participants' questions and comments Facilitator's summary 	Flip chartsLaptopProjector	5 minutes
TOTAL			55 min- utes

6.7. Facilitator Guidelines

6.7.1. Introduction And Levelling Expectations (5 minutes)	Session Guide
 (The facilitator welcomes participants to the One Health module and introduces self by stating his/her profile and experience of working with farmers and focus on One Health space). Trainees' expectation (10 minutes) The facilitator organizes the trainees into groups to come up with their expectations Module Objectives The facilitator introduces the module objectives. By the end of the training module the trainee should be able to: Understand and explain the OH concept Identify the components of OH triad. Explain 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 Apiculture Demonstrate knowledge and skills on AMR Explain on waste management in relation to OH 	 PowerPoint presentation Distribute participants' handouts Refer to participants' expectations on a flip chart to track progress

6.7.2. Overview on climate variability and OH outcomes (15 minutes)	Session Guide
 (The facilitator guides the participants in relating climate variability and OH outcomes that negatively impact health and Apiculture. 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
6.7.3. Climate related zoonotic diseases affecting Apiculture (<i>10 minutes</i>)	Session Guide
 (The facilitator will guide the participants in identifying climate related zoonotic diseases affecting Apiculture 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
6.7,4. Antimicrobial use and antimicrobial resistance (AMU/AMR) (10 Minutes)	Session Guide
 (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 	 PowerPoint presentation Participants' handouts

In plenary discussion ask them to share the farmers' experiences with antimicrobials and treatment failure – antibiotics, acaricides, pesticides etc	
6.7.5. Environmental health (10 minutes)	Session Guide
 (The facilitator guides the participants in identifying climate related adverse environmental health impacts). 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 	 PowerPoint presentation Participants' handouts
6.7.8 Module review (5 minutes)	Session Guide
<i>(Facilitator leads the trainees in reviewing the module)</i> Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise	

6.8 Reference Materials

6.8.1 Participants' handouts

- FFBS factsheets
- Training notes
- PowerPoint presentations

6.8.2 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. ISBN 978-92-5-136957-9.

MODULE 7: HARVEST AND POST-HARVEST PRACTICES IN APICULTURE VALUE CHAINS

7.1 Introduction to the Module

Inappropriate harvesting and postharvest handling methods are major causes of post-harvest loss and wastage along the apiculture value chain. Loss of quality and quantity in bee products is partly attributed to improper handling during harvesting and improper storage, leading to increased moisture levels, spoilage, contamination and pest damage. This can have a far reaching effect on the safety of the product, its marketability, keeping quality and shelf life.

Farmer facilitators should be equipped with knowledge in management strategies for controlling harvesting and post-harvest losses, to enable them to support beekeepers with the required information to secure high returns from investments in apiculture through adopting improved on-farm harvesting and storage handling practices. Widespread dissemination of the available climate smart TIMPs through farmer awareness, training and demonstrations can reduce the losses. This module is designed to train beekeepers' facilitators in product harvesting methodologies and post-harvest handling to reduce losses and enhance the quality of the products. The products covered are honey, bee propolis, bee pollen, bee venom, royal jelly and beeswax.

7.1 Module Learning Outcomes

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

- Harvesting Indicators identified and described
- · Honey harvesting and pre- processing handling explained
- Honey processing understood and explained
- Honey packaging described
- Honey storage and transportation recounted
- Pollen harvesting and identification discussed

7.2 Module target group

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

7.4 Module users

This module is intended for use by Master Trainers who are members of the Core Team of Trainers (CTT), lead beekeepers, extension service providers and agri-preneurs in apiculture value chains within target counties. The facilitators using this module should thoroughly familiarize themselves with the participants' handouts (training materials).

7.5 Module duration

The Module is estimated to take a minimum of 1hour 40 minutes.

Module 3: Harvest and Post-Harvest Practices in Apiculture Value Chains			
Sessions	Training Methods	Training Materials	Duration
7.6.1 Introduc- tions, expecta- tions and objec- tives	 Personal introduction Plenary Presentation Plenary discussion 	 Flip charts PowerPoint presentation Participants' handouts 	5 minutes
7.6.2 Harvesting Indicators	 Group work Brainstorming sessions Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Honey combs 	5 minutes
7.6.3 Honey harvesting and pre-processing handling	 Group work Brainstorming sessions Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Glass, plastic and stainless steel honey handling equipment 	15 minutes

5.6 Module Summary

7.6.4 Honey processing by centrifuge	 Group work Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, honey centrifuge, etc.) 	10 minutes
7.6.5 Honey press processing	 Group work Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, honey press, bucket or drum, honey sieve etc.) 	10 minutes
7.6.6 Honey processing by dripping	 Group work Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, straining cloth, bucket or drum, etc.) 	10 minutes
7.6.7 Honey processing by straining	 Group work Brainstorming sessions Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, straining equipment, settling tanks, etc.) 	10 minutes

7.6.8 Honey packaging	 Group work Brainstorming sessions Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, Packaging equipment and materials, etc.) 	10 minutes
7.6.9 Honey stor- age	 Group work Brainstorming sessions Plenary presentation Practical demonstration 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, Packaging equipment, storage barrels etc.) 	5 minutes
7.6.10 Honey transportation	 Group work Brainstorming sessions Plenary presentation 	 Projector Laptop Participants' handouts Materials for practical demonstration (Honey, Packing equipment, transportation barrels - if available, etc.) 	10 minutes
7.6.11 Sub Mod- ule Review	 Facilitator's summary Group exercise 	 Flip charts Projector Laptop Module evaluation forms 	10 minutes
TOTAL			1 hours 40 minutes

7.7 Facilitator's Guidelines

Bee Products Harvesting and Post-Harvest Manageme	nt
7.7.1 Introduction and Levelling of Expectations and Objectives (5 minutes)	Session Guide
 (The facilitator welcomes trainees to the module and invites them to introduce themselves and state their expectations) Introduction and Module Objectives (The facilitator presents the module's objectives) By the end of the module trainees should be able to: Identify the Harvesting Indicators in honey Describe Honey harvesting and pre-processing handling Describe Honey Processing methods Explain correct honey packaging techniques Explain honey storage and transportation techniques Expectations Assist the trainees to state their expectations based on the objectives 	 Participants' handouts Training Program PowerPoint presentation Summarize trainees' "Expectations" and display them on flip chart/ board.
7.7.2 Harvesting Indicators of honey (5 minutes)	Session guide
 Plenary presentation The facilitator presents the objectives of the session By the end of the session, the trainee should be able to Know what to look for before harvesting Determine the best time (months, period) to harvest honey Determine Best time of the day to harvest honey Know the importance of timing harvesting Plenary Discussion Trainees discuss the honey Harvesting Indicators and consequences of not being keen on the same 	 PowerPoint presentation Participants' handouts
7.7.3 Honey harvesting and pre-processing handling (15 minutes)	Session guide
Plenary presentationThe facilitator presents the objectives of the sessionBy the end of the session, trainees should be able tounderscore• Items required for harvesting• Preparations for harvesting	 PowerPoint presentation Participants' handouts Practical demonstration

 Activities during harvesting Hive care during and after harvesting Honey and wax handling after harvest Bee care after harvesting Plenary Discussion Facilitator to lead trainees in discussing the preparatory activities and safe handling of honey prior to processing	
7.7.4 Honey Processing by Centrifuge (10 minutes)	Session guide
 Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Preparation for processing honey using centrifuge method How to handle a centrifuge equipment Honey handling after extraction Waste management Returning of combs after processing Plenary Discussions Trainees to discuss the extraction of honey from comb by use of a centrifuge Trainees to operate the centrifuge equipment 	 PowerPoint presentation Participants' handouts Practical demonstration
7.7.5 Honey Processing by Honeypress (10 minutes)	Session guide
 Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Preparation for processing honey using honey- press method How to handle a honey-press equipment Honey handling after extraction Waste management Plenary Presentation Trainwarts discuss the extraction of the session 	 PowerPoint presentation Participants' handouts Practical demonstration
 Trainees to discuss the extraction of honey from comb by use of a honey press Trainees to practice use of the honey press 	

7.7.6 Honey Processing by Dripping (10 minutes)	Session guide
 Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Preparation for processing honey using dripping method How to handle the honey dripping tools Honey handling after extraction Waste management after extraction Plenary Discussion Trainees to discuss the extraction of honey using the dripping method Trainees to practically experience the tools and their assemblage 	 PowerPoint presentation Participants' handouts Practical demonstration
7.7.7 Honey Processing by Straining (10 minutes)	Session guide
 Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Preparation for processing honey using straining method How to handle a honey straining tool Honey handling after extraction Waste management Plenary discussions Trainees to discuss the extraction of honey by use of straining method Trainees to practice use of the straining method 	 PowerPoint presentation Participants' handouts Practical demonstration
7.7.8 Honey Packaging Techniques (10 minutes)	Session guide
 Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Methods used to package honey Equipment available for honey packaging Methods of packaging honey, advantages and disadvantages Quality control while packaging honey 	 PowerPoint presentation Participants' handouts Practical demonstration

 Plenary Discussion Trainees to discuss common methods of honey packaging, advantages and disadvantages Trainees experience some packages used for honey packaging 	
7.7.9 Honey Storage (5 minutes)	Session guide
 Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Methods of honey storage and storage practices Purpose of storing honey Conditions for honey stores 	 PowerPoint presentation Participants' handouts Practical demonstration
 Plenary discussions Trainees to discuss characteristics of good honey store 	
Trainees to identify honey storage tools	
Trainees to identify honey storage tools 7.7.10 Honey Transportation (10 minutes)	Session guide
 Trainees to identify honey storage tools 7.7.10 Honey Transportation (10 minutes) Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Characteristics of transport systems in Kenya Requirements for good transport systems for honey and other hive products Effective communication across the transportation chain Honey handling in transit 	 Session guide PowerPoint presentation Participants' handouts Practical demonstration
 Trainees to identify honey storage tools 7.7.10 Honey Transportation (10 minutes) Plenary presentation The facilitator presents the objectives of the session By the end of the session, trainees should be able to underscore Characteristics of transport systems in Kenya Requirements for good transport systems for honey and other hive products Effective communication across the transportation chain Honey handling in transit 	 Session guide PowerPoint presentation Participants' handouts Practical demonstration

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

7.8 **Reference Materials**

7.8.1 Participants Handouts

- Apiculture brochures and leaflets
- Honey harvesting and Post-harvest management factsheets
- Training notes on honey harvesting and post-harvest management
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7.8.2 References

- Carroll, T. (2006). A beginner's Guide to Beekeeping in Kenya. The Regal Press Kenya Ltd. ISBN 9966-7078-6-7.
- Mann I. (1991). Bees are wealth/Nyuki ni Mali. Kenya Literature Bureau, Nairobi. ISBN 9966-44-090-9.
- Peterson P.D. (2006). The Tropical Apiculturist: Beekeeping. Macmillan publishers. ISBN 13:978-0-333-60084-9.

MODULE 8: APICULTURE PRODUCTS AND SERVICES

Sub Module 8.1: Quality Assurance

8.1.1 Introduction

This sub module brings trainees to the attention of the requirements for keeping high standards in handling honey as a food material. It brings to the attention of the trainees the opportunities available in apiculture value chain that require attention to comply with quality provisions in hive products systems. Further, quality assurance cuts across all the production systems in apiculture, including equipment and inputs used in the value chain.

8.1.2 Sub Module Learning Outcomes

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

- The composition and quality requirements of honey and hive products identified
- Sources of contamination in honey and hive products identified
- Methods of detecting honey adulteration described
- Role of geographical indications in honey quality and sustainability demonstrated and explained

8.1.3 Sub Module Target Group

This module targets service providers, who include county extension staff and private service providers, export and local traders and lead beekeepers

8.1.4 Sub Module Users

This module is intended for use by master trainers who are members of the Core Team of Trainers (CTT) and farmer (bee keepers) trainers. The trainers using this module

should thoroughly familiarize themselves with the participant's handouts and training reference materials.

8.1.5 Sub Module Duration

The duration of the sub module is estimated to be 50 minutes.

Sub Module 8.1: Qual	ity Assurance		
Sessions	Training Methods	Training Materials	Duration
8.1.6.1 Introduction and leveling of expectations	DiscussionsPlenary presentations	 Projector Copy of Module Objectives 	5 minutes
8.1.6.2 Quality and hygiene requirements for honey and other hive products	 Plenary discussions Discussion	ProjectorFlip chartsHandoutsNotebooks	10 minutes
8.1.6.3 Sources of contaminants in honey and other hive products	 Plenary discussions Discussion	 Projector Flip charts Handouts Notebooks	10 minutes
8.1.6.4 How to identify honey adulteration	 Plenary discussions Discussion Classroom demonstration 	 Projector Flip charts Handouts Notebooks 	10 minutes
8.1.6.5 Role of geographical indications in honey quality	 Plenary discussions Discussion	 Projector Flip charts Handouts Notebooks	10 minutes
8.1.6.6 Quality monitoring of inputs and equipment	 Plenary presentation Plenary discussions 	 Projector Flip charts Handouts Notebooks	5 minutes
8.1.6.7 Sub Module review	 Plenary discussions Discussion	Q&A session	5 minutes
TOTAL			50 minutes

8.1.6 Sub Module Summary

8.1.7 Facilitator's Guidelines

8.1.7.1. Introduction and Leveling Expectations (5	Session Guide	
Introduction	Summarize	
(The facilitator welcomes trainees to the module Quality assurance, and invites them to introduce themselves and state their expectation for the module). The facilitator then presents the module objectives.	Participants' "Expectations" and display them through PowerPoint presentation	
Sub Module Objectives	• Distribute to Participants'	
By the end of the module trainees should be able to:	Handouts on module objectives	
• List quality requirements for honey and other hive products		
 Identify sources of contaminants in honey and other hive products 		
 Explain methods of easy detection of honey fraud before export 		
 Outline the indicators of quality honey 		
8.1.7.2 Quality and hygienic requirements for hive products (10 minutes)	Session guide	
8.1.7.2 Quality and hygienic requirements for hive products (10 minutes) Plenary discussion	Session guide PowerPoint 	
8.1.7.2 Quality and hygienic requirements for hive products (10 minutes) Plenary discussion (The facilitator explains the differences between good and poor quality honey as well as hygienic handling)	Session guide • PowerPoint presentation and discussion	
 8.1.7.2 Quality and hygienic requirements for hive products (10 minutes) Plenary discussion (The facilitator explains the differences between good and poor quality honey as well as hygienic handling) The facilitator gives a PowerPoint presentation on quality and hygienic requirements for hive products 	Session guide • PowerPoint presentation and discussion	
 8.1.7.2 Quality and hygienic requirements for hive products (10 minutes) Plenary discussion (The facilitator explains the differences between good and poor quality honey as well as hygienic handling) The facilitator gives a PowerPoint presentation on quality and hygienic requirements for hive products The presentation should highlight: 	Session guide • PowerPoint presentation and discussion	
 8.1.7.2 Quality and hygienic requirements for hive products (10 minutes) Plenary discussion (The facilitator explains the differences between good and poor quality honey as well as hygienic handling) The facilitator gives a PowerPoint presentation on quality and hygienic requirements for hive products The presentation should highlight: Definition of quality honey Handling hygiene and food safety challenges on honey 	Session guide • PowerPoint presentation and discussion	
 8.1.7.2 Quality and hygienic requirements for hive products (10 minutes) Plenary discussion (The facilitator explains the differences between good and poor quality honey as well as hygienic handling) The facilitator gives a PowerPoint presentation on quality and hygienic requirements for hive products The presentation should highlight: Definition of quality honey Handling hygiene and food safety challenges on honey Quality requirements 	 Session guide PowerPoint presentation and discussion Distribute Participant's 	
 8.1.7.2 Quality and hygienic requirements for hive products (10 minutes) Plenary discussion (The facilitator explains the differences between good and poor quality honey as well as hygienic handling) The facilitator gives a PowerPoint presentation on quality and hygienic requirements for hive products The presentation should highlight: Definition of quality honey Handling hygiene and food safety challenges on honey Quality requirements 	 Session guide PowerPoint presentation and discussion Distribute Participant's handout 	
Plenary discussion (The facilitator describes the major sources of contaminants in honey that affects quality and market access)• PowerPoint presentation and discussionThe facilitator makes a PowerPoint presentation on sources of contaminants in honey and other hive products•The presentation highlights: • Sources of contaminants•biscussion•Discussion Let the trainees recall what they learned and discuss any other issue not mentioned•Plenary discussion (The facilitator makes a PowerPoint presentation (10 min) sources of contaminants in honey and other hive products•Discussion Let the trainees recall what they learned and discuss any other issue not mentioned•Plenary discussion (The facilitator describes the major sources of contaminants in honey that affects quality and market access)•The presentation highlights: •••••••••Discussion (The facilitator describes the major sources of contaminants in honey that affects quality and market access)•The presentation highlights: ••	8.1.7.3 Sources of contaminants in honey and other hive products (10 minutes)	Session Guide
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The presentation highlights:• Sources of contaminants in food sources• Chemical hazards• Effects of these contaminantsDiscussionLet the trainees recall what they learned and discuss any other issue not mentioned8.1.7.4 How to identify honey adulteration (10 min)Plenary discussion(The facilitator describes the major sources of contaminants in honey that affects quality and market access)The facilitator makes a PowerPoint presentation on sources of contaminants in honey and other hive productsThe presentation highlights: • Sources of contaminants in food sources • Chemical hazards • Effects of these contaminantsDiscussionLet the trainees recall what they learned and discuss any other issue not mentioned	Plenary discussion (The facilitator describes the major sources of contaminants in honey that affects quality and market access) The facilitator makes a PowerPoint presentation on sources of contaminants in honey and other hive products The approximation himblighter	PowerPoint presentation and discussion
8.1.7.4 How to identify honey adulteration (10 min)Session GuidePlenary discussion• PowerPoint presentation and discussion(The facilitator describes the major sources of contaminants in honey that affects quality and market access)• PowerPoint presentation and discussionThe facilitator makes a PowerPoint presentation on sources of contaminants in honey and other hive products• Distribute Participant's handoutThe presentation highlights: • Sources of contaminants in food sources • Chemical hazards • Effects of these contaminants• Q&A sessionLet the trainees recall what they learned and discuss any other issue not mentioned• Intervention of the second and discuss any other issue not mentioned	 Ine presentation highlights: Sources of contaminants in food sources Chemical hazards Effects of these contaminants Discussion Let the trainees recall what they learned and discuss any other issue not mentioned.	• Distribute Participant's handout
Plenary discussion• PowerPoint presentation and discussion(The facilitator describes the major sources of contaminants in honey that affects quality and market access)• PowerPoint presentation and discussionThe facilitator makes a PowerPoint presentation on sources of contaminants in honey and other hive products• Distribute 	8.1.7.4 How to identify honey adulteration (10 min)	Session Guide
	Plenary discussion	PowerPoint presentation and

8.1.7.5 Role of geographical indications in honey quality (10 minutes)	
Plenary discussion(The facilitator describes the geographical indications for quality in honey and other hive products)The facilitator makes a PowerPoint presentation on role of geographical indications in honey quality	PowerPoint presentation and discussion
The presentation highlights:	
 Promoting local heritage Geographical indication specifications: codes of practice Fostering sustainable development Participatory process involving public and private stakeholders "By-products" of a successful geographical indication Discussion	• Distribute Participant's handouts
other issue not mentioned	
8.1.7.6 Quality monitoring for inputs and equipment (5 minutes)	Session Guide
 Plenary Presentation (The facilitator presents the various inputs and equipment a long the value chain). By the end of the presentation, trainees should be able to identify Quality inputs Quality equipment Effects of poor quality on hive productivity 	 Recap of the key take home points using any of the following participatory methods: Q & A session Discussions Any other
Plenary discussions	
Trainees to discuss and give examples of adulteration across the value chain	Distribute Participants' handout on module review

8.1.7.7 Sub Module Review (5 minutes)	Session Guide
Plenary Presentation and Discussion (The facilitator lets the trainees present their views on each of the sessions covered under this module. On flip charts, list summarize the key points they should emphasize when	Recap of the key take home points using any of the following participatory methods:
training farmers).	 Q & A session Discussions
• Review together with the trainees the main points in quality assurance	• Any other
 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? 	Distribute Participants' handout on module review

8.1.8 Reference Materials

8.1.8.1 Participants Handouts

• Handouts on quality assurance in honey and hive products

8.1.8.2 References

- European Food Safety Authority (EFSA). 2020. Risk assessment of beeswax adulterated with paraffin and/or stearin/stearic acid when used in apiculture and as food (honeycomb). EFSA Supporting Publications, 17(5): 1859E. <u>https://doi.org/10.2903/sp.efsa.2020.EN-1859.</u>
- D'Ascenzi, C., Formato, G. & Martin, P. 2019. Chemical hazards in honey. In F.J.M. Smulders, I.M.C.M. Rietjens & M. Rose, eds. ECVPH Food Safety Assurance, 443–475. Wageningen Academic Publishers.
- FAO, IZSLT, Apimondia and CAAS. 2021. Good beekeeping practices for sustainable apiculture FAO Animal Production and Health Guidelines No. 25. Rome. <u>https://doi.org/10.4060/cb5353en</u>
- Moore, J.C., Spink, J. & Lipp, M. 2012. Development and application of a database of food ingredient fraud and economically motivated adulteration from 1980 to 2010. Journal of Food Science, 77(4). https://doi.org/10.1111/ j.1750-3841.2012.02657.x.

Sub Module 8.2: Value Addition

8.2.1 Introduction

This module aims at addressing the management practices as well as innovations that could be carried out on bee products to add to their value. It concentrates on value added bee products for use as food, health and commercial purposes.

8.2.2 Sub Module Learning Outcomes

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

- Ability to come up with various honeybee products through value addition demonstrated
- Importance of value addition on bee products discussed and explained.

8.2.3 Sub Module Target Group

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

8.2.4 Sub Module Users

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

8.2.5 Sub Module Duration

The Module is estimated to take 1 hour 45 minutes

Sub module 8.2: Value addition			
Sessions	Training Methods	Training Materials	Duration
8.2.6.1 Introduction and leveling of expectations	DiscussionsPlenary presentations	 Projector Copy of Module Objectives	5 minutes
8.2.6.2 Pollen harvesting and identification	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes

8.2.6. Sub Module Summary

8.2.6.3 Pollen packaging and storage	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
8.2.6.4 Honey characterization	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
8.2.6.5 Propolis harvesting, processing and packaging	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
8.2.6.6 Beeswax candle	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
8.2.6.7 Bees venom harvesting, processing and packaging	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes

8.2.6.8 Royal jelly harvesting, processing and packaging	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
8.2.6.9 Processing and packaging comb honey	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
8.2.6.10 Beeswax harvesting, processing and packaging	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 minutes
8.2.6.11 Beeswax body cream	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts Demonstration materials 	30 minutes
8.2.6.12 Sub Module Review	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
TOTAL			1 hours 45 minutes

8.2.7 Facilitator's Guidelines

8.2.7.1. Introduction and Leveling Expectations (5	Session Guide
Introduction (The facilitator introduces the sub module and invites trainees to introduce themselves and state their expectations). The facilitator then presents module objectives and levels out expectations Sub module objectives By the end of the sub module trainees should be able to: • Harvest pollen for identification purposes. • Package and store pollen. • Characterize honey • Harvest, process and package propolis • Make beeswax candle • Identify, harvest, process and package various bee hive products • Formulate beeswax cream NB: Value added bees honey and its by products	 Summarize trainees expectations using cards or any appropriate method. PowerPoint presentation Distribute participants' handouts on sub module objectives.
8.2.7.2 Pollen harvesting and identification (5 minutes)	Session guide
Plenary Presentation (10 minutes).	PowerPoint
 (The facilitator makes a presentation on Pollen harvesting and identification) Methods of pollen harvesting How to identify pollen Linking pollen to bee flora Plenary discussion (10 minutes) Let the participants recall what they learned and discuss any issues that may arise	 presentation and discussion Distribute participants' handouts
 (The facilitator makes a presentation on Pollen harvesting and identification) Methods of pollen harvesting How to identify pollen Linking pollen to bee flora Plenary discussion (10 minutes) Let the participants recall what they learned and discuss any issues that may arise 8.2.7.3 Pollen packaging and storage (5 minutes) 	 presentation and discussion Distribute participants' handouts

8.2.7.4 Honey characterization (10 minutes)	Session Guide
 Plenary Presentation (10 minutes). (The facilitator makes a presentation on honey characterization) Honey traits How to characterize honey Plenary discussion (10 minutes) Let the participants recall what they learned and discuss any issues that may arise. 	 PowerPoint presentation and discussion Distribute participants' handouts
8.2.7.5 Propolis harvesting, processing and packaging (10 minutes)	Session Guide
 Plenary Presentation (10 minutes). (The facilitator makes a presentation on harvesting, processing and packaging of propolis) How to harvest propolis How to process propolis How to package propolis Plenary discussion (10 minutes) Let the participants recall what they learned and discuss any issues that may arise	 PowerPoint presentation and discussion Distribute participants' handouts
8.2.7.6 Beeswax candle (10 minutes)	Session Guide
 Plenary Presentation (10 minutes). (The facilitator makes a presentation on Production of beeswax candle) Preparation of beeswax for various end uses Procedures of making candle Plenary discussion (10 minutes) Let the participants recall what they learned and discuss	 PowerPoint presentation and discussion Distribute participants' handouts
8.2.7.7 Bees venom harvesting, processing and packaging	Session Guide
(5 minutes)	
 Plenary Presentation (10 minutes). (The facilitator makes a presentation on Bee venom harvesting, processing and packaging) Describing bee venom Why bees produce bee venom and its value for income generation 	 PowerPoint presentation and discussion Distribute participants' handouts

 Methods of harvesting bee venom How to process bee venom How to package bee venom How to transport bee venom Plenary discussion (10 minutes) Let the participants recall what they learned and discuss any issues that may arise	Service Cruide
(5 minutes)	Session Guide
 Plenary Presentation (10 minutes). (<i>The facilitator makes a presentation on Royal jelly harvesting, processing and packaging</i>) What is royal jelly and its value How is royal jelly produced How to harvest royal jelly How to process royal jelly How to process royal jelly How to package royal jelly How to store and transport royal jelly Plenary discussion (10 minutes) Let the participants recall what they learned and discuss any 	 PowerPoint presentation and discussion Distribute participants' handouts
issues that may arise.	
8.2.7.9 Processing and packaging comb honey (5 minutes)	Session Guide
 Plenary Presentation (10 minutes). (The facilitator makes a presentation on processing and packaging comb) What is comb honey Harvesting comb honey Processing comb honey Packaging comb honey Transporting comb honey 	 PowerPoint presentation and discussion Distribute participants' handouts

8.2.7.10 Beeswax harvesting, processing and packaging (10 minutes)	Session Guide
 Plenary Presentation (The facilitator makes a presentation on beeswax harvesting, processing and packaging) Harvesting, processing and packaging of beeswax Plenary discussion Let the participants recall what they learned and discuss any issues that may arise. 	 PowerPoint presentation and discussion Distribute participants' handouts
8.2.7.11 Beeswax body cream (30 minutes)	Session Guide
 Plenary Presentation (10 minutes). (The facilitator makes a presentation on beeswax body cream) What is beeswax body cream Processing of beeswax body cream Packaging and storing beeswax body cream Plenary discussion (10 minutes) Let the participants recall what they learned and discuss any issues that may arise.	 PowerPoint presentation and discussion Distribute participants' handouts
8.2.7.12 Sub Module Review (5 minutes)	Session Guide
 Plenary Presentation (The facilitator leads the trainees in presenting their views on each of the sessions covered under this sub module) Review the sessions' main points together with the trainees What new things did they learn from this sub module? What are some of the issues that they have become more aware of? What questions do they still have? 	Recap of the key take home points using any of the following participatory methods: • Q & A session • Discussions • Any other Distribute participants' handouts on sub module review

8.2.8 Reference Materials

8.2.8.1 Participants Handouts

- Handout on pollen harvesting and identification
- Handout on pollen packaging and storage
- Handout on honey characterization

- · Handout on propolis harvesting, processing and package
- Handout on beeswax candle
- Handout on bees venom harvesting processing and package
- Handout on royal jelly harvesting, processing and package
- Handout on processing and packaging comb
- Handout on beeswax harvesting, processing and packaging
- Handout on beeswax body cream

NB: A handout on value added bees honey and its products

8.2.8.2 Reference

- Marieke Mutsaers, Henk van Blitterswijk, Leen van 't Leven, Jaap Kerkvliet and Jan van de Waerdt (2005). Bee products, properties, processing and marketing. *Agrodok-series No. 42.* ISBN Agromisa: 90-8573-028-7, ISBN CTA: 92-9081-305-9.

Sub Module 8.3: Apiculture Services

8.3.1 Introduction

This sub module aims at addressing services provided by bees in promoting ecosystem stability and in food/feed production systems. It concentrates on pollination of both food crops and wild plants that enhance livelihoods of the bee-keeping community and the ecosystem.

8.3.2 Sub Module Learning Outcomes

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

- Significance of bees as pollinators on pollinator dependent crops understood and explained.
- Establishment and conservation of bee forage discussed.
- Importance of bees in ecosystem conservation discussed.

8.3.3 Sub Module Target Group

This sub module targets agricultural extension service providers and agri-preneurs dealing directly with farmer groups at community level or community facilitators.

8.3.4 Sub Module Users

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

8.3.5 Sub Module Duration

The sub module is estimated to take 45 minutes.

Sub module 8.3: Apiculture Services				
Sessions	Training Methods	Training Materials	Duration	
8.3.6.1 Introduc- tion and leveling of expectations	DiscussionsPlenary presentations	 Projector Copy of Module Objectives	5 minutes	
8.3.6.2 Water- melon pollination man- agement	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes	

8.3.6. Sub Module Summary

8.3.6.3 Avocado pollination management 8.3.6.4 Mango pollination management	 PowerPoint presentation Plenary discussions PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts Laptop LCD projector Felt pens Masking tapes and glue Flip charts 	5 minutes 5 minutes
8.3.6.5 Cashew nuts pollination management	 PowerPoint presentation Plenary discussions 	 Participants' handouts Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
8.3.6.6 Coffee pollination man- agement	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
8.3.6.7 Pyre- thrum Pollina- tion management	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	5 minutes
8.3.6.8 Sub Module Review	 PowerPoint presentation Plenary discussions 	 Laptop LCD projector Felt pens Masking tapes and glue Flip charts Participants' handouts 	10 min- utes
TOTAL			45 minutes

8.3.7 Facilitator's Guidelines

Apiculture Services	
8.3.7.1 Introduction and Leveling Expectations (5 minutes)	Session Guide
 Introduction (The facilitator introduces the sub module and invites trainees to introduce themselves and state their expectations). The facilitator then presents module objectives and levels out expectations Sub Module Objectives By the end of the sub module trainees should be able to: Name various apiculture services on the ecosystem management. Explain the significance bee pollination on various pollinator dependent crops 	 Summarize trainees expectations using cards or any appropriate method. PowerPoint presentation Distribute participants' handouts on sub module objectives.
8.3.7.2 Watermelon Pollination management (5 minutes)	Session guide
 Plenary Presentation (5 minutes). (The facilitator makes a presentation on Watermelon pollination management) Economic importance of bees in watermelon pollination How is pollination effected on the crop Bee density requirements Bee colony placement (temporary and permanent) Protecting bees during periods of pollination Relocating bees after pollination service Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 	 PowerPoint presentation and discussion Distribute participants' handouts
8.3.7.3 Avocado Pollination management (5 minutes)	Session Guide
 Plenary Presentation (5 minutes). (The facilitator makes a presentation on avocado pollination management) Economic importance of bees in avocado pollination How is pollination effected on the crop Bee density requirements Bee colony placement (temporary and permanent) 	 PowerPoint presentation and discussion Distribute participants' handouts

 Protecting bees during periods of pollination Relocating bees after pollination service Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 	
8.3.7.4 Mango Pollination management (5 minutes)	Session Guide
 Plenary Presentation (5 minutes). (The facilitator makes a presentation on mango pollination management) Economic importance of bees in mango pollination How is pollination effected on the crop Bee density requirements Bee colony placement (temporary and permanent) Protecting bees during periods of pollination Relocating bees after pollination service Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise. 	 PowerPoint presentation and discussion Distribute participants' handouts
8.3.7.5 Cashew nuts Pollination management (5 minutes)	Session Guide
Plenary Presentation (5 minutes). (<i>The facilitator makes a presentation on Cashew nuts pollination management</i>)	PowerPoint presentation and
 Economic importance of bees in Cashew nuts pollination How is pollination effected on the crop Bee density requirements Bee colony placement (temporary and permanent) Protecting bees during periods of pollination Relocating bees after pollination service Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 	 Distribute participants' handouts
 Economic importance of bees in Cashew nuts pollination How is pollination effected on the crop Bee density requirements Bee colony placement (temporary and permanent) Protecting bees during periods of pollination Relocating bees after pollination service Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise 8.3.7.6 Coffee Pollination management (5 minutes)	 Distribute participants' handouts Session Guide

 Bee colony placement (temporary and permanent) Protecting bees during periods of pollination Relocating bees after pollination service Plenary discussion (5 minutes) Let the participants recall what they learned and discuss any issues that may arise	
8.3.7.7 Pyrethrum Pollination management (5 minutes)	Session Guide
 Plenary Presentation (The facilitator makes a presentation on Pyrethrum pollination management) Economic importance of bees in pyrethrum pollination How is pollination effected on the crop Bee density requirements Bee colony placement (temporary and permanent) Protecting bees during periods of pollination Relocating bees after pollination service Plenary discussion Let the participants recall what they learned and discuss any issues that may arise. 	 PowerPoint presentation and discussion Distribute participants' handouts
8.3.7.8 Sub Module Review (10 minutes)	Session Guide
 Plenary Presentation (The facilitator leads the trainees in presenting their views on each of the sessions covered under this sub module) Review the sessions' main points together with the trainees What new things did they learn from this sub module? What are some of the issues that they have become more aware of? What questions do they still have? 	 Recap of the key take home points using any of the following participatory methods: Q & A session Discussions Any other Distribute participants' handouts on sub module review

8.3.8 Reference Materials

8.3.8.1 Participants handouts

• Crop-specific brochures on pollination

8.3.8.1 References

- Mulwa J., Kahuthia- Gathu R. and Kasina M. (2020). High pollinator diversity and species evenness increases avocado (*Persea americana*) yield. *Afr. J. Hort. Sci.* (July 2020) 17:43-52.
- Mulwa J., Kahuthia-Gathu R. and Kasina M. (2019). Avocado (*Persea americana*) yield as influenced by pollinators in Murang'a County, Kenya. J. Agri. Res. Adv. **01**(03):34-41.
- Mulwa JM, Gathu RK, Matolo N, Guantai MM and Kasina JM (2019). Avocado *(Persea americana)* floral calendar and diurnal visitation rates of its pollinators in Murang'a, Kenya. J. Agri. Res. Adv. 01(02): 23-2.7.
- Mulwa, J. (2018). Pollinators and Pollination Syndrome of avocado in Kenya. *The Pollinator Information Newsletter*. June 30, 2018. Vol. 2, Issue 2. Pages 7-8.
- Muo Kasina, Mary Mwari, Muthama Eric and Joseph Mulwa (2015). Bee monitoring and plant pollinator interactions in Kenya. Final Kenya Pollination Project Report, 2015.



MODULE 9: STINGLESS BEEKEEPING

Sub Module 9.1: Stingless Bees

9.1.1 Introduction

This module aims at introducing stingless bee species found in Kenya. The module further, identifies three stingless bee species that are good in honey production and pollination. The module should explain the body morphology features specific to species that can be used to identify them in the field during nest searching. The stingless bee species are conserved through stingless bee domestication. Domestication technology in stingless bees keeping will be introduced in this module.

9.1.2 Sub Module Learning Outcomes

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

- 1. The stingless bee species, Meliponula ferruginea identified
- 2. The stingless bee species Meliponula bocandei identified
- 3. The stingless bee species Plebeina hildebrandti identified
- 4. Domestication technology explained

9.1.3 Sub Module Target Group

This module targets service providers who include county extension staff and private service providers and lead farmers

9.1.4 Sub Module Users

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

9.1.5 Sub Module Duration

This sub-module is estimated to take a minimum of one (1) hour.

Sub Module 9.1: Stingless bees			
Sessions	Training Methods	Training Materials	Duration
9.1.6.1 Introduction, Objective and Expectations	 PowerPoint Presentation Group discussions 	 Projector Handout Flip charts Felt pens 	5 minutes
9.1.6.2 Ferruginea Stingless bee	 PowerPoint Presentation Group discussions 	 PowerPoint projector Handout Flip charts Felt pens 	10 minutes
9.1.6.3 Bocandei stingless bees	 Presentation Group discussions	 PowerPoint projector Handout Flip charts Felt pens 	8 minutes
9.1.6.4 Plebeina stingless bees	 PowerPoint Presentation Group discussions 	 Projector Handout Flip charts Felt pens 	7minutes
9.1.6.5 Stingless bee domestication	 PowerPoint Presentation Group discussions Case study video 	 Projector Handout Flip charts Felt pens 	20 minutes
9.1.6.6 Sub module review	 PowerPoint Presentation Group discussions 	 Projector Handout Flip charts Felt pens 	10 minutes
TOTAL			1 hour

9.1.6 Sub Module Summary

9.1.7 Facilitator's Guidelines

9.1.7.1 Introduction, Objective and Expectations (5	Session Guide
minutes)	
 Introduction (The facilitator introduces the module and invites trainees to introduce themselves and state their expectations). The facilitator then presents module objectives and levels out expectations Module Objectives and Expectations By the end of the module trainees should be able to: Identify ferruginea, bocandei, plebeian stingless bee species in Kenya Appreciate the different honey production capacities of ferruginea, bocandei, plebeian stingless bee species Discuss the stingless bee domestication technology 	 Summarize trainees' expectations using cards or any appropriate method. PowerPoint presentation Distribute Participants' Handout on Module Objectives.
9.1.7.2 Ferruginea Stingless bee (10 minutes)	Session guide
 (The facilitator should be able to guide the trainees in identifying Meliponula ferruginea.) Distinct body morphological features of Meliponula ferruginea Nesting sites and nest requirements, including the hive types suitable for Meliponula ferruginea Productivity of Meliponula ferruginea Distribution of Meliponula ferruginea in Kenya Ecological and conservation of Meliponula ferruginea Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation and distribute Participants' handout
9.1.7.3 Bocandei stingless bees (8 minutes)	Session Guide
 (The facilitator should be able to guide the trainees in identifying Meliponula bocandei) Distinct body morphology features of Meliponula bocandei Nesting sites for Meliponula bocandei Nest requirements, including the hive types suitable for Meliponula bocandei Productivity of Meliponula bocandei Distribution of Meliponula bocandei in Kenya Ecological and conservation of Meliponula bocandei 	 PowerPoint presentation and distribute Participants' handout

Let the trainees recall what they learned and discuss any issue that may arise	
9.1.7.4 Plebeina stingless bees (7 minutes)	Session Guide
 (The facilitator should be able to guide the trainees in identifying Plebeina hildebrandti) Distinct body morphology features of Plebeina hildebrandti Nesting sites for Plebeina hildebrandti Nest requirements, including the hive types suitable for Plebeina hildebrandti) Productivity of Plebeina hildebrandti Distribution of Plebeina hildebrandti in Kenya Ecological and conservation of Plebeina hildebrandti Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation and Distribute Participants' handout
9.1.7.5 Stingless bee domestication (20 minutes)	Session Guide
 (The facilitator should be able to guide the trainees in domesticating stingless bees) Explain the stingless bee domestication technology 	 PowerPoint presentation and Distribute Video
Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise	• Participants' handout
Plenary discussionLet the trainees recall what they learned and discussany issue that may arise9.1.7.5 Sub Module Review (10 minutes	Participants' handout Session Guide

9.1.8 Reference Materials

9.1.8.1 Participants Handouts

• Handouts on stingless bee species/types

Sub Module 9.2: Stingless Bee Hives

9.2.1 Introduction

This module aims at introducing the stingless bee hives. Further, the module explains the specificity of stingless bees in terms of nest requirements and thus different hive requirements. The hives for four selected species will be introduced, this includes: *Meliponula ferruginea, Meliponula bocandei, Plebeina hildebrandti,* and *Hypotrigona spp.*

9.2.2 Sub Module Learning Outcomes

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

- The stingless bee hive for the different species identified
- Nesting requirements explained

9.2.3 Sub Module Target Group

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

9.2.4 Sub Module Users

This module is intended for use by trainers and Farmer Trainers. The trainer should thoroughly familiarize themselves with the training reference materials. The facilitator using this sub module should thoroughly familiarize him/herself with the participant's handouts (training materials).

9.2.5 Module Duration

This sub-module is estimated to take a minimum of 35 minutes.

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Sub Module 9.1: Stingless bees			
Sessions	Training Methods	Training Materials	Duration
9.2.6.1 Introduc- tion, Objective and Expectations	 PowerPoint Pres- entation Group discussions	 Projector Handout Flip charts Felt pens 	5 minutes
9.2.6.2 Bocandei stingless bee Hive	 PowerPoint Pres- entation Group discussions	 Projector Handout Flip charts Felt pens Materials (Hives) 	5 minutes

9.2.6 Module Summary

9.2.6.3 Ferruginea stingless bee hive	 PowerPoint Presentation Group discussions	 Projector Handout Flip charts Felt pens Materials (Hives) 	5 minutes
9.2.6.4 Plebeina stingless bees	 PowerPoint Pres- entation Group discussions	 Projector Handout Flip charts Felt pens Materials (Hives) 	5 minutes
9.2.6.5 Hypotrigona stingless bee hive	 PowerPoint Presentation Group discussions Case study video 	 Projector Handout Flip charts Felt pens Materials (Hives) 	5 minutes
9.2.6.6 Sub module review	 PowerPoint Pres- entation Group discussions	 Projector Handout Flip charts Felt pens 	10 minutes
TOTAL			35 minutes

9.2.7 Facilitator's Guidelines

9.2.7.1 Introduction, Objective and Expectations (5	Session Guide
minutes)	
Introduction	Summarize
(The facilitator introduces the module and invites trainees	trainees'
to introduce themselves and state their expectations).	expectations
The facilitator then presents module objectives and levels	using cards or
out expectations	any appropriate
Module Objectives and Expectations	method.
By the end of the module trainees should be able to:	
• Identify the hives for the following species;	 PowerPoint
Meliponula ferruginea, Meliponula bocandei,	presentation
Plebeina hildebrandti, and Hypotrigona spp.	
Plenary discussion	• Distribute
Let the trainees recall what they learned and discuss any	Participants'
issue that may arise	Handout
	on Module
	Objectives.

9.2.7.2 Bocandei stingless bee Hive (5 minutes)	Session guide
 (The facilitator should be able to guide the trainees in identifying Bocandei stingless bee Hive) Distinct features of Bocandei stingless bee Hive Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise	 PowerPoint presentation and Distribute Participants' handout
9.2.7.3 Ferrugenea stingless bee hive (5 minutes)	Session Guide
 (The facilitator should be able to guide the trainees in identifying Ferruginea stingless bee hive) Distinct features of <i>ferruginea</i> stingless bee Hive Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise. 	 PowerPoint presentation and Distribute Participants' handout
9.2.6.4 Plebeina stingless bee hive (5 minutes)	Session Guide
 (The facilitator should be able to guide the trainees in identifying Plebeina stingless bee hive) Distinct features of Plebeina stingless bee Hive Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation and Distribute Participants' handout
9.2.7.5 Hypotrigona stingless bee hive (5 minutes)	Session Guide
 Distinct features of <i>Plebeina</i> stingless bee Hive Plenary discussion (10 minutes) Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation and Distribute Participants' handout
9.2.7.6 Module Review (10 minutes)	Session Guide
Plenary Presentation (<i>The facilitator leads the trainees in presenting their views on each of the sessions covered under this module</i>)	• Recap of the key take home points using any

9.2.8 Reference Materials

9.2.8.1 Participants Materials

• Handouts on stingless bee hives

9.2.8.2 References

Kiatoko Nkoba (2013) Distribution, Behavioural Biology, Rearing and Pollination Efficiency of Five Stingless Bee Species (Apidae: Meliponinae) in Kakamega Forest, Kenya. PhD Thesis, Kenyatta University. http://ir-library.ku.ac.ke/ handle/123456789/6910.

MODULE 10 MANAGEMENT OF STINGLESS BEE COLONIES

Sub Module 10.1: Stingless Bee Apiary

10.1.1 Introduction

Stingless beekeeping, also known as meliponiculture, is an ancient and sustainable practice that involves cultivating and managing stingless bee colonies for various purposes, including honey production, pollination services, and conservation efforts. Stingless bee apiary involves creating suitable conditions for these bees to thrive, promoting biodiversity, and often focusing on the production of unique honey and other products.

10.1.2 Module Learning Outcomes

By the end of the module, participants will have acquired knowledge and skills on:

- Basic skills in how to make simple stingless bee apiary
- Management of stingless bee predators.

10.1.3 Module Target Group

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

10.1.4 Module Users

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

10.1.5 Module Duration

The Module is estimated to take 30 minutes.

10.1.6 Module Summary

Sub Module 10.1: Stingless bee apiary			
Sessions	Training Methods	Training Materials	Duration
10.1.6.1 Introduction, objectives and expectations	 Plenary presentation Group discussions	 Laptop Projector Flip charts Participants' handouts 	5 minutes
10.1.6.2 Stingless bee apiary	 Plenary presentation Group discussions Case study video 	 Laptop Projector Flip charts Participants' handouts 	10 minutes
10.1.6.3 Management of stingless bee predators	 Plenary presentation Group discussions Case study video 	 Laptop Projector Flip charts Participants' handouts 	10 minutes
10.1.6.4 Sub Module Review	 Power-Point presentations Plenary discussion 	 Laptop Projector Flip charts Participants' handouts 	5 minutes
TOTAL			30 minutes

10.1.7 Facilitator's Guidelines

10.1.7.1 Introduction and leveling of expectations and objectives(5 minutes)	Session Guide
Introduction	 Summarize train-
(The facilitator welcomes trainees to the module on stingless	ees' expectations
bee apiary. They are then invited to introduce themselves	using cards or
and state their expectations)	any appropriate
Module Objectives	method. PowerPoint pre-
(The facilitator presents module objectives)	sentation

 By the end of the training module the trainee should be able to: Describe the simple structure of the stingless bee apiary Explain and discuss the importance of housing of stingless bees in an apiary Manage the predators that attack stingless bees 	• Distribute Participants' Handout on Module Objectives.
10.1.7.2 Stingless bee apiary (10 minutes)	Session guide
Plenary Presentation	Recap of the key take
 (The facilitator guides the trainees in describing parts of the stingless bee apiary) Constructions of stingless bee apiary Materials used to construct apiary Siting of stingless bee apiary 	 home points using any of the following participatory methods: Q & A session Discussions
r ienar y discussion	• Video
Let the trainees recall what they learned and discuss any issue that may arise	• Any other Distribute participants' handout on module review
10.1.7.3 Management of stingless bee predators 10 minutes	Session guide
Plenary Presentation (5minutes)	Recap of the key take
(The facilitator should be able to guide the trainees in management of stingless bee predators)Control of predators	home points using any of the following participatory methods:
	• Q & A session
Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise	 Discussions Video Any other Distribute participants' handout on module review

10.1.7.3 Module Review (5 minutes)	Session Guide
 Plenary Presentation (The facilitator leads the trainees in presenting their views on each of the sessions covered under this module) Review together with the trainees the stingless bee apiary What new things did you learn from this module? What are some of the issues that you may have become more aware of? What questions do you still have? 	Recap of the key take home points using any of the following participatory methods: • Q & A session • Discussions • Any other Distribute participants' handout on module review

10.1.8 Reference Materials

10.1.8 Participants Handouts

- Handouts on stingless bee apiary
- Handout on stingless bee predators

10.1.8.2 References

Episode 3 - Stingless Bees Part 1. https://www.youtube.com/watch?v=5qZs14mcMQc

Sub Module 10.2: Stingless Bee Husbandry

10.2.1 Introduction

Stingless bee husbandry involves the care, management, and cultivation of colonies of stingless bees. Unlike honeybee husbandry, stingless bee husbandry is characterized by the unique behaviors and characteristics of these bees. Although stingless bees are generally less susceptible to pests and diseases than honeybees, beekeepers should be vigilant and take appropriate measures to prevent and manage any arising issues.

10.2.2 Module Learning Outcomes

By the end of the module, participants will have acquired knowledge and skills on:

- Basic skills on stingless bee husbandry
- Identification and Management of stingless bee pests
- Identification and Management of stingless bee diseases

10.2.3 Module Target Group

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

10.2.4 Module Users

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

10.2.5 Module Duration

The Module is estimated to take 35 minutes.

SUB MODULE 10.2: Stingless Bee Husbandry			
Sessions	Training Methods	Training Materials	Duration
10.2.6.1 Introduction, objectives and expectations	 Plenary presentation Group discussions 	 Laptop Projector Flip charts Participants' handouts 	5 minutes

10.2.6 Module Summary

10.2.6.2 Stingless bee Husbandry	 Plenary presentation Group discussions Case study video 	 Laptop Projector Flip charts Participants' handouts 	10 minutes
10.2.6.3 Management of stingless bee pests 10.2.6.4 Management	 Plenary presentation Group discussions Case study video Plenary presentation 	 Laptop Projector Flip charts Participants' handouts Laptop Projector 	10 minutes 5 minutes
of stingless bee diseases	Group discussionsCase study video	 Flip charts Participants' handouts 	
10.2.6.5 Module Review	 Power-Point presentations Plenary discussion 	 Laptop Projector Flip charts Participants' handouts 	5 minutes
TOTAL			35 minutes

10.2.7 Facilitator's Guidelines

10.2.7.1. Introduction and leveling of expectations and objectives(5 minutes)	Session Guide
Introduction (The facilitator welcomes trainees to the module of stingless bee husbandry. They are then invited to introduce themselves and state their expectations) Module Objectives	• Summarize trainees' expectations using cards or any appropriate method.
 (The facilitator presents module objectives) By the end of the training module the trainee should be able to: Outline the simple skills on stingless bee husbandry. Identify and manage the pests that attack stingless bees. Identify and manage stingless bee diseases. 	 PowerPoint presentation Distribute Participants' Handout on Module Objectives.

10.2.7.2 Stingless bee Husbandry (10 minutes)	Session guide	
 Plenary Presentation (The facilitator guides the trainees in stingless bee husbandry) Stingless bee hive cleaning Stingless bee apiary management Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	Recap of the key take home points using any of the following participatory methods: • Q & A session • Discussions • Video • Any other Distribute participants' handout on module review	
10.2.7.3 Management of stingless bee pests 10 minutes	Session guide	
 Plenary Presentation (The facilitator guides the trainees in the management of stingless bee pests) Identification of stingless bee pests Control of stingless bee pests Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	Recap of the key take home points using any of the following participatory methods: • Q & A session • Discussions • Video • Any other Distribute participants' handout on module review	
10.2.7.4 Management of stingless bee diseases (5 minutes)	Session guide	
 Plenary Presentation (The facilitator should be able to guide the trainees in the management of stingless bee diseases) Identification of stingless bee diseases Control of diseases Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise. 	 Recap of the key take home points using any of the following participatory methods: Q & A session Discussions Any other Distribute participants' handout on module review 	

10.2.7.5 Module Review (5 minutes)	Session Guide
 Plenary Presentation (The facilitator leads the trainees in presenting their views on each of the sessions covered under this module) Review together with the trainees the stingless husbandry What new things did you learn from this module? What are some of the issues that you may have become more aware of? What questions do you still have? 	 Recap of the key take home points using any of the following participatory methods: Q & A session Discussions Any other Distribute participants' handout on module review

10.2.8 Reference Materials

10.2.8. Participants Handouts

- Handouts on stingless bee husbandry
- Handout on stingless bee pests
- Handout on stingless bee diseases

10.2.8. References

Episode 3 - Stingless Bees Part 1. https://www.youtube.com/watch?v=5qZs14mcMQc

MODULE 11 STINGLESS BEEKEEPING HARVEST AND POST-HARVEST PRACTICES

Sub Module 11.1: Stingless Bee Products Harvest and Post-Harvest Handling

11.1.1 Introduction

Stingless bee harvest and post-harvest practices involve careful and considerate techniques in order to obtain products like honey, propolis, and beeswax while ensuring the well-being and sustainability of the stingless bee colonies. Post-harvest practices for stingless bee products involve the processing, packaging, storage, and utilisation of the harvested honey, propolis, beeswax, or other products.

11.1.2 Module Learning Outcomes

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

- Harvest stingless bee honey
- Process stingless bee honey
- Package stingless bee honey
- Storage stingless bee honey

11.1.3 Module Target Group

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

11.1.4 Module Users

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

11.1.5 Module Duration

The Module is estimated to take 1 hour.

Sub Module 11.1: Stingless bee harvest and post-harvest			
Sessions	Training Methods	Training Materials	Duration
11.1.6.1 Introduction, objectives and expectations	 Plenary presentation Group discussions	 Laptop Projector Flip charts Participants' handouts 	10 minutes
11.1.6.2 Stingless bee honey harvesting	 Plenary presentation Group discussions Case study video 	 Laptop Projector Flip charts Participants' handouts 	20 minutes
11.1.6.3 Stingless bee honey processing, packaging and storage	 Plenary presentation Group discussions Case study video 	 Laptop Projector Flip charts Participants' handouts 	20 minutes
11.1.6.4 Sub Module Review	 Power-Point presentations Plenary discussion 	 Laptop Projector PowerPoint presentation Flip charts Participants' handouts 	10 minutes
TOTAL			1 hour

11.1.6 Module Summary
11.1.7 Facilitator's Guidelines

11.1.7.1 Introduction and leveling of expectations and objectives(10 minutes)	Session Guide
Introduction (The facilitator welcomes trainees to the module of stingless bee honey harvesting, processing, packaging and storage. They are then invited to introduce themselves and state their expectations) Module Objectives (The facilitator presents module objectives) By the end of the training module the trainee should be able to demonstrate:	 Summarize trainees' expectations using cards or any appropriate method. PowerPoint presentation Distribute Participants' Handout on Module Objectives.
11.1.7.2 Stingless bee honey harvesting (20 minutes)	Session guide
 Plenary Presentation (The facilitator guides the trainees in stingless bee honey harvesting) Tools and equipment in stingless bee honey harvesting Steps/procedure of proper harvesting of stingless bee honey Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 Recap of the key take home points using any of the following participatory methods: Q & A session Discussions Any other Distribute participants' handout on module review
11.1.7.3 Stingless bee honey processing, packaging and storage (20 minutes)	Session guide
 Plenary Presentation (The facilitator guides the trainees in Stingless bee honey processing, packaging and storage) Stingless bee honey processing Stingless bee honey packaging Stingless bee honey storage Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 Recap of the key take home points using any of the following participatory methods: Q & A session Discussions Any other Distribute participants' handout on module review

11.1.7.4 Sub-Module Review (10 minutes)	Session Guide
Plenary Presentation	Recap of the key take
(The facilitator leads the trainees in presenting their	home points using
views on each of the sessions covered under this module)	any of the following
• Review together with the trainees the stingless	participatory methods:
bee honey harvesting, processing, packaging and	• Q & A session
storage	Discussions
• What new things did you learn from this module?	• Any other
• What are some of the issues that you may have	Distribute participants'
become more aware of?	handout on module
• What questions do you still have?	review

11.1.8 Reference Materials

11.1.8.1 Participants Handouts

- Handouts on stingless bee honey harvesting
- Handout on stingless bee honey processing, packaging and storage

11.1.8.2 References

Episode 4- Stingless Bees part 2. https://www.youtube.com/watch?v=zCKmbN9rAkM

Sub Module 11.2: Stingless Bee Honey Value Addition

11.2.1 Introduction

This sub module introduces the stingless bee honey characteristics. The trainees will also be introduced to the value addition aspect in stingless bee honey, which is achieved through generation of stingless bee honey infusions. Often, due to the high demand for stingless bee honey, farmers do not add value to it but sell it as honey, as soon as it is harvested. There haven't been any value addition in stingless bee honey. The aspect of food safety in handling stingless bee honey from the farmers to the consumers will be discussed. Finally, the module will introduce to the trainees, best practices in handling stingless bee honey .

11.2.2 Sub Module Learning Outcomes

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

- Value of stingless bee honey explained
- Stingless bee honey value addition aspect outlined
- The value stingless bee honey infusions appreciated and explained
- The food safety aspect in handling stingless bee honey understood and described

11.2.3 Sub Module Target Group

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

11.2.4 Sub Module Users

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

11.2.5 Sub Module Duration

This sub module is estimated to take 1 hour.

Sub Module 11.2: Stingless bee honey value addition			
Sessions	Training Methods	Training Materials	Duration
11.2.6.1 Introduction, Objective and Expectations	 Presentation Group discussions 	 Projector Handout Flip charts Felt pens 	10 minutes
11.2.6.2 Stingless bee honey	 Presentation Group discussions 	 Projector Handouts Flip charts Felt pens 	15 minutes
11.2.6.3 stingless bee honey recipes and infusions	 Presentation Group discussions 	 Projector Handouts Flip charts Felt pens Materials (raw honey, infusion, packaging materials etc) 	15 minutes
11.2.6.4 Food safety in stingless beekeeping value chain	 Presentation Group discussions 	 Projector Handout Flip charts Felt pens 	15 minutes
11.2.6.6 Sub module review	 Presentation Group discussions 	 Projector Handout Flip charts Felt pens 	5 minutes
TOTAL			1 hour

11.2.6 Sub Module Summary

11.2.7 Facilitator's Guidelines

11.2.7.1 Introduction, Objective and Expectations (5 minutes)	Session Guide
Introduction (The facilitator introduces the module and invites trainees to introduce themselves and state their expectations). The facilitator then presents module objectives and levels out expectations Sub Module Objectives and Expectations By the end of the module trainees should be able to: • Explain the aspect of value for stingless bee honey,	• Summarize trainees' expectations using cards or any appropriate method.

 Describe value addition aspect of the stingless bee honey including various stingless bee honey infusions Explain the aspect of food safety in handling stingless bee honey. Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation Distribute Participants' Handout on Module Objectives.
11.2.7.2 Stingless bee honey (15 minutes)	Session guide
 (The facilitator guides the trainees in understanding the value of stingless bee honey) The characteristic of stingless bee honey Uses of stingless bee honey Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise	 PowerPoint presentation Distribute Participants' handout
11.2.7.3 stingless bee honey recipes and infusions (15	Session Guide
minutes)	
 (The facilitator guides the trainees in understanding the formulation of various honey recipes and infusions.) Formulation of various infusions of stingless bee honey Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 	 PowerPoint presentation Distribute Participants' handout
 (The facilitator guides the trainees in understanding the formulation of various honey recipes and infusions.) Formulation of various infusions of stingless bee honey Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise 11.2.7.4 Food safety in stingless beekeeping value chain (15 minutes) 	 PowerPoint presentation Distribute Participants' handout Session Guide

11.2.7.7 Sub Module Review (5 minutes)	Session Guide
Plenary Presentation	Recap of the key take
(The facilitator leads the trainees in presenting their views	home points using
on each of the sessions covered under this module)	any of the following
• Review together with the trainees the main points	participatory methods:
on stingless bee species hives	• Q & A session
• What new things did you learn from this sub	 Discussions
module?	Any other
• What are some of the issues that you have become	Distribute participants'
more aware of?	handout on module
• What questions do you still have?	review

11.2.8 Reference Materials

11.2.8.1 Participants Handouts

• Handouts on stingless bee honey value addition

11.2.8.2 Reference

Mokaya, H.O., Nkoba, K., Ndunda. R.M., Vereecken, N.J (2022). Characterization of honeys produced by sympatric species of Afrotropical stingless bees (Hymenoptera, Meliponini). Food Chemistry, 366:130597. https://doi.org/10.1016/j.foodchem.2021.130597.

MODULE 12. NUTRITIONAL BENEFITS OF APICULTURE PRODUCTS

12.1 Introduction to the Module

Honey is one of the most delicious and extremely beneficial natural sweeteners that has been utilized over the ages to ramp up the taste of a wide variety of dishes and cuisines. The impressive array of nutrients that it contains also makes it one of the most potent home remedies for common day to day illness. Its mild and pleasant flavor makes it highly versatile to welcome delightful flavors of many herbs, spices, flowers, and fruits through a simple and amazing process of "infusion".

About 95% of the honey dry matter is composed of carbohydrates, mainly fructose and glucose, 5–10% of the total carbohydrates are oligosaccharides, in total about 25 different di- and trisaccharides. Besides, honey contains small amounts of proteins, enzymes, amino acids, minerals, trace elements, vitamins, aroma compounds and polyphenols. Honey has been shown to possess antimicrobial, antiviral, antiparasitic, anti-inflammatory, antioxidant, antimutagenic and antitumor effects. Due to its high carbohydrate content and functional properties honey is an excellent source of energy for athletes. Most of the health promoting properties of honey are only achieved by application of rather high doses of honey such as 50 to 80 g per intake.

12.2 Module learning outcomes

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

- Importance of honey for human nutrition understood and explained
- Honey bee infused products and recipes identified and explained
- Honey bee recipes for treatment identified and described

12.3 Module Target groups

This module targets beekeepers, farmers, individuals, Extension staff, individuals and organizations/Institutions

12.4 Module Users

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

12.5 Module Duration

The Module is estimated to take a maximum of 1 hour.

12.6 Module summary

Module 12.: Honey for Nutrition and Health			
Sessions	Training Methods	Training materials	Duration
126.1 Introduction and leveling expectations 126.2 Honey for	 Presentation Discussion Presentation 	 Participants' Handouts Felt pens, masking tapes and glue Projector 	10 minutes
food and nutrition security resilience	• Discussion	 Participants' Handouts Felt pens	
126.3 Making infused honey products	 Group exercise Presentation of group exercise Discussions 	Flip chartsParticipants' handouts	10 minutes
126.4 Honey- food recipes	 Plenary presentation Group discussions 	Flip chartsProjector	20 minutes
126.5 Module Review			10 Minutes
TOTAL			1 hour

12.7 Facilitator Guidelines			
12.7.1. Introduction and Levelling Expectations (10	Session Guide		
minutes)			
Introduction The facilitator welcomes participants to the module of Honey for nutrition and health, and invites trainees to introduce themselves and state their expectation for the module) The facilitator then presents the module objectives. Module Objectives	 Summarize Participants' "Expectations" and display them 		
By the end of the module the participants should be able			
 to: List some of the nutritional components of honey Explain the importance of honey as food List some of the infused products obtained from honey Health benefits of honey 	 Distribute Participant Handouts on module objectives. 		
12.7.2 Role of honey in improving food and nutrition	Session Guide		
security (XX minutes)			
 Plenary discussion (XXX minutes) (The facilitator describes the components of honey and its importance as a source of nutrition) The facilitator makes a PowerPoint presentation on honey for food and nutrition security resilience The presentation should highlight: The nutritional constituents of honey How honey meets as human food and nutrition requirements 	 PowerPoint presentation and discussion 		
The facilitator defines food and nutrition security, explains food security status in terms of malnutrition and outline the role of honey in ensuring improved nutritional status thus ensuring food and nutrition security	• Distribute Participant's handouts		
Plenary presentations (xxx minutes)			
 Definition of Food and nutrition security The current food security status in Kenya Role of honey in ensuring food security in Kenya 			
Let the trainces recall what they learned and discuss any issues that may arise			

Nutritional importance of honey and its health benefits (XX minutes)	Session Guide
 Discussion (VV minutes) (The facilitators leads trainees discussion on the nutrition importance of honey for humans at different growth stages of the human life) Plenary presentation (XX minutes) (The facilitators present the nutrition importance of honey and its health benefits among people with special conditions such as people living with HIV/AIDS, diabetes and hypertensive persons and in weaning children) Nutrition importance of honey and its benefits to people with special conditions Nutrition importance of honey and its benefits at different growth stages of the human life 	
Dietary diversification and complimentary foods (XXX	
 (The facilitator defines dietary diversification and complimentary foods. Later on lead the discussion on types of foods that can be eaten in accompaniment with honey and finally define food portion size and servings and do demonstration of each in ensuring healthy living) Plenary presentation (10 minutes) Defining dietary diversification and complementary feeding (local nutrient dense foods) Group exercise (XX minutes) Group discuss on types of food that can accompany honey (My plate, SHARP diets, Balanced diets and DASH diets) Plenary presentation (XX minutes) Portion size and servings 	
12.7.3 Nutritional and medicinal based Value addition	Session Guide
Making infused honey products (10 minutes)	
Plenary discussion (The facilitator describes the process of making infused honey products) The facilitator makes a PowerPoint presentation on making infused honey products	 PowerPoint presentation and discussion

 The presentation should highlight: Definition of infusion Honey infused products and their uses Discussion (5 minutes) Let the trainees recall what they learned and discuss any issues that may arise	 Distribute Participant's handouts
12.6.4 Honey-food recipes (20 minutes)	Session Guide
Plenary discussion (The facilitator describes the various honey food recipes and their uses) The facilitator makes a PowerPoint presentation on honey food recipes and their uses	• PowerPoint presentation and discussion
 The presentation should highlight: Honey recipe for common colds Honey recipe for infants, children and lactating mothers Honey for wound management Honey for diabetics and dieting 	
Discussion (5 minutes) Let the trainees recall what they learned and discuss any issues that may arise	• Distribute Participant's handout
12.6.5 Module Review (10 minutes)	Session Guide
 Plenary Presentation and Discussion (5 minutes) (The facilitator should let the trainees present their views on each of the sessions covered under this module. On flip charts, list summarize the key points they should emphasize when training farmers). Review together with the trainees the main points in quality assurance 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? 	 Recap of the key take home points using any of the following participatory methods: Q & A session Discussions Any other

12.8 Reference Materials

12.8.1 Participants Handouts

• Summary of training notes

12.8.2 References

KALRO Beekeeping ToT Training Manual

Stefan Bogdanov , Tomislav Jurendic, Robert Sieber & Peter Gallmann (2008) Honey for Nutrition and Health: A Review, Journal of the American College of Nutrition, 27:6, 677-689, DOI: 10.1080/07315724.2008.10719745.



MODULE 13 AGRIBUSINESS AND MARKETING

Sub Module 13.1: Apiculture Agribusiness

13.1.1 Introduction to the sub module

This sub module is intended to provide service providers with a foundation on the basic concepts of farming as a business i.e. agribusiness. Agribusiness encompasses the economic sectors for farming and farming-related commerce. It involves all the steps for getting agricultural goods to the market, including production, processing, and distribution. The industry is a traditional part of any economy, especially for countries with arable land and excess agricultural products for export. Some of the topics that shall be covered under agribusiness include: record keeping, marketing, economic analysis and business planning. Emphasis is placed on practical application of ideas and strategies in order to prepare a marketing plan and business plan for apiculture enterprise. For the success of an apicultural business enterprise, there is need to develop a business plan, maintain proper records, carry out proper analysis of the enterprise and aggressively market the products once the enterprise is already in production.

13.1.2 Learning Outcomes

By the end of the training, the facilitators should be able to help the participants to:

- Formulate a business plan for apiculture enterprise
- Practically build capacity of apiculture farmers on record keeping
- Understand the importance of record keeping in apiculture
- Understand cost benefit analysis of apiculture production under different production systems
- Understand Gross Margin analysis for apiculture production under different production systems

- Understand Profit and loss analysis and how to increase profits or minimize losses
- Appreciate Business planning for apiculture production enterprise

13.1.3 Target Group and Categories

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

13.1.4 Sub module Users

This module is intended for use by trainer of trainers (TOT) in bee production value chain master trainers who are members of the Core Team of Trainers (CTT), Lead Farmers and agri-preneurs in the Apiculture value chain in target Counties. The facilitator using this module should thoroughly familiarize themselves with the Participants' Handouts.

13.1.5 Sub module Duration

The sub module is estimated to take 30 minutes.

Apiculture Business Planning			
Sessions	Training Methods	Training Materials	Time
13.1.6.1. Introduction and leveling expectations	Presentation	 Participants' Handouts Felt pens, masking tapes and sticker glue 	5 minutes
13.1.6.2. Introduction to Business planning	 Plenary presentation and discussions PowerPoint presentation 	 Flip charts felt pens Projector 	2 minute
13.1.6.3. Development of a simple business plan	 PowerPoint Presentation Plenary discussion Group exercise Plenary presentation 	 Projector/Flip charts Handouts Note books 	3 minutes
13.1.6.4. Introduction to record keeping	 Discussion Power point Presentation Direct instruction 	 LCD projector Flip charts, felt pens 	2 minutes

13.1.6 Sub module Summary

13.1.6.5. Importance of record keeping in apiculture	 PowerPoint Presentation Discussions Demonstration Practice by the trainee 	 LCD projector Flip chart, participants handouts, visuals, Practical notes 	3 minutes
13.1.6.6. Types of records, their uses and characteristics	 PowerPoint Presentation Discussions Demonstration Practice by the trainee 	 LCD projector Flip chart, participants handouts, visuals, Practical notes 	3 minutes
13.1.6.7. Record keeping demo/ practical	 PowerPoint Presentation Discussions Demonstration Practice by the trainee 	 LCD projector Flip chart Participants handouts Photographs 	2 minutes
13.1.6.8. Identification of cost components in an apiculture enterprise (Cash outflows)	 Discussion PowerPoint Presentation Practice by the trainee Direct instruction 	 LCD projector Flip charts, felt pens 	3 minutes
13.1.6.9. Identification of sources of income in the enterprise	 Presentation Group exercise	 PowerPoint Flip chart, participants handouts Exercise guide 	2 minutes
13.1.6.13. Demo/ Work out the gross margins and cost benefit Analysis (Net cash flow)	 Presentation Group exercise	 PowerPoint Exercise guide	3 minutes
13.1.6.11. Module review	• Participants' and Facilitator's summary	• Participants' Handouts module review	2 minutes
TOTAL			30 minutes

13.1.7 Facilitators' Guidelines

13.1.7.1 Introduction and leveling expectations (5	Session Guide
minutes)	
 The facilitator introduces the module and invites participants to give their expectations. The module learning outcomes and expectations are also given by the facilitator By the end of this module, the trainee should be able to: Understand the benefits of developing a business plan 	 Summarize Participants' expectations and display them. Distribute Participants' Handouts on Module Objectives.
plan	5
Modalities to use in business development	
• Facilitate farmers or their groups in developing a marketing plan.	
13.1.7.2. Introduction to business planning (2 minutes)	Session Guide
 Plenary presentation and discussion Concise statement of your business mission and vision Describe enjoylture products and services 	• Let the participants brainstorm and define the benefits of creating a business
 List competitors and your value proposition relative to their products 	plan • Summarize discussion in flip
• Create a road map for achieving your goals and objectives	chats Participants' Handouts on
• Helps employees understand the goals and vision of the company	Definition, dimension and benefits
13.1.7.3 Development of a simple business plan (3	Session Guide
minutes)	
 Plenary presentation Describe a business and its importance 	• Presentation notes and tool shared with
Take participants through developing a simple business plan	trainees

13.1.7.4 Introduction to records and record keeping (2 minutes)	Session Guide
 The facilitator introduces the next session and provides the module learning outcomes and expectations By the end of the module participants should be able to: Understand record keeping Explain the importance of record keeping in apiculture Describe the various types of records, their uses and characteristics Prepare various types of records for apiculture enterprise 	 PowerPoint presentation Share training materials at the end of the module
13.1.7.5 Introduction to and importance of record keeping in apiculture (3 minutes)	Session guide
 The facilitator makes a presentation on record keeping and its importance Plenary discussion The participants discuss the importance of records. Any issue or questions arising is answered during this session. 	 PowerPoint presentation Plenary discussion
13.1.7.6 Types of records, their uses and characteristics (3 minutes)	Session guide
The facilitator makes a presentation on different types or records and their characteristics Plenary discussion The participants ask questions on the presentation, which are answered by the facilitator. They also discuss various records apiculture farmers keep and constraints of record keeping in their respective regions	 PowerPoint presentation Plenary discussion
13.1.7.7 Prepare various types of record (2 minutes)) Participants are divided into several groups and tasked to	Session guide
prepare various records	
The facilitator takes the participants through various types of records and divides them into groups to prepare records during their break time Plenary discussion Any issue or questions arising is answered during this session	 PowerPoint presentation Flip charts Group work Plenary discussions

13.1.7.8. Identification of cost components in an apiculture enterprise (3 minutes)	Session Guide
 Plenary presentation What is a business? What business are we familiar with? What is agri-business? Common terms used in business Characteristics of a good apiculture business venture Discuss the various costs associated with the apiculture production and marketing and strategies for minimizing costs without compromising quality 	 Summarize Participants' responses on a flip chart and display on the wall/board. Handouts on Definition and comparisons between farming and retail shop (business) Handouts on Common terms and characteristics of a good apiculture business venture
13.1.7.9 Identification of sources of income in the Enterprise (2 minutes)	Session Guide
Plenary presentation • Strategies for apiculture farmenhancing returns from the apiculture farmPlenary discussion Brief discussion with participants on cost saving strategies in apiculture	 PowerPoint presentation Flip charts Plenary discussions Participants' Handouts
13.1.7.10 Gross margin and cost benefit analysis of apiculture enterprise (3 minutes)	Session Guide
 Plenary presentation Definition and importance of economic analysis Present different economic performance indicators (the Gross Margin Analysis, break even, cost benefit) Benefits of economic analysis? Group exercise –carry out gross margin analysis for apiculture value chains by filling in the chart provided Plenary discussion Brief discussion with participants and response to questions or issues arising	 List answers on flip chart. Distribute Participants' Handouts on farming gross margin analysis Distribute Group exercise handout/ Session guide

13.1.7.	11 Module review (2 minutes)		
•	Facilitator and participants review the module together	•	Distribute participants module
•	Participants identify new lessons learnt or challenges envisaged in implementing the module lessons		review/evaluation sheets

13.1.8 Reference Materials

13.1.8.1 Participants handouts

Sub Module 13.2: Apiculture Marketing

13.2.1 Introduction to the sub module

Marketing requires identifying and meeting customer requirements. It provides information on a specific target market that includes customers that are interested in purchasing a product or service. Effective marketing requires investing in research and analysis of what target customers demand, finding solutions that meet these needs at a cost that is acceptable, promoting offerings through different methods, and establishing long term trusting relationships. This module is designed to enable trainers/facilitators to train farmers on marketing of apiculture products. This is necessary in order to provide knowledge and skills necessary for market assessment and developing market plans.

This module is necessary because of the disconnect between production and marketing, with most farmers selling their produce at farm gate with very little value addition done. In most cases, farmers engage middle men to link them to the produce market. These middlemen facilitate through engaging in upstream value chains activities like sorting, grading, packaging, storage and bulking that should otherwise have been undertaken by the farmer or farmer groups. In the process, the middle men may earn more than the farmers. The module also aims at building capacity of farmers in carrying out economic analysis of the enterprise to know whether they are making profit or not.

13.2.2 Learning Outcomes

By the end of the training, the facilitators should be able to help the participants to:

- Identifying the market assessment methods and tools
- Conduct a market assessment along apiculture value chain
- Facilitate farmers or their groups in developing a marketing plan
- Determine the types of apiculture markets and the supply and demand patterns
- Differentiate between different marketing strategies, functions and marketing plan Marketing tools in the apiculture value chain
- Describe Apiculture and Apiculture products Market Channels, Marketing principles, Value chain, Distribution Networks and the 7Ps of Marketing

13.2.3 Target Group and Categories

This module targets agricultural extension service providers and agri-preneurs 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.

13.2.4 Sub module Users

This module is intended for use by trainer of trainers (TOT) in bee production value chain master trainers who are members of the Core Team of Trainers (CTT), Lead Farmers and agri-preneurs in the Apiculture value chain in target Counties. The facilitator using this module should thoroughly familiarize themselves with the Participants' Handouts.

13.2.5 Sub module Duration

The sub module is estimated to take 30 minutes

Apiculture Marketing					
Sessions	Training Methods	Training Materials	Time		
13.2.6.1. Introduction and leveling expectations	BuzzPresentation	 Participants' Handouts Felt pens, masking tapes and sticker glue 	5 minutes		
13.2.6.2. Introduction to apiculture Marketing	 Plenary presentation and discussions PowerPoint presentation 	Flip charts felt pensProjector	5 minutes		
13.2.6.3. Marketing Mix (7Ps)	Buzz activityPresentation discussion	Flip chartsHandouts	3 minutes		
13.2.6.4. Collective marketing	 PowerPoint Presentation Plenary discussion Group exercise Plenary presentation 	 Projector/Flip charts Handouts Note books	2 minutes		
13.2.6.5. Consumer behavior	 PowerPoint Presentation Plenary discussion Group exercise Plenary presentation 	 Samples for assessment Handout – Checklist/ tools Flip charts 	5 minutes		

13.2.6 Sub module Summary

13.2.6.6. Developing a marketing plan	 Plenary discussion Group exercise Discussions PowerPoint 	 Participants' handouts Projector Flip charts, felt pens 	5 minutes
13.2.6.7. Module review	• Participants' Facilitator's summary	 Participants' Handouts module review	5 minutes
Total			30 minutes

13.2.7. Facilitators' Guidelines

13.2.7.1. Introduction and levelling expectations (5 minutes)	Session Guide
 The facilitator introduces the module and invites participants to give their expectations. The module learning outcomes and expectations are also given by the facilitator By the end of the module participants should be able to: Understand what agricultural marketing is Understand and apply the marketing mix Understand and help farmers to undertake collective marketing through producer organizations and cooperatives Understand consumer behavior/demand towards apiculture products in order to meet their needs Facilitate farmers or their groups in developing a marketing plan. 	 Facilitator summarize participants' expectations and displays them. Distribute Participants' Handouts on Module Objectives.
13.2.7.2 Introduction to apiculture marketing (5	Session Guide
minutes)	
 Plenary presentation Present definition of marketing Present on the importance of marketing in apiculture value chain 	 Summarize discussion in flip chats Participants' Handouts on Definition, dimension and benefits
 Plenary discussion Brief brainstorming on apiculture marketing Challenges in apiculture marketing. 	

13.2.7.3 Marketing Mix (7Ps) (3 minutes)	Session Guide
Plenary presentation Take participants through the marketing mix of the 7 Ps (Product, price, promotion, place, people, packaging and process Plenary discussion Have some discussion on the 7Ps	• Distribute Participants' Handouts on Information required from a market assessment exercise.
13.2.7.4 Collective marketing (2 minutes)	Session Guide
 The facilitator makes a PowerPoint presentation on: Farmer marketing organizations in apiculture Farmer cooperatives in apiculture 	 Power Point Distribute Participants' Handouts on tools used in market assessment. Distribute Participants' Handouts on generic questions for a checklist or questionnaire Distribute Participants' Handouts on Procedures for market assessment and decision making
13.2.7.5 Consumer behavior (5 minutes)	Session Guide
 Plenary presentation Take participants through consumers patterns Factors affecting consumer behavior for hive and hive products 	Handouts on Consumer behavior and preferences
13.2.7.6 Developing A Marketing Plan (5 minutes)	Session Guide
 Brief Brainstorm session and come up with: Description of the target market for various products Customer profile Competitor profile. Who are the other competitors to be aware of? 	Distribute Participants' Handouts on: The Marketing guide Distribute Participants' Handouts on Marketing plan template. If time allows they can complete the business plan report

13.2.7.	7 Module Review (5 minutes)	Session Guide
•	Facilitator and participants review the module main points together	Distribute participants' module review handouts
•	Any pending questions or issues on the module are responded to	
•	Participants review the module by filling out the review forms	

13.2.8 Reference Materials

13.2.8.1 Participants handouts

• Participants' module handouts

MODULE 14: CROSS CUTTING THEMES IN APICULTURE

This module consists of three cross-cutting issues that influence the uptake and upscaling of TIMPs in the Apiculture value chain. These issues are Gender and socioenvironmental concerns, Agricultural Innovation Platforms and Climate-Smart agricultural policy.

Gender and socio-environmental concerns are considerations aimed at providing appropriate solutions to value chain challenges with due regard to graduated gender and social inclusion considerations. Agricultural Innovation Platforms provide a forum for stakeholders to interact and develop technical, institutional and organizational innovations to solve value chain challenges. Finally, Climate smart agricultural policy creates awareness on policy formulation and the various regulations that are put in place to facilitate the development of value chains. The methodology of delivery for each of these sub modules are presented here.

Sub Module 14.1 Apiculture Gender, Vulnerable and Marginalized Groups (VMGs), Socio, Environmental Concerns and Cohesion

14.1.1 Introduction to the Sub module

Apiculture plays an important role in household economies in ensuring food and nutritional security as well as reducing poverty. Apiculture involves all the gender categories (men, women, youth and vulnerable & marginalized groups (VMGs) along the entire value chain from production, through marketing to consumption.

Men perform most of the apiculture production activities such as hive manufacturing, honey harvesting and apiary management. Although women perform some activities such as cleaning the apiary, watering bees and transporting hives to the apiary, their roles are mainly in supporting processing as well as marketing of the hive products, mainly honey. Gender inequalities still exist along the apiculture value chain. Some gender inequalities include: 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.

The value chain TIMPs interventions, when designed and implemented with genderequitable 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 Apiculture value chain is enhanced by field agricultural practitioners, agri-preneurs and extension officers in an effort geared towards increasing agricultural productivity in target counties.

14.1.2 Sub module learning outcomes

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

- 1. The concept of gender mainstreaming and social inclusion in Apiculture value chain appreciated.
- 2. Youth empowerment in the Apiculture value chain explained.
- 3. Women empowerment in Apiculture value chain explained and understood.
- 4. Strategies for inclusion of vulnerable and marginalized groups in Apiculture value chain understood and applied.
- 5. Knowledge on environmental and social management framework (ESMF) tools explained and demonstrated.

14.1.3 Sub module Target Group

This sub module is intended for service providers, agri-preneurs, lead farmers, and extension agents.

14.1.4 Sub module Users

This module is intended for use by Master trainers who are members of the core team of trainers (CTT) and 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.

14.1.6 Module Summary

Sub module 14.1: Gender mainstreaming and social inclusion in the					
Apiculture value chain					
Sessions	Training methods	Training materials	Duration		
14.1.6.1 Introduction, expectations and objectives	 Self- introduction Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Laptop Participants' handouts 	5 minutes		
14.1.6.2 Gender mainstreaming and social inclusion in Apiculture value chain	 PowerPoint Presentations Group Exercise Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	15 minutes		
14.1.6.3 Youth empowerment in Apiculture value chain	 PowerPoint Presentations Group exercise Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	7 minutes		
14.1.6.4 Women empowerment in Apiculture value chain	 PowerPoint Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	8 minutes		
14.1.6.5 Strategies for inclusion of vulnerable and marginalized groups (VMGs)	 PowerPoint Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	15 minutes		

14.1.6.6 Environmental and Social Management Framework (ESMF)	•	PowerPoint Presentations Plenary discussion	•	Flips charts Felt pens PowerPoint Presentation Participants handouts	5 minutes
14.1.6.7 Sub module Review	•	Plenary discussion	•	Flips charts Felt pens	5 minutes
TOTAL					1 hour

14.1.7 Facilitator's Guidelines

Sub module 14.1: Gender mainstreaming and social inclusion in Apiculture value chain			
14.1.7.1 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 gender mainstreaming and social inclusion, in the Apiculture value chain. Explain youth empowerment in the Apiculture value chain. Appreciate women empowerment in the Apiculture value chain. Recognize strategies for inclusion of vulnerable and marginalized groups (VMGs) in the Apiculture value chain. Explain the environmental and social management framework (ESMF) tool. 	 Summarize trainees' expectations and display them PowerPoint Presentation Group exercise Training Program 		

14.1.7.2 Gender mainstreaming and social inclusion in Apiculture value chain (15 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 Apiculture value chain). Plenary Presentation Definition of gender 	 PowerPoint presentation Group exercise Plenary discussion Participants' handouts
• Gender mainstreaming and its importance in apiculture value chain	
 Who does what – Gender division of roles in Apiculture value chain) 	
• Who owns what – Access and control of resources & benefits)	
• Decision making in apiculture – Who makes which decisions?	
Group exercise and discussion Let the trainees recall what they learned and discuss any issues that may arise	
14.1.7.3 Youth empowerment in Apiculture value chain (7 minutes)	Session Guide
 Plenary Presentation Youth in agriculture – Why agriculture is not attractive to youth Youth's role in the aniculture value chain 	 PowerPoint Presentation Group exercise Plenary discussion
 Strategies to empower youth in the Apiculture value chain. 	 Participants' handouts
Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise.	
14.1.7.4 Women empowerment in Apiculture value chain (8 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 	 PowerPoint Presentation Participants' handouts Plenary discussion
Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise.	

14.1.7.5. Strategies for inclusion of vulnerable and marginalized groups in Apiculture value chain (15 minutes)	Session Guide
 Plenary presentation Who are vulnerable and marginalized groups (VMGs) Why inequalities exists Social inclusion – definition and importance Strategies for inclusion of VMG in the value chain Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise.	 PowerPoint Presentation Plenary discussion Participants' handouts
14.1.7.6. Environmental and social management framework (ESMF) (5 minutes)	Session Guide
 Plenary presentation Objective of ESMF in Apiculture value chain Environmental and social safeguards of Apiculture Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise. 	 PowerPoint Presentation Plenary discussion
14.1.7.7 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 is it important? Youth empowerment in Apiculture value chain Women empowerment in Apiculture value chain Strategies for inclusion of vulnerable and marginalized groups in Apiculture value chain Environmental and Social Management Framework of Apiculture activities. Let the trainees recall what they learned and discuss any issues that may arise. 	 Summary of the main points on from the module on a flip chart and display Participants review the sub-module

14.1.8 Reference Materials

14.1.8. Participants' handouts

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

14.1.8.2 References

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

Sub Module 14.2. Apiculture Innovation Platforms

14.2.1 Introduction to the Sub-Module

This sub-module introduces the extension staff, service providers, lead farmers and facilitators to an innovation systems based configuration of stakeholders called the Agricultural Innovation Platform (AIP). Agricultural Innovation Platform (AIP) is an organizational model for stimulating innovation and development, and brings actors together in a way that pools skills and knowledge to address challenges and utilize opportunities. The AIP configuration emanated from the realization that innovations arise from multiple sources and have to be adapted to specific contexts. The adaptation process requires systems that foster partnerships and reflexive institutions which allow for learning and innovation. The actors include individuals, private and public sector organizations, policy makers, agri-preneurs 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 apiculture 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.

14.2.2 Sub-Module learning Outcomes

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

- Innovation platforms defined and explained
- The characteristics of an AIP described and understood.
- Process of mobilization of stakeholders for initiation, establishment, management and sustenance of an AIP explained and demonstrated
- Business model development process of an AIP demonstrated
- The innovation capacity building process of the AIP actors explained and understood
- Benefits and challenges of AIP described
- The sustainability of an AIP (Exit strategy) explained and understood

14.2.3 Sub-Module Target Group and Categories

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

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 lead farmers. The facilitator using this module should have an in-depth understanding of the participants' handouts.

14.2.5 Sub-Module Duration

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

14.2.6 Module Summary

Innovation platforms defined and explained				
Sessions	Training methods	Training materials	Time	
14.2.6.1 – Introductions, objectives and expectations	 Self- introductions Presentations Plenary discussions 	 Flips charts PowerPoint presentation Laptop Projector 	5 minutes	
14.2.6.2 – 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	
The characteristics of an innovation platform described and understood.				
 14.2.6.3 – Dissemination and scaling Enhancing information flow and learning Making value chain work Enhancing resource efficiency 	 PowerPoint presentations Plenary discussions Role plays Flips charts PowerPoint presentation 	 Laptop Projector Participants' handouts 	10 minutes	
 Enhancing innovation and creativity Enhancing farmer capacity 				

14.2.6.4 Phases of an innovation platform (Initiation, Establishment, Management and Sustenance	 PowerPoint presentations Plenary discussions Role plays 	 Flips charts PowerPoint presentation Laptop Projector Participants' handouts 	10 minutes
14.2.6.5 Case studies of a successful Innovation Platform (Identify one nearest the training venue) e.g KAMAKI farmers beekeepers cooperative-Kitui	 PowerPoint presentations Plenary discussions Role plays Flips charts 	 Laptop Projector Participants' handouts 	10 minutes
14.2.6.6 Benefits and challenges of AIPS	 PowerPoint presentations Plenary discussions	 Flip charts Laptop Projector Participants' handouts 	5 minutes
 14.2.6.7. 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' handouts 	5 minutes
14.2.6.8. Module review	 PowerPoint presentations Plenary discussions 	Flip chartsLaptopProjector	5 minutes
TOTAL			1 hour

14.2.7 Facilitator's Guidelines

Sub Module 14.2 Agricultural Innovation Platform (AIP)			
14.2.7.1. Introduction, leveling of expectations and	Session Guide		
objectives (5 minutes)			
Introduction			
(The facilitator welcomes trainees to the module and			
then invites them to introduce themselves and state			
their expectations)	 Summarize 		
Module Objectives	Trainees'		
(The facilitator presents modules objectives and levels	expectations and		
out expectations)	display them.		
By the end of the module the trainee should be able to:	PowerPoint		
• Define the innovation process and the innovation	Presentation		
products.	Training Program		
• Explain characteristics of an innovation platform.			
• Describe now to initiate and establish Agricultural			
Evaluin how to manage and sustain innovation consulty			
of actors in A gricultural Innovation Platforms			
• Get exposed to successful aniculture innovation			
nlatforms			
 Understand benefits and challenges of agricultural 			
innovation platforms.			
14.2.7.2 Definition of Agricultural Innovation Systems	Session Guide		
and different types of innovations (technical, institutional			
and organizational) (10 minutes)			
The facilitator presents an overview of innovation	 PowerPoint 		
platforms and their main characteristics	Presentation		
	 Participants' 		
Plenary Presentation	handouts		
• 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			
Volue chain exter linkages and other hanefts			
value chain actor mikages and other benefits			
Plenary Discussion			
Let the trainees recall what they learned and			
Let the trainees recan what they rearried and			

14.2.7.3. Characteristics of an Agricultural Innovation Platform (10 minutes)	Session Guide
 Plenary Presentation 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 Plenary Discussion Let the trainees recall what they learned and discuss any issue that may arise. 	 PowerPoint Presentation Participants' handouts Plenary discussion
14.2.7.4 Stages of an innovation platform (Initiation, Establishment, Management and Sustenance (10 minutes)	Session Guide
 Plenary Presentation Initiation or preformation phase Engagement or mobilization of stakeholders in the apiculture 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
14.2.7.5 Case studies of successful AIPS (10 minutes)	Session Guide
 e.g. KAMAKI farmers beekeeping cooperative -Analogy of African funeral Invite a participant from the successful AIP to make a presentation Plenary discussion Let the trainees recall what they learned and discuss any issue that may arise. 	 Participants' handouts Marketing models and pathways Case study reports
12.2.7.6 Benefits and challenges of AIPS (5 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 apiculture value chain that will ensure easy flow of operations. Discuss challenges associated with running successful AIPs and opportunities to overcome the challenges 	 Plenary presentation Champions selected to campaign for attitude change
14.2.7.7. Cross cutting issues (5 minutes)	Session Guide
 Gender issues – for inclusivity in AIPs Scale: Need to factor this from outset Policy influencing and advocacy Communication and capacity strengthening 	 Presentations General discussions
14.2.7.8. 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 apiculture 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

14.2.8 Reference materials

14.2.8.1 Participants' handouts

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

14.2.8.2 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 14.3 Apiculture Policies and Regulations

14.3.1 Introduction to the Sub module

The training program on apiculture policies and regulations for smallholder farmers in Kenya is designed to empower practitioners with essential knowledge and skills to effectively navigate the regulatory framework governing the sector. As smallholder farmers play a vital role in Kenya's apiculture industry, it is imperative to equip them with the understanding and tools needed to comply with policies, make informed decisions, and optimize their apiculture enterprises. This training program is structured into comprehensive modules that delve into various aspects of apiculture 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 apiculture regulatory landscape, fostering a more sustainable and economically viable apiculture sector in Kenya.

14.3.2 Sub module learning outcomes

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

- 1. Key apiculture policies and regulations understood and applied
- 2. Compliance and record-keeping understood and applied
- 3. Quality and safety standards understood and applied
- 4. Environmental and sustainability regulations explained
- 5. Market Access and trade regulations understood and applied
- 6. Health and animal welfare regulations understood and applied
- 7. Consumer protection regulations understood and applied
- 8. Policy advocacy and engagement process understood

14.3.3 Sub module Target Group

This sub module is intended for service providers, agri-preneurs, lead farmers, and extension agents.

14.3.4 Sub module Users

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

14.3.5 Sub module Duration

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

14.3.6 Module Summary

Sub module 14.3.6: Po	olicy options and regulations in the Apiculture value		
chain			
Sessions	Training methods	Training materials	Duration
14.3.6.1 Introduction, expectations and objectives	 Self-introduction Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Laptop 	5 minutes
14.3.6.2 Introduction to Apiculture Policies and Regulations	 PowerPoint Presentations Plenary discussion 	 PowerPoint projector, Flip charts, felt pens Laptop 	10 minutes
14.3.6.3 Compliance and Record-Keeping	 PowerPoint Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	5 minutes
14.3.6.4 Quality and Safety Standard	 PowerPoint Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	5 minutes
14.3.6.5 Environmental and Sustainability Regulations	 PowerPoint Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	5 minutes
14.3.6.6 Health and Animal Welfare Regulations	 PowerPoint Presentations Plenary discussion 	 Flips charts Felt pens PowerPoint Presentation Participants handouts 	5 minutes

14.3.6.7 Market	 PowerPoint	 Flips charts Felt pens PowerPoint	10 minutes
Access and Trade	Presentations Plenary	Presentation Participants	
Regulations	discussion	handouts	
14.3.6.8 Consumer	 PowerPoint	 Flips charts Felt pens PowerPoint	5 minutes
Protection	Presentations Plenary	Presentation Participants	
Regulations	discussion	handouts	
14.3.6.9 Policy	 PowerPoint	 Flips charts Felt pens PowerPoint	5 minutes
Advocacy and	Presentations Plenary	Presentation Participants	
Engagement	discussion	handouts	
14.3.6.10 Sub module Review	Plenary discussion	Flips chartsFelt pens	5 minutes
TOTAL			1 hour

14.3.7 Facilitator's Guidelines

Sub module 14.3: Policy options and regulations in the Apiculture value chain		
14.3.7.1 Introduction, Objectives and Expectations (5	Session Guide	
minutes)		
(The facilitator welcomes trainees to the sub module and	Summarize	
thereafter invites them to introduce themselves and state	trainees'	
their expectations)	expectations	
• Be aware of their responsibilities as outlined in the	and display	
policies and regulations.	them.	
• Understand what is expected of them in terms of	 PowerPoint 	
compliance, reporting, and best practices.	Presentation	
• Understand the policy advocacy and engagement	Group exercise	
process.	Training	
	Program	

14.3.7.2 Introduction to Apiculture Policies and	Session Guide
Regulations (10 minutes)	
 (The facilitator should able to lead participants in understanding the current policies and regulations related to apiculture farming, which trainees need to be aware of as they practice apiculture farming) Plenary Presentation The facilitator gives highlights on: Key policies, regulations and the regulatory bodies involved in the apiculture sector. Licensing procedures, and quality standards for apiculture products and services. Emphasis should be placed on animal health, welfare regulations, and environmental sustainable practices. Pricing mechanisms, marketing channels, and relevant financial support programs. 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
14.3.7.3 Compliance and Record-Keeping (5 minutes)	Session Guide
 Plenary Presentation (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) The facilitator gives highlights on: The importance of adherence to regulatory requirements. Specific documentation and record-keeping obligations imposed by relevant authorities. This includes maintaining comprehensive records related to human and animal safe hive production and environmental management practices. The significance of accurate record-keeping to demonstrate compliance during inspections. 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

14.3.7.4 Quality and Safety Standard (5 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 hive products handling, hygiene, storage, and transportation protocols to maintain quality and prevent contamination. Emphasize will be on hygiene and sanitation practices, hive products testing, equipment and utensils, honey composition, disposal of unfit honey, environmental 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 noncompliance. Produce traceability to ensure the safety and quality of bees and hive products. Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise. 	 PowerPoint Presentation Participants' handouts Plenary discussion
14.3.7.5. Environmental and Sustainability Regulations	Session Guide
(5 minutes)	
 (The facilitator should able to lead participants understand sustainable and environmentally friendly practices) Plenary presentation The facilitator will impact knowledge and information on: Understanding the regulations related to observing practices that minimise environmental impacts including effective waste management, 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

14.3.7.6. Health and Animal Welfare Regulations (5	
 (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 in apiculture, as well as compliance and implication on the value chain. Practical guidance on disease prevention, fumigation protocols, and proper bee care practices Plenary discussion 	 PowerPoint Presentation Plenary discussion Participants' handouts
Let the trainees recall what they learned and discuss any issues that may arise	
14.3.7.7. Market Access and Trade Regulations (10 minutes)	Session Guide
The facilitator should able to lead participants in understanding market access and trade regulations for apiculture	 PowerPoint Presentation Plenary discussion
 Plenary presentation The facilitator will impact knowledge and information on: Local and international regulations governing apiculture farming and trade. Practical guidance on market entry requirements, including obtaining licenses and certifications. Thorough coverage of quality standards, tariffs, duties, and trade agreements, and practical tips on documentation and record-keeping. 	
Let the trainees recall what they learned and discuss any issues that may arise.	
14.3.7.8. Consumer Protection Regulations (5 minutes)	Session guide
 (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 	 PowerPoint Presentation Plenary discussion

Plenary discussion	
Let the trainees recall what they learned and discuss any	
issues that may arise	
14.3.7.9. Policy Advocacy and Engagement (5 minutes)	Session guide
The facilitator to present to participants the existing	PowerPoint
regulations on consumer protection	Presentation
Plenary presentation	Plenary
The facilitator will impact knowledge and information on:	discussion
Identifying the problem	
 Analysis and assessment of consequences of the 	
identified problem/policy gap.	
Articulating policy options	
• Stakeholder 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	
Fienary discussion	
I at the trainees recall what they be mad and discuss any	
Let the trainees recall what they learned and discuss any issues that may arise	
Let the trainees recall what they learned and discuss any issues that may arise	
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes)	Session Guide
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the</i>	Session Guide • Summary of the
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) <i>(The facilitator leads the participants in reviewing the module)</i>	 Session Guide Summary of the main points on
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) <i>(The facilitator leads the participants in reviewing the module)</i> Summarize the main points of the training and together with	 Session Guide Summary of the main points on from the module
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) Summarize the main points of the training and together with the trainees review the main points on the:	• Summary of the main points on from the module on a flip chart
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) <i>(The facilitator leads the participants in reviewing the module)</i> 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 animatement of the trainees the trainees are including and together with the trainees review the main points on the:	 Session Guide Summary of the main points on from the module on a flip chart and display
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) <i>(The facilitator leads the participants in reviewing the module)</i> 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 apiculture sector including environmental standards, and more that access regulations	 Session Guide Summary of the main points on from the module on a flip chart and display
Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) <i>(The facilitator leads the participants in reviewing the module)</i> 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 apiculture sector including environmental standards, and market access regulations.	Session Guide • Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations 	Session Guide • Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations. 	Session Guide Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations. What is expected of trainees in terms of compliance, reporting, and best practices 	Session Guide Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations. What is expected of trainees in terms of compliance, reporting, and best practices. Policy advocacy and engagement process 	Session Guide • Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations. What is expected of trainees in terms of compliance, reporting, and best practices. Policy advocacy and engagement process 	Session Guide Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations. What is expected of trainees in terms of compliance, reporting, and best practices. Policy advocacy and engagement process 	Session Guide • Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations. What is expected of trainees in terms of compliance, reporting, and best practices. Policy advocacy and engagement process Plenary discussion Let the trainees recall what they learned and discuss any 	Session Guide Summary of the main points on from the module on a flip chart and display
 Let the trainees recall what they learned and discuss any issues that may arise 14.3.7.10 Sub module review (5 minutes) (<i>The facilitator leads the participants in reviewing the module</i>) 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 apiculture sector including environmental standards, and market access regulations. Participants' responsibilities as outlined in the policies and regulations. What is expected of trainees in terms of compliance, reporting, and best practices. Policy advocacy and engagement process Plenary discussion Let the trainees recall what they learned and discuss any issues that may arise. 	Session Guide Summary of the main points on from the module on a flip chart and display

14.3.8 Training Materials

14.3.8.1 Participants' handouts

• Participants' training handouts

14.3.8.2 References

Livestock (Bee industry) regulations, 2023 arrangement of regulations The Kenya Apiculture Industry Regulations, 2021.

Livestock (Bee industry) regulations, 2023 arrangement of regulations The Kenya Apiculture Industry Regulations, 2021.

ANNEXES

ANNEX 1: TRAINING PROGRAM

The training program presented here assumes that the trainees report on Sunday evening and Monday is the first day.



NAVCDP TRAINER OF TRAINERS FOR APICULTURE VALUE CHAIN FOR XXXX COUNTY

VENUE: XXXX

Time	Day 0 (Sunday) Travel to Venue	Duration	Remarks / Facilitator
Late Evening	 § Arrival of participants and registration – Host § Setting up and prepare training venue and materials – CTT 	2 Hours	The training venue and materials are ready for use
Close of Day 0			
Time	Day 1 (Monday)	Duration	Remarks / Facilitator
8.00am-9.30am	Session 1: Introduction, objectives		The
	& expectations	10 minutes	trainees
	Welcome by host and Prayers	20 minutes	relax and
	Self-introductions –(CTT)	20 minutes	climate
	 Introduction to NAVCDP 	20 minutes	set for the
	project	20 minutes	ten-day
	Official opening Ceremony		training
	(CEC) Introduction to the		
	training program (CTT)		
9.30 - 10.30 am	Module 1: Introduction to	1 hour	Facilitator
	Beekeeping		
	SUB Module 1:1 Honey bees		
10.30 - 11.00 am	Tea Break	30 minutes	
11.00am	SUB Module 1:1 (continued)	45 minutes	Facilitator
-11.45am			
	End of Sub module		

11.45am -1PM	Sub Module 1.3 Bee Hives	1 hour 15 minutes	Facilitator
1.00 -2.00 pm	Lunch Break	1 Hour	
2.00 -2.25 pm	Sub Module 1.3 (continued): Bee Hives	25 minutes	Facilitator
	End of Sub module		
2.25 -4.00 pm	Sub Module 2.1 Apiary	1 hour 35 minutes	Facilitator
	End of Sub module		
4.00 -5.00 pm	Sub Module 2.2 Bee Handling	1 hour	Facilitator
	End of Sub module		
Close of Day 1			
Time	Day 2 (Tuesday)	Duration	Remarks / Facilitator
08.00 am -09.00	Registration for second day	30 minutes	CTT
am	participation Recap of day 1 activities	30 minutes	
09.00 am -10.30	Sub Module 2.3 Beekeeping	1 hour 30	Facilitator
am	Husbandry Practices	minutes	
	End of Sub module		
10.30 - 11.00 am	Tea break	30 minutes	
11.00 - 12.25 pm	Sub-module 1.2 Bee Breeding	1 hour 25 minutes	Facilitator
	End of sub module		
12.25 - 1.00 pm	Sub Module 2.4 Bee Health	35 minutes	Facilitator
1.00 -2.00 pm	Lunch Break	1 Hour	
2.00- 2.30 pm	Sub Module 2.4 (continued) Bee Health	30 minutes	Facilitator
	End of Sub module		
2.30- 4.10 pm	Module 3 Harvesting and Post Harvest Practices	1 hour 40 minutes	Facilitator
	End of sub module		
4.105.00 pm	Sub Module 4.1 Quality Assurance	50 minutes	Facilitator
	End of sub module		
Time	Day 3 (Wednesday)	Duration	Remarks / Facilitator
8.00-9.00am	Registration for second day participation Recap of day 1 activities	30 minutes 30 minutes	CTT
9.00-10:30 am	Sub- Module 4.2 Value Addition	1 hour 30 minutes	Facilitator
10.30-11.00 am	Tea break	30 minutes	
11.00-11.15 am	Sub- Module 4.2 (continued) Value Addition	15 minutes	Facilitator
	End of sub module		

11.15am - 12.00PM	Sub- Module 4.3 Apiculture	45 minutes	Facilitator
12:001101	End of sub module		
12.00 pm- 1.00 pm	Module 5: Sub-Module 5.1 Stingless Bees	1 hour	Facilitator
1.00- 2.00 pm	Lunch break	1 hour	All
2.00 -2.35 pm	Sub-Module 5.2 Stingless Beehives	35 minutes	Facilitator
	End of sub module		
2.35 -3.05 pm	Module 6: Sub-Module 6.1 Stingless Bee Apiaries	30 minutes	Facilitator
	End of sub module		
3.05- 3.40 pm	Sub-Module 6.2 Stingless Bee Husbandry practices	35 minutes	Facilitator
	End of sub module		
3.40- 4.40 pm	Module 7: Sub-Module 7.1 Stingless Bee Harvest and Post-harvest Practices	1 hour	Facilitator
	End of sub module		Facilitator
4:40 pm - 5.00	Tea Break	1 Hour	All
pm			
Close of day 3			
Time	Day 4 (Thursday)	Duration	Remarks / Facilitator
Time 8.00 am-9.00 am	Day 4 (Thursday) Registration for third day participation Recap of day 3 activities	Duration 30 minutes	Remarks / Facilitator CTT
Time 8.00 am-9.00 am 9.00 am -9.00 am	Day 4 (Thursday) Registration for third day participation Recap of day 3 activities Sub-Module 7.2 Stingless Bee honey Value Addition	Duration 30 minutes 1 hour	Remarks / Facilitator CTT Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am	Day 4 (Thursday) Registration for third day participation Recap of day 3 activities Sub-Module 7.2 Stingless Bee honey Value Addition End of sub module	Duration 30 minutes 1 hour	Remarks / Facilitator CTT Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safety	Duration 30 minutes 1 hour 30 minutes	Remarks / Facilitator CTT Facilitator Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am 10.30-11.00 am	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safetyTea break	Duration 30 minutes 1 hour 30 minutes 30 minutes	Remarks / Facilitator CTT Facilitator Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am 10.30-11.00 am 11.00 am- 11:30 pm	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safetyTea breakModule 8: Good beekeeping practice and food safety	Duration 30 minutes 1 hour 30 minutes 30 minutes 30 minutes	Remarks / Facilitator CTT Facilitator Facilitator Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am 10.30-11.00 am 11.00 am- 11:30 pm	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safetyTea breakModule 8: Good beekeeping practice and food safetyEnd of module	Duration 30 minutes 1 hour 30 minutes 30 minutes 30 minutes 30 minutes	Remarks / Facilitator CTT Facilitator Facilitator Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am 10.30-11.00 am 11.00 am-11:30 pm 11.30 am-12:30 pm	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safetyTea breakModule 8: Good beekeeping practice and food safetyEnd of moduleModule 9: Nutritional Benefits of Honey	Duration30 minutes1 hour30 minutes30 minutes30 minutes1 hour	Remarks / Facilitator CTT Facilitator Facilitator Facilitator Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am 10.30-11.00 am 11.00 am- 11:30 pm 11.30 am- 12:30 pm	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safetyTea breakModule 8: Good beekeeping practice and food safetyEnd of moduleModule 9: Nutritional Benefits of HoneyEnd of module	Duration 30 minutes 1 hour 30 minutes 30 minutes 30 minutes 1 hour 1 hour	Remarks / Facilitator CTT Facilitator Facilitator Facilitator Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am 10.30-11.00 am 11.00 am-11:30 pm 11.30 am-12:30 pm 12:30 pm - 1.00 pm	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safetyTea breakModule 8: Good beekeeping practice and food safetyEnd of moduleModule 9: Nutritional Benefits of HoneyEnd of moduleModule 10: Agribusiness and Marketing Submodule 10.1 Apiculture business planning	Duration30 minutes1 hour30 minutes30 minutes30 minutes1 hour30 minutes	Remarks / Facilitator CTT Facilitator Facilitator Facilitator Facilitator Facilitator Facilitator Facilitator Facilitator Facilitator Facilitator
Time 8.00 am-9.00 am 9.00 am -9.00 am 10:00 am-10.30 am 10.30-11.00 am 11.00 am- 11:30 pm 11.30 am- 12:30 pm 12:30 pm - 1.00 pm	Day 4 (Thursday)Registration for third day participation Recap of day 3 activitiesSub-Module 7.2 Stingless Bee honey Value AdditionEnd of sub moduleModule 8: Good Beekeeping Practice and food safetyTea breakModule 8: Good beekeeping practice and food safetyEnd of moduleModule 9: Nutritional Benefits of HoneyEnd of moduleModule 10: Agribusiness and Marketing Submodule 10.1 Apiculture business planningEnd of sub module	Duration 30 minutes 1 hour 30 minutes 30 minutes 30 minutes 1 hour 30 minutes 30 minutes 30 minutes 30 minutes 30 minutes	Remarks / Facilitator CTT Facilitator Facilitator Facilitator Facilitator Facilitator

1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm 3.40 - 4.00 pm 4.00 - 4.30 pm Close of day 5 Time	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module Course Evaluation Announcements Way Forward Closing remarks Tea Break	1 hour 40 minutes 1 hour 20 minutes 30 minutes 30 minutes Duration	Facilitator Facilitator All CCT Remarks / Facilitator
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm 3.40 - 4.00 pm 4.00 - 4.30 pm Close of day 5	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module Course Evaluation Announcements Way Forward Closing remarks Tea Break	1 hour 40 minutes 1 hour 20 minutes 30 minutes	Facilitator Facilitator All CCT
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm 3.40 - 4.00 pm 4.00 - 4.30 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module Course Evaluation Announcements Way Forward Closing remarks Tea Break	1 hour40 minutes1 hour20 minutes30 minutes	Facilitator Facilitator All CCT
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm 3.40 - 4.00 pm 4.00 - 4.30 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module Course Evaluation Announcements Way Forward Closing remarks	1 hour 40 minutes 1 hour 20 minutes 30 minutes	Facilitator Facilitator All CCT
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm 3.40 - 4.00 pm 4.00 - 4.30 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module Course Evaluation Announcements Way Forward	1 hour40 minutes1 hour20 minutes30 minutes	Facilitator Facilitator All CCT
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm 3.40 - 4.00 pm 4.00 - 4.30 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module Course Evaluation Announcements	1 hour 40 minutes 1 hour 20 minutes 30 minutes	Facilitator Facilitator All CCT
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm 3.40 - 4.00 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module Course Evaluation	1 hour 40 minutes 1 hour 20 minutes	Facilitator Facilitator
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture End of Module	1 hour 40 minutes 1 hour 1 hour	Facilitator Facilitator
1.00 -2.00 pm 2.00 -2.40 pm 2:40 - 3:40 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module Module 14: Cross-cutting themes in Apiculture	1 hour 40 minutes 1 1	Facilitator Facilitator
1.00 -2.00 pm 2.00 -2.40 pm	Apiculture Lunch Break Module 13: One Health in Apiculture End of Module	1 hour 40 minutes	Facilitator
1.00 -2.00 pm 2.00 -2.40 pm	Apiculture Lunch Break Module 13: One Health in Apiculture	1 hour 40 minutes	Facilitator
1.00 -2.00 pm 2.00 -2.40 pm	Apiculture Lunch Break Module 13: One Health in	1 hour40 minutes	Facilitator
pm 1.00 -2.00 pm	Apiculture Lunch Break	1 hour	
pm = 1.00	Apiculture		
		50 minutes	racimator
12.30 pm 1.00	Module 13: One Health in	30 minutos	Facilitator
pm	Business school	minutes	
11.00 am – 12:30	Module 12: Farmer Field and	1 hour 30	Facilitator
10.30 -11.00 am	Tea Break	30 minutes	
am	Business school		
10:00 am- 10:30	Module 12: Farmer Field and	30 minutes	Facilitator
	End of Module		
9.00-10.00alli	Policies and Regulations	1 11000	racintator
9.00-10.00am	activities	1 hour	Facilitator
8.00-9.00am	Registration for fourth day participation Recap of day 3	30 minutes	CTT
Time	Day 5 (Friday)	Duration	Remarks / Facilitator
Close of day 4			
pm			
4.30 nm -5.00	Tea Break	30 minutes	
pin	End of sub module		
3.30 pm – 4.30	Sub module 11.2: Apiculture	1 hours	Facilitator
	End of sub module		
	Sub module 11.1 Gender, VMG		
pm	in apiculture		
2.30 pm - 3.30	Module 11: Cross-cutting themes	1 hour	Facilitator
	End of sub module		
	Marketing	5 0 minutes	1 definitator
pm	Sub module 10.2 Apiculture		1 av III alv II

ANNEX 2: GENERAL REFERENCE MATERIALS

ANNEX 2.1: FFBS LEARNING MATERIALS

PARTICIPATORY TECHNOLOGY DEVELOPMENT (PTD) ON APICULTURE HIVE MANAGEMENT

Value Chain	Apiculture		
Learning Enterprise	Apiculture		
Funded Enterprise	Apiculture VC at production level		
Background Problem	Low honey and other bee products production due to use		
	of poor hives		
Objective	ive Increase honey and other bee products production		
	through use of improved hives.		

Factors to consider:

- Under same Apiary management
- Same hives management practices
- Same Apiculture husbandry Practices

Setting the P.T.D blocks:

- Different hives as treatments of both improved and farmers practice
- The hives should be in the same Apiary
- Have four treatments of the KALRO improved hives and farmers practice
- Data collections done from each of the hives at the same time
- Other TIMPs should be applied for each of the hives equally.

Parameters Measurement

- Honey Quantities
- Honey quality
- Wax Quantity
- Propolis quantity

Setting of Blocks

Improved Kapkuikui super log hive	Improved Kenya top bar hive	Improved box hive		Farmers Practice Log hive
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ANNEX3: LIVESTOCK ECOSYSTEMS ANALYSIS (LESA) ON APICULTURE

LESA NO	
General information	Production data
Date of colonization	Honey Qty
Apiary Type	Honey quality
Vaccination date	Wax Qty
Time of observation:	Propolis qty
Diagram of pests and natural enemies of	bserved:
Natural enemies of Pests	Pests Observed
1	1.
2.	2
3.	3
4.	4.
Observations	Recommendations



National Agricultural Value Chain Development Project (NAVCDP)

Ministry of Agriculture and Livestock Development Capital Hill, Cathedral Road, Nairobi P. O. Box 8073-00200 Kenya info@navcdp.go.ke

www.navcdp.go.ke



Kenya Agricultural and Livestock Research Organization KALRO Secretariat P O Box 57811-00200 Nairobi, KENYA Email: <u>director@kalro.org</u> Tel. No(s): +254-722206986/ +254-73333223 Web: www.kalro.org