

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

TRAINING OF TRAINERS' MANUAL



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DISCLAIMER

The information presented in this inventory of Technologies, Innovations and Management Practices (TIMPs) book is for advisory use only. Users of this book should seek additional advice from the livestock extension service in order to fully benefit from the inventory recommendations.

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FOREWORD

The Kenya Agricultural and Livestock Research Organization (KALRO) through the support of development partners has laid a strong foundation for growth and commercialization of agriculture in Kenya. This has been done through the development of Climate Smart Technologies, Innovations and Management Practices (TIMPs) through the adaptive and applied research guided by some of the research gaps identified earlier. In addition, the organization has embraced an interconnected information communication technology to ease the handling of data and information from research. A notable inclusion is 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 KCSAP and NARIGP previous projects. In this NAVCDP project, KALRO seeks to strengthen, customize and update the existing inventories of TIMPs, with emphasis on climate resilience, safer food production practices, value addition, nutrition, market participation and commercialization.

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 inventories of TIMPs for the two new value chains, pyrethrum and rice and is continuously expanding, updating and revising existing inventories of TIMPs. In doing so, KALRO further strengthens climate resilience, value addition and market participation aspects of the updated TIMPs to support farmers to transition from subsistence to commercial farming. The organization continues to support the strengthening of the current 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 relevant support mechanisms to oversee the implementation of these activities.

Extensive information from research and background data has been used to develop this revised Inventory of TIMPs for the Apiculture Value chain. To disseminate the TIMPs, a Training of Trainers (ToT) manual has been developed. The design of the manual takes into consideration the delivery system, partners and their roles, duration of training and logical flow of the modules. The training modules have a uniform outline that ensures every aspect of the TIMPs are fully covered in way that the trainees can absorb and relate to. Various delivery methods are deployed and where possible demonstrations and practical work are incorporated to enable the trainees learn by participating in the actual field activities. The use of this TIMPs inventory 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 revised TIMPs inventory is to be used in conjunction with the respective ToT Manual.

Finally, I am greatly indebted to the value chain leaders and all those who participated in the preparation and revision of this Inventory of TIMPs for the Apiculture. It is expected to herald new ways of delivering training content that will enable realization of the project objectives and aspirations.

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ABBREVIATIONS AND ACRONYMS

ABIRI	Apiculture and Beneficial Insects Research Institute
ASALs	Arid and Semi Arid Lands
CBOs	Community Based Organizations
CIGs	Common Interest Groups
DVS	Directorate of Veterinary Services
EU	Egerton University
ICIPE	International Centre for Insect Physiology and Ecology
IPR	Intellectual Property Rights
ITK	Indigenous Technology Knowledge
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	Kenya Climate Smart Agriculture Project
KEFRI	Kenya Forestry Research Institute
KES	Kenya Shillings
Kg	Kilogram
KTBH	Kenya Top Bar Hive
MoALD	Ministry of Agriculture and Livestock Development
NARIGP	National Agricultural and the Rural Inclusive Growth Project
NARS	National Agriculture Research Systems
NAVCDP	National Agricultural Value Chain Development Project
NBI	National Beekeeping Institute of the State Department of Livestock Development
NGOs	Non-Governmental Organizations
NMK	National Museums of Kenya
PDO	Project Development Objective
SEKU	South Eastern Kenya University
TIMPS	Technologies, Innovations Management Practices
ToTs	Training of Trainers
VC	Value Chain
VMGs	Vulnerable and Marginalized Groups

1.0 DEFINITION OF TERMS AND SUMMARY TABLES OF APICULTURE, TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES (TIMPS)

1.1 Definition of terms

Agripreneur: An established commercial agri-entrepreneur who will be mentored and coached by a business accelerator to deliver E-extension sustainably and provide digital data on TIMPS dissemination and adoption.

Technology: This is defined as an output of a research process which is beneficial to the target clientele (mainly beekeepers, farmers, pastoralists, agro-pastoralists and fisher folk for NAVCDP's case), can be commercialized and can be patented under intellectual property rights (IPR) arrangements. It consists of research outputs such as tools, equipment, genetic materials, breeds, farming and herding practices, gathering practices, laboratory techniques, models etc.

Innovation: This is defined as a modification of an existing technology for an entirely different use from the originally intended use. (e.g. fireless cooker modified to be used as a hatchery).

Management practice: This is defined as a recommendation(s) on practice(s) that is/are considered necessary for a technology to achieve its optimum output. These include, for instance, different agronomic practices (seeding rates, fertilizer application rates, spatial arrangements, planting period, land preparation, watering regimes, etc.), protection methods, for crops; and feed rations, management systems, disease control methods, etc. for animal breeds. This is therefore important information, which is generated through research to accompany the parent technology before it is finally released to users and the technology would be incomplete without this information.

1.2 Summary of TIMPs Inventory in the Apiculture Value Chain

The inventory process resulted in a total of 115 TIMPs including 31 technologies, 41 innovations, and 43 Management Practices, distributed among 3 sub-themes, as indicated in Table 1.

Table 1: Sub themes and TIMPs

Commodity/VC	Sub-Theme	Technologies	Innovations	Management Practices
Apiculture	Honey Bees	5	0	2
Apiculture	Bee Breeding	6	0	0
Apiculture	Bee Hives	10	0	0
Apiculture	Apiary	1	8	4
Apiculture	Bee Handling	0	0	4
Apiculture	Husbandry Practices	0	0	7
Apiculture	Bee Health	1	2	3
Apiculture	Quality Assurance	0	0	1

Commodity/VC	Sub-Theme	Technologies	Innovations	Management Practices
Apiculture	Harvest and Post-harvest Practices	0	5	4
Apiculture	Value Addition	0	8	2
Apiculture	Honey for Nutrition and Health	0	7	0
Apiculture	Apiculture Services	0	6	0
Apiculture	Apiculture Agribusiness	0	0	6
Apiculture	Apiculture Policy and Regulations	0	0	1
Apiculture	Stingless bees	4	0	0
Apiculture	Stingless bee Hives	4	0	0
Apiculture	Stingless bee apiary	0	1	0
Apiculture	Stingless bee Husbandry	0	0	3
Apiculture	Stingless bee Harvest and Post Harvest	0	2	0
Apiculture	Stingless bee honey value addition	0	2	1
Apiculture	Stingless bee business	0	0	5
Overall Total		31	41	43

1.3 Summary Status of TIMPs in Apiculture Value Chain

The inventory process resulted in a total of 115 TIMPs, 112 now ready for upscaling, as indicated in Table 2.

Table 2: Number of TIMPs ready for upscaling, require validation or further research

Commodity/VC	Sub-Theme	Ready for upscaling	Require validation	Further Research
Apiculture	Honey bees	7		
Apiculture	Bee Breeding	6		
Apiculture	Bee Hives	7	1	2
Apiculture	Apiary	13		
Apiculture	Bee handling	4		
Apiculture	Husbandry practices	7		
Apiculture	Bee health	6		
Apiculture	Quality Assurance	1		
Apiculture	Harvest and Post-harvest Practices	9		
Apiculture	Value Addition	10		
Apiculture	Honey for Nutrition and Health	7		
Apiculture	Apiculture Services	6		

Commodity/VC	Sub-Theme	Ready for upscaling	Require validation	Further Research
Apiculture	Apiculture Agribusiness	6		
Apiculture	Apiculture Policy and Regulations	1		
Apiculture	Stingless bees	4		
Apiculture	Stingless bee Hives	4		
Apiculture	Stingless bee apiary	1		
Apiculture	Stingless bee Husbandry	3		
Apiculture	Stingless bee Harvest and Post-harvest	2		
Apiculture	Stingless bee honey value addition	3		
Apiculture	Stingless bee business	5		
Overall Total		112	1	2

Table 3: Inventory of Apiculture TIMPs by Category and Status

TIMPs Sub-Theme	TIMPs Title	TIMPs Category	Status
2.1 Honey bees	2.1.1 The East African lowland honeybee	Technology	Ready
	2.1.2 The East African mountain honeybee	Technology	Ready
	2.1.3 The East African coastal honeybee	Technology	Ready
	2.1.4 Sahelian honeybee	Technology	Ready
	2.1.5 Colony Transfer	Management Practice	Ready
	2.1.6 Estimating colony strength in a bar hive	Management Practice	Ready
	2.1.7 Attracting and Retaining bees in hives	Technology	Ready
2.2 Bee Breeding	2.2.1 Queen rearing by grafting	Technology	Ready
	2.2.2 Queen rearing by cell punch	Technology	Ready
	2.2.3 Bee breeding by colony splitting	Technology	Ready
	2.2.4 Bee breeding by Overcrowding	Technology	Ready
	2.2.5 KTBH Breeder box	Technology	Ready
	2.2.6 Bar and framed hive breeder Box	Technology	Ready
2.3 Bee Hives	2.3.1 Improved Kapkuikui super log hive	Technology	Ready
	2.3.2 Improved Kenya Top Bar Hive	Technology	Ready
	2.3.3 Improved Single Box Hive	Technology	Ready
	2.3.4 Improved Box hive	Technology	Ready
	2.3.5 Warre hive	Technology	Further Research
	2.3.6 Two - Queen hive	Technology	Validation
	2.3.7 Framed Box hive	Technology	Ready

	2.3.8 Improved Complete loghive	Technology	Ready
	2.3.9 Flow hive	Technology	Further Research
	2.3.10 Timber production for hives	Technology	Ready
2.4 Apiary	2.4.1 Permanent housing for bee hives	Innovation	Ready
	2.4.2 Semi-Permanent housing for bee hives	Innovation	Ready
	2.4.3 Temporary housing technology for bee hives	Innovation	Ready
	2.4.4 Open apiary	Innovation	Ready
	2.4.5 Use of multiple trees as an Apiary	Innovation	Ready
	2.4.6 Use of a single tree as an Apiary	Innovation	Ready
	2.4.7 Swinging wire for honey badger prevention	Innovation	Ready
	2.4.8 Using Guard Sheets to manage honey badger	Innovation	Ready
	2.4.9 Hive stand against honey badger	Technology	Ready
	2.4.10 Management of bird and wasp pests of bees	Management Practice	Ready
	2.4.11 Management of ants	Management Practice	Ready
	2.4.12 Management of snakes and lizards, rodents	Management Practice	Ready
	2.4.13 Management of baboons	Management Practice	Ready
2.5 Bee handling	2.5.1 Bee stings prevention	Management Practice	Ready
	2.5.2 Managing honeybee attack to people and animals	Management Practice	Ready
	2.5.3 Honey bee colony relocation from houses and buildings	Management Practice	Ready
	2.5.4 Livestock /Bee conflict management	Management Practice	Ready
2.6 Husbandry practices	2.6.1 Colony inspection	Management Practice	Ready
	2.6.2 Integrated bee pasture management for high potential areas	Management Practice	Ready
	2.6.3 Integrated bee pasture management for ASALs	Management Practice	Ready
	2.6.4 Integrated bee pasture management for commercial plantations	Management Practice	Ready
	2.6.5 Water and Feed supplementation	Management Practice	Ready

	2.6.6 Region-specific beekeeping floral calendar	Management Practice	Ready
	2.6.7 Establishment of Bee forage plants for pest management	Management Practice	Ready
2.7 Bee health	2.7.1 Wax moths and hive beetles trap	Innovation	Ready
	2.7.2 Open bottom board for managing mites and small hive beetles in bar-hives	Technology	Ready
	2.7.3 Management of nosema diseases of bees	Management Practice	Ready
	2.7.4 Management of bacterial diseases of bees	Management Practice	Ready
	2.7.5 Management of bee pesticide poisoning	Management Practice	Ready
	2.7.6 Mobile app for bee health	Innovation	Ready
2.8 Quality Assurance	2.8.1 Food safety along apiculture value chain	Management Practice	Ready
2.9 Harvest and post-harvest practices	2.9.1 Harvesting Indicators	Management Practice	Ready
	2.9.2 Honey harvesting and pre processing handling	Management Practice	Ready
	2.9.3 Honey processing by centrifuge	Innovation	Ready
	2.9.4 Honey press processing	Innovation	Ready
	2.9.5 Honey processing by dripping	Innovation	Ready
	2.9.6 Honey processing by straining	Innovation	Ready
	2.9.7 Honey packaging	Innovation	Ready
	2.9.8 Honey storage	Management Practice	Ready
	2.9.9 Honey transportation	Management Practice	Ready
2.10 Value Addition	2.10.1 Pollen harvesting and identification	Management Practice	Ready
	2.10.2 Pollen packaging and storage	Management Practice	Ready
	2.10.3 Honey characterization	Innovation	Ready
	2.10.4 Propolis harvesting, processing and packaging	Innovation	Ready
	2.10.5 Beeswax candle	Innovation	Ready
	2.10.6 Bees venom harvesting, processing and packaging	Innovation	Ready
	2.10.7 Royal jelly harvesting, processing and packaging	Innovation	Ready
	2.10.8 Processing and Packaging comb honey	Innovation	Ready
	2.10.9 Bees wax harvesting, processing and packaging	Innovation	Ready


	2.10.10 Beeswax body cream	Innovation	Ready
2.11 Honey for nutrition and health	2.11.1 Honey for food and nutrition security resilience	Innovation	Ready
	2.11.2 Making infused honey products	Innovation	Ready
	2.11.3 Honey-food recipes	Innovation	Ready
	2.11.4 Honey recipe for common colds	Innovation	Ready
	2.11.5 Honey recipe for infants, children and lactating mothers	Innovation	Ready
	2.11.6 Wound Management using honey	Innovation	Ready
	2.11.7 Diet Honey	Innovation	Ready
2.12 Apiculture Services	2.12.1 Watermelon Pollination Management	Innovation	Ready
	2.12.2 Avocado Pollination Management	Innovation	Ready
	2.12.3 Mango Pollination Management	Innovation	Ready
	2.12.4 Cashew nuts Pollination Management	Innovation	Ready
	2.12.5 Coffee Pollination Management	Innovation	Ready
	2.12.6 Pyrethrum Pollination Management	Innovation	Ready
2.13 Apiculture Agribusiness	2.13.1 Business Planning	Management Practice	Ready
	2.13.2 Marketing of Apiculture Products	Management Practice	Ready
	2.13.3 Economic Analysis of Beekeeping	Management Practice	Ready
	2.13.4 Beekeeping Records and Record Keeping	Management Practice	Ready
	2.13.5 Certification in Apiculture Value chain	Management Practice	Ready
	2.13.6 Geographic Branding of Honey	Management Practice	Ready
2.14 Apiculture Policy and Regulations	2.14.1 Beekeeping Policy options and Regulations	Management Practice	Ready
3.1 Stingless bees	3.1.1 Ferruginea Stingless bee	Technology	Ready
	3.1.2 Bocandei Stingless bees	Technology	Ready
	3.1.3 Plebeina Stingless bees	Technology	Ready
	3.1.4 Stingless bee domestication	Technology	Ready
3.2 Stingless bee Hives	3.2.1 Bocandei Stingless bee Hive	Technology	Ready
	3.2.2 Ferruginea Stingless bee hive	Technology	Ready
	3.2.3 Plebeina Stingless bee hive	Technology	Ready
	3.2.4 Hypotrigona Stingless bee hive	Technology	Ready
3.3 Stingless bee apiary	3.3.1 Stingless bee apiary	Innovation	Ready

3.4 Stingless bee husbandry	3.4.1 Stingless bee Husbandry	Management Practice	Ready
	3.4.2 Management of Stingless bee pests	Management Practice	Ready
	3.4.3 Management of stingless bee diseases	Management Practice	Ready
3.5 Stingless bee harvest and post harvest	3.5.1 Stingless bee honey Harvesting	Innovation	Ready
	3.5.2 Stingless bee honey processing, packaging and storage	Innovation	Ready
3.6 Stingless bee honey value addition	3.6.1 Stingless bee honey	Innovation	Ready
	3.6.2 Stingless bee honey recipes and infusions	Innovation	Ready
	3.6.3 Food safety in stingless beekeeping value chain	Management Practice	Ready
3.7 Stingless bee business	3.7.1 Stingless beekeeping business plan	Management Practice	Ready
	3.7.2 Stingless beekeeping Economic analysis	Management Practice	Ready
	3.7.3 Stingless beekeeping Records and Record Keeping	Management Practice	Ready
	3.7.4 Stingless beekeeping marketing	Management Practice	Ready
	3.7.5 Stingless beekeeping Policy options and regulation	Management Practice	Ready

2.0 DETAILED APICULTURE VALUE CHAIN TIMPS

2.1 Honey Bees

2.1.1 The East African Lowland Honey bee

2.1.1 TIMP name	The East African lowland honey bee
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Low honey and honey products productivity due to innappropriate management practices arising from knowledge gap in identifying the type of honeybees (honeybee races) in Kenya and therefore understanding the bee race for a specific region.
What is it? (TIMP description)	<p>The East African lowland honey bee (<i>Apis mellifera scutellata</i>) is the most spatially distributed bee in Kenya and is found in all parts of the country except where the other bee breeds are found. It is medium sized and usually has three yellow bands in its abdomen- thus mainly referred to as yellowbee or semi-arid bee.</p>  <p>Source: http://www.atlashymenoptera.net/page.aspx?id=238</p> <p>Regions</p> <ul style="list-style-type: none"> It is found in the mid altitudes from 500-1500 m above sea level It is so far the most aggressive bee in the country <p>This bee will not be productive outside its geographic range, avoid transferring it to other areas</p> <p>Bee breed crosses</p> <ul style="list-style-type: none"> Hybridization may occur in areas of transition with other bee races Bee transfer across the ecological zones may have occurred, introducing it in new ranges. This will need to be confirmed and effects determined
Justification	Low productivity of honey and honey products may arise due to knowledge gap in identifying the type of honeybees (honeybee races) in Kenya and therefore understanding the bee race for a specific region. Optimization honey and honey products require


	<p>understanding of the Knowledge of the breed of bees available in a locality, which aids in contributing towards their management and utilization. It helps in decision making of:</p> <ol style="list-style-type: none"> 1. Where to locate or transfer our colonies 2. Geographic indication for branding of honey 3. Enhance bee productivity <p>Knowledge of honey bee breeds will go a long way in optimizing yields of honey and honey products.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, extension service, researchers, artisans,agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFPS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms–Website,Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Dissemination pathways • Translation to local languages
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- farmer materials provision; phone apps for suitability maps • Training institutions- capacity building • County governments extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	All low-mid altitude counties excluding high altitude areas in these counties
Counties where TIMP will be up scaled	<ul style="list-style-type: none"> • All low-mid altitude counties including Kitui, Machakos, Makueni, Kajiado, Migori, Siaya Kilifi, Tana River, Nakuru, Kwale, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Poor extension services • Poor partnership and linkages • Low android phone penetration
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increase awareness through social media and on-farm demonstrations • Use of digital extension tools and applications

Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Beekeepers aren't aware of the various bee breeds, and where they occur
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • The bee keeping will be acceptable to the target communities • The target environments will be suitable to the honey bee breed • Policy environment will be friendly for production and marketing of honey bee products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Access to information through data: KES 100 • Keeping of bees: hive KES 7,000/-; assorted hive tools and bee suits KES 15,000/-
Estimated returns	<ul style="list-style-type: none"> • Improved colony management resulting in better bee performance • One hive can produce 10 kg honey per harvest each costing 700/kg • A minimum of 20 hives to start the business
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • In some communities' cultural norms may hinder women from rearing the East African lowland honeybee • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women and youths may have less access to production resources such as land, capital and labour required to implement the technology • Women may have less access to training and extension services on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in rearing the East African lowland honeybee, offering security, repairing the hives and harvesting the honey • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Financial inclusion funds opportunities exist for VMGs to acquire the required credit

	<ul style="list-style-type: none"> • Employment opportunities exist for male youth in rearing the East African lowland honeybee, offering security, repairing the hives and harvesting the honey
Success stories from similar previous projects	None
Application guidelines for users	<ul style="list-style-type: none"> • Guidelines and briefs available in the ToT Manual • Extension materials
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	1-Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa,
Partner organizations	International Centre of Insect Physiology and Ecology, Directorate of Veterinary Service, National Beekeeping Institute, National Museum of Kenya

2.1.2. The East African Mountain honeybee

2.1.2 TIMP name	The East African mountain honeybee
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low honey and honey products productivity due to inappropriate management practices arising from knowledge gap in identifying the type of honeybees (honeybee races) in Kenya and therefore understanding the bee race for the high altitude regions.
What is it? (TIMP description)	The East African mountain honeybee (<i>Apis mellifera monticola</i>) occurs in the high-altitude mountainous areas. It is a medium-sized bee and usually black. It is found in the high-altitude areas concentrated around mountain zones (mountain ecology- not deep into the farmland unless encroachment has resulted in farms getting close to the mountain) across the country. This bee is black in colour and medium to large in size


	 <p>Source: http://www.atlashymenoptera.net/page.aspx?id=238</p> <p>Regions</p> <ul style="list-style-type: none"> • It will mainly be found in the high altitudes from 2,000 m above sea level • It is mainly a forest bee and in tea zones • It is the least aggressive bee in the country <p>This bee will not be productive outside its geographic range, avoid transferring it to other areas</p> <p>Bee breed crosses</p> <ul style="list-style-type: none"> • Hybridization may occur in areas of transition with other bee races • Bee transfer across the ecological zones may have occurred, introducing it in new ranges. This will need to be confirmed and effects determined
Justification	<p>Low productivity of honey and honey products may arise due to knowledge gap in identifying the type of honeybees (honeybee races) in Kenya and therefore understanding the bee race for a specific region. Optimization honey and honey products require understanding of the Knowledge of the breed of bees available in a locality, which aids in contributing towards their management and utilization. It helps in decision making of:</p> <ol style="list-style-type: none"> 1. Where to locate or transfer our colonies 2. Geographic indication for branding of honey 3. Enhance bee productivity <p>Knowledge of honey bee breeds will significantly contribute to optimizing yields of honey and honey products.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, extension service, researchers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents

	<ul style="list-style-type: none"> Farmer to Farmer Extension Models Mass media – Electronic and Print Publications -Posters/Brochures/Leaflets, ManualsDigital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Dissemination pathways Translation to local languages
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO- farmer materials provision; phone apps for suitability maps Training Institutions- capacity building County Governments extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	<ul style="list-style-type: none"> Counties with tea zones focusing on those tea zones and forest areas.
Counties where TIMP will be up scaled	<ul style="list-style-type: none"> Kilifi, Migori, Tana River, Siaya, Nakuru, Kitui, Kwale, Kajiado, Kakamega, Machakos, Makueni
Challenges in dissemination	<ul style="list-style-type: none"> Lack of awareness Poor extension services Poor partnership and linkages Low android phone penetration
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Strengthen extension services to include apiculture Establish partnership and linkages for dissemination Use of digital apps
Lessons learned in up scaling if any	Beekeepers are not aware of the various bee breeds, and where they inhabit.
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> The East African mountain honey bee will be acceptable within the Beekeeping communities The target environment will be suitable to this type of Bee Policy environment will be suitable for the production and marketing of honey bee products The market will be willing and able to absorb the honey bee products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Access to information through data: KES 100 Keeping of bees: hive KES 7,000/-; assorted hive tools and bee suits KES 15,000/-
Estimated returns	<ul style="list-style-type: none"> Improved colony management resulting to better performance One hive can produce 10 kg honey per harvest each costing 700/kg A minimum of 20 hives to start the business
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> In some communities' cultural norms may hinder women from rearing the East African lowland honey bee Women may suffer from bee-sting phobia

	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women and youths may have less access to production resources such as land, capital and labour required to implement the technology • Women may have less access to training and extension services on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in rearing the East African mountain honeybee, offering security, repairing the hives and harvesting the honey. • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances.
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs. • VMGs may have limited access to education, training and extension services on the technology. • Due to their social status, VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required credit. • Employment opportunities exist for male youth in rearing the East African mountain honeybee, offering security, repairing the hives and harvesting the honey.
Success stories from similar previous projects	
Application guidelines for users	<ul style="list-style-type: none"> • Guidelines and briefs available • Honey bee extension materials
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	1-Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa

Partner organization	National Beekeeping Institute, International Centre for Insect Physiology and Ecology, Baraka College, Community Based Organizations, Beekeeping groups and beekeepers.
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2.1.3 The East African coastal honeybee

2.1.3 TIMP name	The East African coastal honeybee
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low honey and honey products productivity as a result of inappropriate management practices due to knowledge gap in identifying the type of honeybees (honeybee races) in Kenya and therefore understanding the bee race for a specific coastal region.
What is it? (TIMP description)	<p>The East African coastal honeybee (<i>Apis mellifera litorea</i>) race is found in the coastal areas, within 0-300 m above sea level. It is mainly found in counties of Mombasa, Kilifi, Kwale; parts of Taita Taveta, Lamu and Tana River. It has a long tongue, two yellow bands in the abdomen and has smaller body size compared to the East African Lowland honeybee breed. It is well adapted to the coastal region, which is warm and humid.</p> <p>Bee breed crosses:</p> <ul style="list-style-type: none"> Hybridization may occur in areas of transition with other bee races Bee transfer across the ecological zones may have occurred, introducing it to new ranges  <p>Source: http://www.atlashymenoptera.net/page.aspx?id=238</p>
Justification	Low productivity of honey and honey products may arise due to knowledge gap in identifying the type of honeybees (honeybee races) in Kenya and therefore understanding the bee race for a specific region. Optimization honey and honey products require understanding of the Knowledge of the breed


	of bees available in a locality, which aids in contributing towards their management and utilization. It helps in decision-making on where to locate or transfer colonies, geographic indication for branding of honey and enhancing bee productivity.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, extension service, researchers, farmer groups, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Dissemination pathways • Translation to local languages
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO-farmer materials provision; phone apps for suitability maps • Training Institutions- Capacity Building • County governments extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Taita Taveta, Kwale, Mombasa, Lamu, Kilifi, Tana river along the coastal strip
Counties where TIMP will be up scaled	All bee keeping counties including; Kilifi, Migori, Tana River, Siaya, Nakuru, Kitui, Kwale, Kajiado, Kakamega, Machakos, Makueni
Challenges in dissemination	<ul style="list-style-type: none"> • Poor extension services • Poor partnership and linkages • Low android phone penetration
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Strengthen extension services to include apiculture • Establish partnership and linkages for dissemination • Use of digital apps
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Beekeepers aren't aware of the various bee breeds and where they are found
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • The East African coastal honey bee will be acceptable within the Beekeeping communities • The target environment will be suitable to this type of Bee

	<ul style="list-style-type: none"> • Policy environment will be suitable for the production and marketing of honey bee products • The market will be willing and able to absorb the honey bee products • Honey produced will meet market requirements
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 100 to buy bundles for downloading app
Estimated returns	<ul style="list-style-type: none"> • Improved colony management resulting to better performance • One hive can produce 10 kg honey per harvest each costing 700/kg
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • In some communities' cultural norms may hinder women from rearing the East African lowland honeybee • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women and youths have less access to production resources such as land, capital and labour required to implement the technology • Women may have less access to training and extension services on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary. • Employment opportunities exist for men and youth males in rearing the East African coastal honeybee, offering security, repairing the hives and harvesting the honey. • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs. • VMGs may have limited access to education, training and extension services on the technology. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Financial inclusion funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for male youth in rearing the East African coastal honey bee, offering security, repairing the hives and harvesting the honey

Success stories from similar previous projects	
Application guidelines for users	<ul style="list-style-type: none"> • Training of Trainers manuals • Honey bee extension materials
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa
Partner organizations	International Centre for Insect Physiology and Ecology, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute.

2.1.4 The Sahelian honeybee

2.1.4 TIMP name	The Sahelian honey bee
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low honey and honey products productivity due to inappropriate management practices arising from knowledge gap in identifying the type of honeybees (honeybee races) in Kenya and therefore understanding the bee race for the northern parts of Kenya.
What is it? (TIMP description)	<p>The Sahelian honeybee (<i>Apis mellifera yemenitica</i>) is also referred to as <i>Apis mellifera nubica</i> or <i>Apis mellifera yemenitica</i>. It is not well studied in Kenya and limited information exists citing it in the north eastern counties of Kenya. Its main distribution area is Sahelian countries from Senegal to Arabia. It could have spread to the northern parts of Kenya. It has a large yellow band and is medium in size.</p> <p>Bee breed crosses</p> <ul style="list-style-type: none"> • Hybridization may occur in areas of transition

	<ul style="list-style-type: none"> • Bee transfer across the ecological zones may have occurred, introducing some breeds in new ranges. This will need to be confirmed and effects determined  <p>Source: http://www.atlashymenoptera.net/page.aspx?id=238</p>
Justification	Knowledge of the bees breeds available in a locality helps in contributing towards their management and utilization. It helps in making decisions on where to locate or transfer colonies, geographic indication for branding of honey and enhancing bee productivity.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> • Beekeepers, extension service, researchers, farmer groups, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFPS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Dissemination pathways • Translation to local languages
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- farmer materials provision; phone apps for suitability maps • Training institutions- capacity building • County governments extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Turkana, Wajir, Mandera, Garissa, Marsabit
Counties where TIMP will be upscaled	Kilifi, Migori, Tana River, Siaya, Nakuru, Kitui, Kwale, Kajiado, Kakamega, Machakos, Makueni

Challenges in dissemination	<ul style="list-style-type: none"> • Lack of awareness • Poor extension services • Poor partnership and linkages • Low android phone penetration
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Use of digital apps.
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • There is no awareness of the different bee races that exist in the country
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • The Sahelian honey bee will be acceptable within the Beekeeping communities • The type of Bee will enrich bee biodiversity thus contributing to sustainability of the environment • The use of the Sahelian honey bee in apiculture production should be in line with the Wildlife conservation guidelines • Honey produced will meet market requirements
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 100 to buy bundles for downloading app
Estimated returns	<ul style="list-style-type: none"> • Improved colony management resulting to better performance. • One hive can produce 10 kg honey per harvest each costing 700/kg.
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • In some communities' cultural norms may hinder women from rearing the East African lowland honeybee • Women suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women and youths have less access to production resources such as land, capital and labour required to implement the technology • Women may have less access to training and extension services on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary. • Employment opportunities exist for men and male youth in rearing the East African lowland honey bee, offering security, repairing the hives and harvesting the honey. • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities

	<ul style="list-style-type: none"> There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> Affirmative action and Financial inclusion funds opportunities exist for VMGs to acquire the required credit Employment opportunities exist for youth males in rearing the Sahelian honeybee, offering security, repairing the hives and harvesting the honey
Success stories from similar previous projects	None
Application guidelines for users	requires validation
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa
Partner organizations	International Centre for Insect Physiology and Ecology, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute.

2.1.5 Honey bee colony transfer

2.1.5 TIMP name	Honeybee colony transfer
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<p>Reduced honey bee hive and hive products due to reduced bee colonies as a result of:</p> <ul style="list-style-type: none"> Absconding of bees upon transfer from apiary to another Absconding of bees after placement for pollination Absconding after placement in apiaries
What is it? (TIMP description)	This includes ferrying of bee colonies from one apiary to another for purpose of settling them for honey production or pollination service provision. For honey production, colonies could be brought after bee trapping or could be brought after purchase from an established colony. The TIMP includes

	procedures required to be adhered to before the transfer, during the collection and packing of the colonies, while transferring, disembarking the colonies and settling the bees after placement in the new sites.
Justification	Reduced bee colonies results in a decline in honey bee hive and hive products. The TIMP is critical for reducing shocks and trauma to bee colonies while moving them from one location to another. It may be short distances or longer ones. This helps to ensure the acclimatize quickly in the new environment, resulting to better performance. Thus, hive yields are assured and pollination service provision ensured.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, researchers, crop growers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Appropriate transportation means • Modified cages or tools for hive placement • Trained personnel for handling colonies • Well prepared apiaries
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- provide training and mentorship • Training Institutions- capacity building • County governments extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Nakuru, Nairobi, Kiambu
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Less movement of bee colonies • Fear of honey bees described as ‘threat to life’ • Lack of suitability maps for bees
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Awareness about the use of bees • Various government funding opportunities e.g. inua jamii, youth enterprise fund etc • Develop and establish a suitability map

Lessons learned in up scaling if any	Reduced bee absconding
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • The practice of colony movement has limited effect on the environment • The practice of colony movement should be done in conformity with wildlife conservation regulations • The transfer of bee colonies should not affect honey production and thus availability of honey
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hire of track for 50 hives @ KES 200 per km • Labour for loading and offloading 50 hives = 8@ 500 pp • Bee suits. At least 4 @ KES 3000/- a piece • Colony monitoring for 1 week to stabilize @ KES 2,500
Estimated returns	<ul style="list-style-type: none"> • One hive can produce 10 kg honey per harvest each costing 700/kg • For 50 hives, 1st harvest will give KES 350,000
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required credit
Success stories from similar previous projects	<ul style="list-style-type: none"> • ABIRI has been working on the TIMP to make it perfect
Application guidelines for users	Apiculture ToT Manual
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3-requires further research)	Ready for up-scaling
G. Contacts	
Contacts	Institute Director,

	KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	Non-Governmental Organizations, National Beekeeping Institute, Baraka Agricultural College, National Museum of Kenya, Egerton University, South Eastern Kenya University, Common interest Groups, International Centre of Insect Physiology and Ecology

2.1.6 Estimating colony strength in a bee hive

2.1.6 TIMP name	Estimating colony strength in a bee hive
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low honey and honey products productivity and poor pollination service as a result of poor colony strength.
What is it? (TIMP description)	<p>This is the determining of the density of worker bees to know whether the colony is growing, stagnating or declining. This activity should be performed at least once monthly. Colony strength is a factor of worker bee density</p> <p>Worker bee density is an indicator of colony health, including queen quality, pests/disease attacks, or pesticide toxicity to foraging bees. The knowledge will help take steps towards enhancing the growth of the colony.</p> <p>The guidance is supposed to provide beekeepers with the knowledge of the strength of the colony as:</p> <ul style="list-style-type: none"> • Nuke- meaning it just started the colony, 1-3 bars occupied • Weak- meaning it has existed more than 3 months and its coverage is 3-6 bars; it has existed more than a year and it is still covering up to 10-11 bars • Normal- meaning it has existed 3-6 months and occupies 6-11 bars or has existed more than a year and it occupies at least half of the super bars • Strong: it has existed more than a year and it occupies all the brood and super bars
Justification	Poor colony strength results in low honey and honey products productivity and poor pollination service. It is the intention of a beekeeper to have strong colonies because of various benefits such as:

	<ul style="list-style-type: none"> • high yields of honey • increased pollination service provision • better defence: can better fight their enemies • used for breeding and commercialization, among others. <p>Estimating colony strength is critical to help beekeepers understand possible factors that may hinder or enhance productivity. It will also help the beekeepers in planning for business</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, researchers, crop growers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Existence of Centre of excellence in apiculture • Videos demonstrating use of apps • Android phone penetration
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- provide training and mentorship • Training institutions- capacity building • County governments extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Nakuru, Nairobi, Kiambu
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Smart phone penetration
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Beekeeping groups can share information • Youth empowerment
Lessons learned in up-scaling if any	<ul style="list-style-type: none"> • Fear of hive inspections • Lack of bee suits prevents frequent inspections • Hives in trees are not easy to inspect
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • The practice of estimating input costs for a Bee hive is socially acceptable • Estimating costs on a beehive has no environmental effects • Costs on a Beehive do not require any policy guidelines

	<ul style="list-style-type: none"> Knowing input costs assists in the estimation of profitability of Beekeeping
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Inspecting 50 hive colonies per month Smoker @ 1,500 Labour @ 1000 for 2 persons
Estimated returns	<ul style="list-style-type: none"> One hive can produce 10 kg honey per harvest each costing 700/kg For 50 hives, 1st harvest will give KES 350,000
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Social and cultural restrictions may not allow women to touch the hive Women may suffer from bee-sting phobia Women may have less access to information and knowledge on the management practice Women may have less access to production resources such as land, capital and labour Women may have less access to training and extension services on the management practice
Gender related opportunities	<ul style="list-style-type: none"> Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> VMGs may have limited access to finances to acquire the required inputs for the management practice VMGs may have limited access to education, training and extension services on the management practice Due to their social status VMGs are often excluded from decision making in the development and dissemination activities There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> Affirmative action and Financial inclusion funds opportunities exist for VMGs to acquire the required credit Employment opportunities exist for youth males in offering security, repairing the hives and harvesting the honey
Success stories from similar previous projects	ABIRI has been working on the TIMP to make it perfect
Application guidelines for users	Apiculture ToT Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling

G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich Caroline Kimani and Joseph Mulwa
Partner organizations	International Centre of Insect Physiology and Ecology, Directorate of Veterinary Service, National Beekeeping Institute, Baraka Agricultural College, National Museum of Kenya, Egerton University

2.1.7 Attracting and Retaining bees in hives


2.1.7 TIMP name	Attracting and Retaining bees in hives
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low hive occupation • Frequent hive absconding
What is it? (TIMP description)	This is the practice of enticing bees to enter, settle and remain in a hive, using various approaches. Attraction of bees into the hive can be achieved by baiting the hive using melted wax, wax mixed with propolis, hive siting and other suitable methods. Retaining bees is ensuring that bees remain in the hive once they occupy it. Good beekeeping practices must be practiced in order to retain the bees in the hive.
Justification	Unoccupied hives result in low productivity. Hive occupation is important in hive productivity and a sustainable apiculture industry. Populations of honeybees in Kenya are essentially wild. Empty hives are occupied by migrating honeybee swarms. These swarms, once they enter the hives, should be retained therein through good beekeeping practices such as colony inspection. However, once colonies cease brood rearing and consume all food stores, they abandon the hives and migrate to new locations. It is therefore necessary to attract and retain bees in hives for sustainable honey and honey products production.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, extension officers, national government, county governments, researchers, agripreneurs

Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Trained extension officers • Essential nutrition or flora • Proper nests/hives
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Extension service providers to train farmers on good beekeeping practices and siting of the apiaries • DVS –training of county staff as TOTs on bee health • DLP – training of county staff as ToTs on production, hive technology and flora diversity • KALRO – technology development and fine tuning, ToT, backstopping and monitor implementation • Beekeepers and Apiculture Association to maintain records and advocacy
C: Current situation and future scaling up	
Counties where already promoted if any	All Counties in Kenya
Counties where TIMP will be up-scaled	All bee keeping counties including; Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate extension officers • Lack of sufficient funds for awareness creation
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Training of extension service providers and beekeepers on attraction and retention of bees. • Various government funding opportunities e.g Financial inclusion Fund, youth enterprise fund
Lessons learned in up scaling if any	
Social, environmental, policy and market conditions necessary for development and up-scaling	<ul style="list-style-type: none"> • The practice of attracting and retaining bees in their colonies will generally be acceptable in the bee keeping communities • The environmental conditions will be suitable for attracting and retaining bees into target hives • Policy environment will be friendly for marketing of honey and hive products • The market will be able and willing to absorb the increase in honey and hive products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	

Basic costs	<ul style="list-style-type: none"> • Cost of wax KES 700*10kg=7000 • Labour for colony inspection KES 500*5 days=2500
Estimated returns	<ul style="list-style-type: none"> • One hive can produce 10 kg honey per harvest priced at KES 700 /kg • For 50 hives, 1st harvest will give KES 350,000
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Attracting and retaining bees is a task performed mostly by men • Women may have less access to information and knowledge on the innovation • Women may have less access to training and extension services, which can lead to a knowledge gap in the innovation
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youth in attracting and retaining bees
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of innovations • VMGs may have less access to information and knowledge on innovation • VMGs may have less access to training and extension services, which can lead to a knowledge gap in the use of innovation
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for male youth in attracting and retaining bees • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
Success stories from previous similar projects	<ul style="list-style-type: none"> • ABIRI has been working on the TIMP to make it perfect
Application guidelines for users	Extension materials/publications
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Directorate of Veterinary Services, South Eastern Kenya University, Directorate of Crop Protection, National Museum of Kenya, Department of Livestock Production

2.2 Bee Breeding

2.2.1 Queen Rearing by Grafting

2.2.1 TIMP name	Queen Rearing by Grafting
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low number of colonies per apiary • Declining population of bees
What is it? (TIMP description)	<p>Queen rearing by grafting is the process of relocating larvae from a worker cell to a queen cell. The relocated larvae should be freshly hatched and less than 24 hours old. The queen cells are then placed in a cell-holding frame and installed in a queenless hive. A queenless hive should have one frame of honey, one pollen frame, a frame of sealed brood, and a frame of open brood and nurse bees. From then on until the eighth day or so, the larvae are cared for by the nurse bees and finally capped. Once the cells are capped, they remain in the hive until they are moved to the mating hive (nuc).</p>  <p>Cell bar/Holding frame Photo Credit: Nganga J., ICIPE</p>
Justification	Naturally, bees rear new queens during swarming, when the queen is unable to perform the primary function, or during emergencies when the queen is missing. By learning how to rear queens, farmers save money and time. It also helps build colonies that best suited for the environment.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, Researcher Institutions, Extension Officers, Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print

	<ul style="list-style-type: none"> • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Beekeepers’ capacity building and awareness creation • Capacity build (train) extension service providers on queen rearing.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO and ICIPE – technology development and fine-tuning, ToT, backstopping and monitor implementation. • Extension service providers to train farmers on good beekeeping practices and siting of the apiaries • DVS –training of county staff as TOTs on bee health • DLP – training of county staff as ToTs on production, hive technology and flora diversity. • Beekeepers and Apiculture platform of Kenya to maintain records and advocacy.
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui- Kamaki’s Beekeepers Cooperative Society
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of knowledge • Limited number of strong colonies • Inadequate resources (Extra hives for establishing new colonies)
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on queen rearing by grafting • Training beekeepers on queen rearing by grafting
Lessons learnt in up-scaling if any	Most beekeepers depend on natural multiplication of bees
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • The practice of queen rearing will readily be taken up by beekeepers • Queen rearing should happen under clean and safe environment • Queen rearing should be done in accordance with the wildlife conservation guidelines • Queen rearing should be done under hygienic conditions to ensure honey and other hive products taken to the market is safe for consumers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • A Hive costs KES 6,000 • Hive Stand KES 1,500 • Plastic/Wax Queen cells. Can be made locally using beeswax and forming sticks • Cell holding bar/frame KES 100 each • Grafting tool KES 20 each (Farmers can use locally available materials like matchstick, chicken feathers e.t.c) • Mating Nuc KES 2,500

Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw honey per season. From colony multiplication, you have 20kg raw honey per season (10 from mother colony, 10 from new divided colony) • Harvesting could be twice or more • Price for honey could be 700 per kilo • Estimated returns is KES 14,000 from the two colonies per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in queen rearing by grafting
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Financial inclusion funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for male youth in offering security, repairing the hives and harvesting the honey
E. Case studies/profiles of success stories	
Success stories from previous similar projects	The case of KAMAKI Beekeepers Cooperative Society members
Application guidelines for users	Guidelines are included in the Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org

Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa
	International Centre for Insect Physiology and Ecology Joseph Kilonzo and J. Ng'ang'a
Partner organizations	Directorate of Veterinary Sciences, National Beekeeping Institute

2.2.2 Queen Rearing by Cell Punch


2.2.2 TIMP name	Queen Rearing by Cell Punch
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low number of colonies per apiary • Declining population of bees
What is it? (TIMP description)	<p>Queen rearing by cell punch involves cutting out a cell-holding larvae in a comb in the same way you would use a paper punch. The cell is then attached to a holding frame, and the procedure is the same as that of grafting.</p> <div> </div> <div> </div> <div> <p>Punched comb Holding frame</p> </div> <p><i>Source: J. Kilonzo</i></p>
Justification	Naturally, bees rear new queens during swarming, when the queen is unable to perform the primary function, or during emergencies when the queen is missing. By learning how to rear queens, farmers save money, time and it also helps build colonies faster which are best suited for the environment.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, Researcher Institutions, Extension Officers, Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP)

	<ul style="list-style-type: none"> • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Beekeepers’ capacity building and awareness creation • Capacity build (train) extension service providers on cell punch technique
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - Research training • National Beekeeping Institute – Training extension service • ICIPE -Research and training
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of knowledge • Inadequate resources eg extra hives for dividing colonies • Lack of beekeeper’s awareness on how to retain bees in a hive/nest and its impacts on hive production • Inadequate extension officers • Lack of enough funds for awareness creation
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on queen rearing by cell punch • Training beekeepers on queen rearing by cell punch
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Increase in the number of colonies • Increased productivity(products)
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • The practice of queen rearing will readily be taken up by beekeepers • Queen rearing should happen under clean and safe environment • Queen rearing should be done in accordance with the wildlife conservation guidelines • Queen rearing should be done under hygienic conditions to ensure honey and other hive products taken to the market is safe for consumers
D: Economic, gender, vulnerable, and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive KES 6,000 • Hive Stand KES 1,500 • Plastic/Wax Queen cells • Cell holding bar/frame

Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season. From colony multiplication, you have 20kg raw honey per season (10 from mother colony, 10 from new divided colony) • Harvesting could be twice or more • Price for honey could be 700 per kilo • Estimated returns is KES 14,000 from the two colonies per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in queen rearing by Cell Punch
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Financial Inclusion funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for male youth in offering security, repairing the hives and harvesting the honey
E. Case studies/profiles of success stories	
Success stories from previous similar projects	The case of KAMAKI Beekeepers Cooperative Society members
Application guidelines for users	Guidelines are included in Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org

Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani.
Partner organizations	International Centre for Insect Physiology and Ecology Joseph Kilonzo and J Ng'ang'a Directorate of Veterinary Sciences, Directorate of Livestock Production, National Beekeeping Institute

2.2.3 Bee breeding by colony splitting


2.2.3 TIMP name	Bee breeding by colony splitting
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low number of colonies per apiary • Declining population of bees
What is it? (TIMP description)	<p>Bee breeding through splitting is whereby the colony resources are divided across two or more hives. Splits are usually initiated by the beekeeper to reduce the probability of swarming. For the queenless new hive, ensure there is one frame of brood and one frame of food comprising of nectar/honey and pollen. Ensure that the brood is accompanied by a healthy number of nurse bees. The bees will raise a new queen from the brood available to them.</p>  <p><i>Source: J. Kilonzo</i></p>
Justification	Naturally, bees rear new queens during swarming, when the queen is unable to perform the primary function, or during emergencies when the queen is missing. By learning how to rear queens, farmers save money, time and also quickly build colonies which are best suited for the environment.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, Researcher Institutions, Extension Officers, Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days

	<ul style="list-style-type: none"> • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Beekeepers’ capacity building and awareness creation • Capacity build (train) extension service providers on splitting
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – Research and training • National Beekeeping Institute- Training extension service • ICIPE - Research and training
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui - Kamaki’s Beekeepers Cooperative Society Baringo - Kapkuikui beekeeper group
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of knowledge • Lack of strong colonies for splitting/division • Inadequate resources (Extra hives for dividing hives)
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Enhance training • Expose farmers to credit facilities • Government funding
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Increase in the number of colonies • Increased productivity(products)
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Bee Colony splitting is acceptable to the beekeeper’s communities • Bee colony splitting should be done under hygienic environmental conditions • No policy requirements are needed for promoting the technology • The practice of colony splitting should not interfere with the honey productivity thus affecting supply
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • A hive KES 6,000 • Hive Stand KES 1,500
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season. From colony multiplication, you have 20kg raw honey per season (10 from the mother colony, 10 from the newly divided colony) • Harvesting could be twice or more • Price for honey could be 700 per kilo • Estimated returns is KES 14,000 from the two colonies per season

Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in queen rearing by splitting
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Financial inclusion funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for male youth in offering security, repairing the hives and harvesting the honey
E. Case studies/profiles of success stories	
Success stories from previous similar projects	The case of KAMAKI Beekeepers Cooperative Society members
Application guidelines for users	Guidelines are included in Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3- requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa,

	International Centre for Insect Physiology and Ecology Joseph Kilonzo and J Ng'ang'a
Partner organizations	International Centre for Insect Physiology and Ecology, Directorate of Veterinary Sciences, Directorate of Livestock Production, National Beekeeping Institute

2.2.4 Bee breeding by Overcrowding

2.2.4 TIMP name	Bee breeding by Overcrowding
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low number of colonies per apiary leading to low productivity • Declining population of bees
What is it? (TIMP description)	<p>Queen rearing by overcrowding is whereby one mimics the conditions that lead to swarming by reducing the space available to the bees. Any empty comb is removed, and this denies the bees storage space as well as living space. This increases the bee density in the hive. The bees will draw out a number of queen cells. The queen will emerge from the cell after 16 days and should be removed immediately after emergence.</p>  <p>Overcrowded hive Source: <i>ICIPE</i></p>
Justification	Bees swarm from a hive when it gets so heavily populated that some of the worker bees are unable to sense the pheromones of the queen, they start raising a young queen. By mimicking this condition and causing overcrowding, the bees will rear new queens, and therefore a farmer is able to split and start new colonies from this saving time and getting more productivity.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, Researcher Institutions, Extension Officers, Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days

	<ul style="list-style-type: none"> • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Beekeepers’ capacity building and awareness creation • Capacity build (train) extension service providers on cell punch technique
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - Research training • National Beekeeping Institute – Training extension service • ICIPE -Research and training
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi County(ICIPE)
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of knowledge • Inadequate resources (Extra hives for dividing colonies) • Lack of strong colonies for carrying out overcrowding
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media on bee breeding by overcrowding • Training beekeepers on bee breeding by overcrowding
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Increase in the number of colonies • Increased productivity(products)
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Bee Overcrowding splitting is acceptable to the beekeeper’s communities • Bee Overcrowding splitting should be done under hygienic environmental conditions • No policy requirements are needed for promoting the technology • The practice of Overcrowding splitting should not interfere with the honey productivity thus affecting supply
D: Economic, gender, vulnerable, and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive KES 6,000 • Hive Stand KES 1,500
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season. From colony multiplication, you have 20kg raw honey per season (10 from mother colony, 10 from new divided colony) • Harvesting could be twice or more • Price for honey could be 700 per kilo • Estimated returns is KES 14,000 from the two colonies per season

Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may suffer from bee-sting phobia • Women have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap on bee breeding by overcrowding
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and youth males in offering security, repairing the hives and harvesting the honey • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Financial inclusion funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in offering security, repairing the hives and harvesting the honey
E. Case studies/profiles of success stories	
Success stories from previous similar projects	Nairobi County (ICIPE)
Application guidelines for users	Guidelines are included in Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3- requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani.

	International Centre for Insect Physiology and Ecology Joseph Kilonzo and J Ng'ang'a
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2.2.5 KTBH breeder Box


2.2.5 TIMP name	KTBH breeder Box
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Declining population of bee colonies
What is it? (TIMP description)	<p>This is a small hive with four to five bars used for breeding. It is also used to catch swarms, mate, and transfer bees easily into KTBH hives. The bars used in the breeder box are the same size as the bars in the KTBH hive therefore once colonies are captured in the breeder box, they can be transferred into the main hive.</p> <p>Other common names used to refer to the KTBH breeder box</p> <ul style="list-style-type: none"> • Nuc box • Catcher box <div> </div> <p style="text-align: center;">KTBH breeder Box</p> <p><i>Source: Jeptarus Kipkurui</i></p>
Justification	Working with a KTBH breeder box is simpler when beginning colonies, doing inspections, or moving colonies because of its manageable size. Additionally, it is simpler to use the KTBH breeder box as trapping hive during swarming, which facilitates the capture of colonies. The size of the KTBH breeder box also facilitates the easier finding, capture, and relocation of the queen to another hive when they are utilized for queen breeding.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, extension service, input suppliers, research institutions, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print

	<ul style="list-style-type: none"> • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	Lack of public awareness on the benefits of using a nuc box/catcher box/breeder box
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- conduct research and capacity building • National Beekeeping Institute- Training of extension agents • ICIPE- conduct research and capacity building
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Kitui, Machakos, Makueni
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited resources (input supply) • Limited extension services to disseminate the innovation.
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Training of extension service providers and beekeepers on the importance of KTBH breeder box.
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Affordable to the majority of beekeepers • More appealing and user-friendly to all genders • Enhanced honey production due to an increase in colonies
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Socially acceptable and does not lead to mishandling of bee colonies. • Environmentally friendly innovation • Policy guide lines encouraging use of innovative methods to grow bee colonies • Market likely to absorb increased honey produced
D: Economic, gender, vulnerable, and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KTBH breeder box KES 2000/ • Hive Stand KES 1,500/
Estimated returns	<ul style="list-style-type: none"> • Beekeepers can sell bee packages for KES 3,500 per colony • Beekeepers can also sell queens after breeding for KES 500 each • The KTBH breeder box can also be used to provide pollination services
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for the youth in hives construction • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances

VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the hives due to inadequate of resources • VMGs have less access to information and knowledge on the technology • VMGs may have less access to production resources such as land, capital and labour • VMGs may have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for male youth in constructing the hives • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> • Baringo County: Rachemo beekeepers, Irong beekeepers Association • Kitui County: Kamakis Beekeepers Cooperative Society
Application guidelines for users	Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani.
Partner organizations	International Centre for Insect Physiology and Ecology, National Beekeeping Institute

2.2.6 Bar and framed hive breeder Box

2.2.6 TIMP name	Bar and framed hive breeder Box
Category (i.e., technology, innovation or management practice)	Technology

A: Description of the technology, innovation or management practice	
Problem to be addressed	Declining population of bee colonies
What is it? (TIMP description)	<p>This is a small hive with four to five frames used to catch, breed, and transfer bees easily into variety of bar and framed box hives. The frames used in the catcher box are the same size as the frames in the Langstroth hive therefore once colonies are captured in the catcher box, they can be transferred into the main hive.</p> <p>Other names used to refer to the bar and frame hive breeder box is Langstroth nuc box</p>  <p>Bar and framed hive breeder box <i>Source: Jeptarus Kipkurui</i></p>
Justification	Working with a mating breeder box is simpler when beginning colonies, doing inspections, or moving colonies because of its manageable size. Additionally, it is simpler to use the breeder box as bait hives during swarming, which facilitates the capture of colonies. The size of the breeder box also facilitates the easier finding, capture, and relocation of the queen to another hive when they are utilized for queen breeding.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, Researcher Institutions, Extension Officers, Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings- W Policy guide lines encouraging use of innovative methods to grow bee colonies • Workshops/Seminars/Meetings • Public and Private Extension Agents


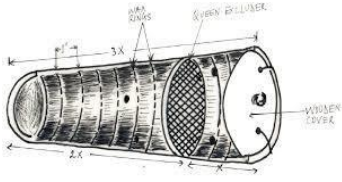
	<ul style="list-style-type: none"> • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Beekeepers’ capacity building and awareness creation • Capacity build (train) extension service providers on Bar and framed hive breeder Box
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- conduct research and capacity building • National Beekeeping Institute- Training of extension agents • ICIPE- conduct research and capacity building
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Kitui, Machakos, Makueni
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited resources (input supply) • Limited extension services to disseminate the innovation.
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Training of extension service providers and beekeepers on importance of Bar and framed hive breeder Box
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Affordable to majority of beekeepers • More appealing and user friendly to all genders • Enhanced honey production due to an increase in colonies
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Socially acceptable and does not lead to mishandling of bee colonies. • The fabrication of the Bar and framed hive breeder boxes from wood is likely to have the negative impact on the environment • The Bar and framed hive breeder boxes are fabricated using wood as per the guidelines of NEMA and forestry services • There will be ready market for the Bar and framed hive breeder boxes
D: Economic, gender, vulnerable, and marginalized groups (VMGs) considerations	
Basic costs	Breeder box KES 2000/
Estimated returns	<p>Beekeepers can sell bee packages for KES 3,500 per colony</p> <p>Beekeepers can also sell queens after breeding for KES 500 each</p>
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for the youth in hives construction • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances

VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the super log hives due to inadequate resources • VMGs have less access to information and knowledge on the technology • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for male youth in constructing the hives • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
Success stories from previous similar projects	<ul style="list-style-type: none"> • Baringo County: Rachemo beekeepers, Irong beekeepers Association • Kitui County: Kamakis Beekeepers Cooperative Society
Application guidelines for users	Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa
Partner organizations	International Centre for Insect Physiology and Ecology, Directorate of Veterinary Sciences, National Beekeeping Institute, Egerton University, Baraka college

2.3 Bee Hives

2.3.1 Improved Kapkuikui super log hive

2.3.1 TIMP name	Improved Kapkuikui super log hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	

Problem to be addressed	Low honey quality and frequent absconding by bee colonies in typical log hives commonly used by the majority of beekeepers in ASALs of Kenya.
What is it? (TIMP description)	<p>The Kapkuikui log hive is made of equal halves of the long-running side of the log, which enables easier working of the hive compared with the complete full log hive. Improved Kapkuikui super log hive adds the queen excluder to prevent the queen from accessing honeycombs and restricting her to the brood chamber. This results in having honey chamber with pure honey where beekeepers can harvest. Further, bee absconding is highly minimized due to little disturbance during harvesting, and the preservation of enough honey for bees after harvesting.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <p><i>Source: Toroitich.D</i></p> <p><i>Source: Tuey R.</i></p> </div>
Justification	<p>About 80% of honey produced in ASALs comes from log hives. One of the major drawbacks of log hives is the mixing of brood and honey during harvesting, due to the nature of the hive, which allows for unregulated brood formation across the combs. This is largely because there is no separation of the brood chamber from the honeycombs.</p> <p>The Improved Kapkuikui super log hive offers a solution to the challenges of mixing honey and brood, accidentally killing/injuring the queen during harvesting as well as avoiding over-harvesting and destruction of brood, both of which are major causes of bee absconding.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers (beekeeping groups and individuals), extension service, input suppliers, Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Funding to cover hive costs • Enhanced user knowledge through awareness creation • Availability of reliable honey markets for the increased honey produced

Partners/stakeholders for scaling up and their roles.	<ul style="list-style-type: none"> • KALRO - Research on hive technologies • County governments - promote technology uptake in various counties • Self-help groups - promote technology uptake in various beekeeping zones • MoALD - promote technology uptake in the Country NGOs - promote hive products and publicity/link farmers to markets • Supermarkets - buy and sell to final consumers of hive products.
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate skills in making the improved Kapkuikui log hives with queen excluder • Lack of knowledge by beekeepers about this type of hive
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Train artisans to make the improved Kapkuikui super Log hive • Capacity build beekeepers on the hive qualities and its use, • Link beekeepers to service providers
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • The technology is resilient to the effects/shocks of extreme weather conditions experienced in the ASALs of Kenya • Log hives form the highest population of hives in the country and thus need improvement for best honey quality production • Beekeepers hold strong cultural value for log hives which are easy to acquire
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • Socially acceptable and does not lead to mishandling of bee colonies • The fabrication of the Improved Kapkuikui super log hive from wood is likely to have the negative impact on the environment • The Improved Kapkuikui super log hive are fabricated using wood as per the guidelines of NEMA and forestry services • There will be ready market for the Improved Kapkuikui super log hive
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive cost KES 3,500/hive x 50 hives • Deploying the technology will need the following. These items are not based on single hive but can be used with many hives • Harvesting suit KES 4,000 • hive tool, bee brush, food grade bucket, smoker, gum boots (all KES 4,000)

	<ul style="list-style-type: none"> • Durability: Average log hive will take a minimum of 10 years of quality service • Total expenses =KES183,000
Estimated returns	<p>7kg of honey per harvest per hive; minimum harvest twice annually; approximately KES 700 per kg totaling KES 4,900 per harvest</p> <p>7Kg x 700 x 50 hives x 2 seasons = KES 490,000 - 183,000 = 307,000</p>
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural factors hinder women from performing apiary management practices • Women have bee-sting phobia • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and male youth in construction of improved Kapkuikui super log hive • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the super log hives due to inadequate resources • VMGs may have less access to information and knowledge on the technology • VMGs may have less access to production resources such as land, capital and labour • VMGs may have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for male youth in construction of improved Kapkuikui super log hive • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<p>Farmers who adopted this technology sustained their bee colonies throughout the dry season. The Kapkuikui beekeeping group in Baringo is one such group which sells a gallon (4.5 kg) of honey at KES 1,500 minimum. This has helped members to pay school fees, buy food for the family and buy family assets. This has transformed community livelihood for the better.</p>

Application guidelines for users	Refer to Super log hive technical brochure (http://www.kalro.org/fileadmin/publications/brochuresII/Honey_production_in_dry.pdf)
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Email: Director.Abiri@kalro.org
Lead organization and scientists	KALRO
	Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa
Partner organizations	Irong Natural Bee Product Group-Kapkuikui, Baringo County Government

2.3.2 Improved Kenya Top Bar Hive

2.3.2 TIMP name	Improved Kenya Top Bar Hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Poor honey quality, bee absconding and low hive productivity
What is it? (TIMP description)	<p>Improved Kenya Top Bar Hive has been designed to have a queen excluder. This creates two chambers in the hive, the honey chamber and brood chamber. The queen is excluded from laying eggs and establishing brood in the honey chamber, making harvesting of pure honey combs easier.</p> <div> </div> <div> </div>
Justification	In absence of queen excluder, the queen lays eggs and establishes her brood haphazardly across the combs, sometimes even having honey combs with brood cells. During harvesting, it becomes impossible to exclude brood cells from honey cells. It also

	becomes impossible to leave some honey combs for the bees. This results to harvesting mixture of honey combs and brood combs, making the quality of honey to be low. Further, this harvesting will result in fewer brood and less or no honey left for bees, causing bees to abscond.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, extension service workers, input suppliers, research institutions, Agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Beekeeper awareness • Additional accessories such as hive stand
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • County governments - farmer groups, • Extension Service Providers - for dissemination • NGOs - for wider reach in dissemination (out-scaling)
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Murang'a, Isiolo, Siaya Lamu and Kitui
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited extension services • Cost of the TIMP and accessories • Having full package of tools/items
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media, and on-farm demonstrations • Access to credit facilities
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Better bee performance and reduced absconding • Affordable to majority of beekeepers • More appealing and user friendly to all genders
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Socially acceptable and does not lead to mishandling of bee colonies • The fabrication of the Improved Kenya Top bar hive from wood is likely to have the negative impact on the environment • The Improved Kenya Top bar hive are fabricated using wood as per the guidelines of NEMA and forestry services

	<ul style="list-style-type: none"> • There will be ready market for the Improved Kenya Top bar hive
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 4,000/ hive • Deploying the technology will need the following items which are not based on single hive but can be used with many hives • Harvesting bee suit KES 4,000; • hive tool, bee brush, food grade bucket, smoker, gum boots (all KES 4,000) • Durability: average log hive will take a minimum of 5 years of quality service
Estimated returns	Minimum 15 kg of honey per harvest; minimum harvest twice annually; approximately KES 700 per kg totaling KES 10,500 per harvest
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural factors hinder women from performing apiary management practices • Women have bee-sting phobia • Traditionally, hive ownership, honey production and harvesting is considered a man's job in most communities Women may not be able to reach far away honey markets or have bargaining power • Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for the youth in hives construction • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the Kenya Top Bar hives due to inadequate of resources • VMGs have less access to information and knowledge on the technology • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology

VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for male youth in constructing the hives • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> • Highly embraced by beekeepers across Kenya • Improved honey quality and yields have been reported from central and eastern regions
Application guidelines for users	<ul style="list-style-type: none"> • Acquire the improved KTBH from sources with proven record of hive production • Use appropriate accessories to establish the apiary • Follow proper husbandry practices • Follow proper harvesting and post-harvest procedures
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	<ul style="list-style-type: none"> • Institute Director, • KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat • P.O Box 32-30403 • Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani.
	International Centre for Insect Physiology and Ecology Directorate of Veterinary Sciences, National Beekeeping Institute, Baraka College

2.3.3 Improved single Box Hive

2.3.3 TIMP name	Improved single Box Hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<p>Frequent absconding of colonies</p> <p>Poor quality honey as a result of mixed honey and brood</p> <p>Over-harvesting and destruction of brood</p>
What is it? (TIMP description)	This hive includes addition of queen excluder in the single box hive.



	
Justification	Persistent bee colony absconding is commonly experienced by beekeepers across the country. Further, honey quality has been wanting due to challenging harvesting situations. Efforts to manage these challenges will drastically improve hive products productivity and encourage wider adoption of beekeeping enterprise.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, extension service providers, input suppliers, farmer groups, NGOs, Agripreneurs
Approaches used in dissemination	Field days, posters, agricultural shows and farmer/beekeepers to farmer visits, local media, social media, community Barazas, extension services, research institutions, artisans and business community, digital platforms. Agricultural innovation platforms
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Knowledgeable beekeepers • Artisans capable of constructing the product
Partners/stakeholders for scaling up and their roles	KALRO – provide technology; training County governments – for extension workers, CIGs, MoALD, NGOs – for technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Nyeri, Isiolo, Siaya and Kitui, Kirinyaga
Counties where TIMP will be up scaled if any	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of public awareness about the hive • Limited extension services to disseminate the technology
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness of this technology • Promote use of outreach activities and service providers to provide extension services
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Reduced absconding of bee colonies • It is user friendly to all genders • Easy to manage • Enhanced honey production
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Socially acceptable and does not lead to mishandling of bee colonies • The fabrication of the Improved Single box hive from wood is likely to have the negative impact on the environment • The Improved Single box hive are fabricated using wood as per the guidelines of NEMA and forestry services

	<ul style="list-style-type: none"> • There will be ready market for the Improved Single box hive
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive KES 5,000/ hive • Hive stand KES 2,000/hive • Accessories (not based on single hive) • Harvesting suit KES 4,000 • hive tool, bee brush, food grade bucket, smoker, gum boots KES 4,000
Estimated returns	Improved Single box hive can give about 13 kg of honey per harvesting, with minimum of 2 harvests annually. Honey price is about KES 700/kg
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural factors hinder women from performing apiary management practices • Women may have bee-sting phobia • Traditionally, hive ownership, honey production and harvesting is considered a man's job in most communities Women may not be able to reach far away honey markets or have bargaining power • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for the youth in hives construction • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the Improved single box hives due to inadequate of resources • VMGs have less access to information and knowledge on the technology • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for male youth in constructing the hives • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
E. Case studies/profiles of success stories	

Success stories from previous similar projects	<ul style="list-style-type: none"> Embraced by beekeepers in Siaya and eastern Kenya due to improved honey quality and production
Application guidelines for users	Use best beekeeping practice contained in the ToT Manual
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3-requires further research)	Requires validation
G. Contacts	
Contacts	Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; Director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa
Partner organizations	International Centre for Insect Physiology and Ecology, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute, Baraka college, Non governmental Organizations, South Eastern Kenya University, community based organization, common interest groups

2.3.4 Improved Box Hive

2.3.4 TIMP name	Improved Box Hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Low honey production due to frequent absconding of bees Poor quality honey as a result of mixed honey and brood Over-harvesting and destruction of brood.
What is it? (TIMP description)	This hive is an improvement to the Kenya Top Bar Hive (KTBH), utilizing the standard top bars while borrowing the external structure of the framed hive. Improved box hive has a queen excluder. The hive is vertically built to reduce horizontal space requirement. It brings the aesthetics that come with the langstroth hive.


	  <p>Box hive Source: National Beekeeping Institute</p>
Justification	<p>The Box hive is a modified KTBH. The oblong design of the KTBH is not always desirable where horizontal space is limited. The large metallic lid of the KTBH also poses a challenge in temperature regulation which leads to the absconding of colonies. Therefore, the box hive adapts better in hot areas since the size of the lid is reduced. Additionally, the box hive comes with a plywood ceiling for better insulation. The vertical structure is preferred by beekeepers for aesthetic reasons too. Beekeepers who want to harvest combs for beeswax find the hive very useful since unlike the framed hive, honey is harvested with combs</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>All Beekeepers, extension service providers, input suppliers, farmer groups, Non Governmental Organizations, Agripreneurs</p>
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Knowledgeable beekeepers • Artisans capable of fabricating the box hive
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – provide technology and training facilitation • County governments- extension services and training facilitation • Common Interest groups, MoALD, Non-Governmental Organizations - technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	<p>Nakuru, Kitui, Murang'a, Laikipia, Embu, Kitui, Makueni, Kajiado</p>
Counties where TIMP will be up scaled if any	<p>Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega</p>
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate awareness about the hive

	<ul style="list-style-type: none"> • Limited extension services to disseminate the technology
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness using various dissemination channels • Targeted capacity building of extension service providers
Lessons learned in upscaling if any	<ul style="list-style-type: none"> • Reduced absconding • It is user-friendly to all genders • Easy to manage • Enhanced honey production
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Generally accepted in the community • Hive has no negative effect on environment • Produces high quality honey which is safe for consumers • The use of the hive will require no major shift in policy environment • There will be high demand for the hive
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive KES 5,000/ hive • Hive stand KES 2,000/hive • Accessories (not based on single hive) • Harvesting suit KES 4,500 • Hive tool, bee brush, food grade bucket, smoker, gum boots KES 4,000
Estimated returns	<ul style="list-style-type: none"> • Box hive can give about 15 kg per harvesting, with minimum of 2 harvests annually thus a total honey yield of 30 kg with gross earnings of KES 21,000 when honey is sold for about KES 700/kg
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the management practice • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youth males in the construction of the Box Hive • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status, VMGs may be excluded from decision-making in development and dissemination of the technology • VMGs may have less access to information and knowledge on the technology • VMGs may have less access to production resources such as land, capital and labour • VMGs may have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth male VMGs in fabrication of improved Box Hive

	<ul style="list-style-type: none"> Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	The improved box hive has been embraced by beekeepers in Nakuru and Eastern Kenya because it enhances production of high quality honey, minimizes absconding of bees and for ease of management
Application guidelines for users	Borst, L.P. 2016. Beekeeping best management practices. American Bee Journal
F: Status of TIMP readiness (1-ready for upscaling; 2 requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa
Partner organizations	National Beekeeping Institute

2.3.5 Warre Hive

2.3.5. TIMP name	Warre Hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> High absconding due to high temperatures in the hive Low honey productivity due to frequent absconding
What is it? (TIMP description)	This is a design adapted to the standard flat roof design of the British 'National' hive. It was originally designed by Abbe Emile Warre in 1948 and can be fabricated with permission. In-built features in the warre hive aid bees in managing internal temperature more effectively. It is an all-wooden design with a ventilated cavity under a gabled roof. This chamber dissipates solar heat. The function is further strengthened by a quilt that fits underneath the roof and is filled with an insulating material of plant origin, such as straw or wood shavings. Warré's method is that the hive needs to be opened once a year at the time of harvest

	 <p><i>Warre hive</i> <i>Source: M Gichora</i></p>
Justification	<p>The rising global temperatures associated with the phenomenon of climate change makes bees face difficulties in regulating temperatures in the brood chamber for them to survive and for normal development of their early life stages. The design of the Warre hive is therefore an intervention to address this challenge of regulating internal hive temperatures. It is appropriate for the arid and semi-arid areas of Kenya with high ambient temperatures.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, hive manufacturers, service providers (Agro-vets), trainers/TVETs, agricultural extension staff, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Knowledgeable beekeepers • Artisans capable of fabricating the box hive
C: Current situation and future scaling up	

Counties where already promoted if any	Nakuru, Kitui, Murang'a, Laikipia, Embu, Kitui, Makueni, Kajiado
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Language barriers during training especially in explaining technical issues • Unwillingness to use well seasoned timber • Failure of artisans to adhere to standard measurements and fabrication instructions
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Translate information to local dialects for ease of understanding • Sensitize artisans to use of seasoned and well cured timber to fabricate hives • Sensitize artisans on the importance of adhering to standard measurements and fabrication instructions
Lessons learned in up scaling if any	There is need to have a pilot phase for fabrication and skill development of beekeepers in operation of the hive
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Warre hive will easily be acceptable in beekeeping areas • Warre hive has no adverse environmental effects • The use of the hive will require no major shift in policy environment • Beekeepers will be willing to buy the warre hive
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive KES 5,000/ hive • Hive stand KES 2,000/hive • Accessories (not based on single hive) • Harvesting suit KES 4,500 • Hive tool, bee brush, food grade bucket, smoker, gum boots KES 4,000
Estimated returns	50kg of honey harvested per annum/hive sold @ KES 700 per kg giving a total of KES 35,000
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Traditionally in some communities, taboos may prevent women from harvesting honey or interacting with bee colonies in the open apiary production system • Social and cultural factors may hinder women from performing apiary management practices • Women may have less access to information and knowledge on the management practice • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youth males in the construction of the Warre Hive

	<ul style="list-style-type: none"> Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies VMGs face the barrier of accessing the super log hives due to inadequate of resources VMGs may have less access to information and knowledge on the management practice VMGs may have less access to production resources such as land, capital and labour VMGs may have less access to training and extension services, which can lead to a knowledge gap in the management practice
VMG related opportunities	<ul style="list-style-type: none"> Employment opportunities exist for youth male VMGs especially in fabrication of Warre (Modified roof) Bee Hive Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	Apiculture farmers in Igembe South Meru County are adopting Warre and other modern bee hives because they are economical to use since they are more efficient in honey harvesting than the traditional ones. Warre hives reduce bee absconding
Application guidelines for users	<p>1. Altogether, there are 16 documented variants https://warre.biobees.com/modifications.htm</p> <p>2. The variant of the hive that is referred to here is one by David Heath (UK) https://warre.biobees.com/heaf.htm</p>
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Requires validation
G. Contacts	
Contacts	<p>Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org</p>
Lead organization and scientists	<p>KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa</p>
	<p>Kenya Forestry Research Institute Mercy Gichora</p>
Partner organizations	National Beekeeping Institute, Southern Eastern Kenya University

Gaps

1. Management of bee pests and diseases in Warre hives by introducing movable frames to replace top bars
2. Efficiency of the Warre hives in Kenyan conditions

2.3.6 Two Queen hive

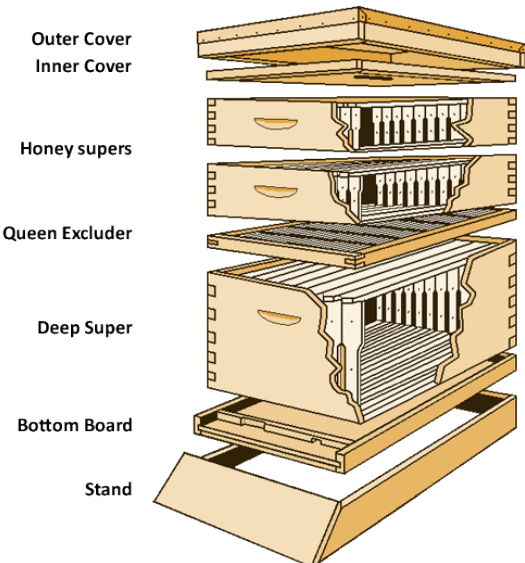
2.3.6 TIMP name	Two Queen hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low colonization resulting in low hive productivity
What is it? (TIMP description)	The double-queen hive employs two brood boxes and a common super. Each brood box has a mated and laying queen and the two brood boxes are separated by a barrier. A queen excluder is placed at the top and middle part of the two boxes to allow workers from each queen to access the single super.
Justification	Short flowering seasons, occasioned by a myriad of factors such as short rains due to changing weather patterns is a reality that faces Kenyan beekeepers in the ASAL areas. It means colonies do not have sufficient time and resources to build up their populations and store surplus honey. Two queens in 'one hive' will contribute enough worker bee populations and allow colonies to produce honey even in bad seasons (when resources are minimal), as opposed to a single queen.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, County government, National government, both local and export traders, processors, packagers and transporters, researchers, agri-prenuers
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Knowledgeable beekeepers • Artisans capable of fabricating the box hive
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Beekeepers who are to adopt the technology

	<ul style="list-style-type: none"> • County government to provide extension services, trainings and promote adoption of the technology • Research institutions to do validation of the hive • Donors to support the upscaling • Private sector – fabrication and promotion
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega and other NAVCDP Counties.
Challenges in dissemination	<ul style="list-style-type: none"> • Language barriers during training especially in explaining technical issues • Inadequate knowledge colony division • Failure to have both chambers colonized • Unwillingness of artisans to use well seasoned timber • Failure of artisans to adhere to standard measurements and fabrication instructions • Predation by honey badgers
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Translate training material into swahili and local dialects • Training on colony division • Sensitize artisans to use well seasoned timber • Use metallic stands to hoist hives • Fencing the apiary
Lessons learned in up scaling if any	Training and proper apiary site selection are key.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • Two queen hive has known adverse environmental effects • There will be know major shifts in policy guiding use of hives in beekeeping • Financing regulations that encourage investment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of the hive is KES 5000-6000.
Estimated returns	30 – 40kgs/year (considering two harvests)/hive. KES 18,000 – 24,000 with a farm gate honey price of KES 600/kg.
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the management practice • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youth males in the construction of the Box Hive • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances

VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision-making in development and dissemination of technologies • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in construction of improved Box Hive • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	None
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Requires validation
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani.
	South Eastern Kenya University Benjamin Muli
Partner organizations	Directorate of Veterinary Services

2.3.7 Framed Box hive

2.3.7. TIMP name	Framed Box hive (Langstroth)
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Long intervals between the harvesting seasons • Cutting of the combs away from the bars during harvesting • Processing of honey is difficult hence this technology increases mechanization

<p>What is it? (TIMP description)</p>	<p>This hive is commonly known as the Langstroth hive. It is composed of two main chambers: the brood hive and the super hive. Between these two chambers, a queen excluder is placed to prevent the queen from laying eggs at the super. The bars are framed to stabilize the combs, which enhances extraction of honey using centrifuge, quickly and with less damage. The hive is easy to install and operate. It allows for colony inspection, it facilitates good management of honey bee pests and diseases.</p> <p>Key features of Langstroth beehives</p>  <p>Illustration of framed box hive</p> <p>Source: https://imaginecare.co.ke/product/langstroth-bee-hive/</p>
<p>Justification</p>	<p>This technology makes it possible to harvest honey and process it while still in the comb without damaging the comb, which then becomes reusable. It expands the possibility of diversifying hive products/ it is easier to harvest pollen</p>
<p>B: Assessment of dissemination and scaling up/out approaches</p>	
<p>Users of TIMP</p>	<p>Beekeepers, hive manufacturers, hive product processors, service providers (Agro-vets), National Beekeeping Institute/TVETs (trainers), agricultural extension staff of County Governments, agripreneurs</p>
<p>Approaches to be used in dissemination</p>	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services


Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Knowledgeable beekeepers • Artisans capable of fabricating the box hive
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Machakos, Kitui, Makueni, Meru, Embu
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos, Makueni and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Language barriers during training, especially in the communication of technical concepts • Acceptance of the concept of working with well-seasoned timber • Low uptake of the Langstroth bee hive • Carpenters unwilling to adhere to standard measurements and fabrication instructions
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Translate messages swahili and local dialects • Sensitization to ensure artisan accept to work with seasoned timber • Create awareness about the Langstroth • Create awareness for artisans on the importance of adhering to standard measurements and fabrication instructions
Lessons learned in up scaling if any	Farmers who buy this technology require after-sales follow-up to ensure correct installation and should invest in beekeeping accessories for colony handling during inspection and harvesting. The beekeepers need to be trained in operating this type of hive themselves to minimize reliance on out-sourced management services.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • Two queen hive has known adverse environmental effects • There will be know major shifts in policy guiding use of hives in beekeeping • Financing regulations that encourage investment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive KES 5,000/ hive • Hive stand KES 2,000/hive • Accessories (not based on single hive) • Harvesting suit KES 4,500 • Hive tool, bee brush, food grade bucket, smoker, gum boots KES 4,000
Estimated returns	With good management practices, an average of 30 kg of honey can be harvested annually translating into earnings of KES 21000 @ KES per kg
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Fabrication of Langstroth hives is a preserve of men • Women may have less access to information and knowledge on the management practice

	<ul style="list-style-type: none"> • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youth males in hive construction • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs may sometimes be excluded from decision making in development and dissemination of technologies • VMGs may face the barrier of accessing the Langstroth Bee Hives due to inadequate of resources • VMGs may have less access to information and knowledge on the management practice • VMGs may have less access to production resources such as land, capital and labour • VMGs may have less access to training and extension services, which can lead to a knowledge gap in the management practice
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in construction of Langstroth Bee Hives • Affirmative action and hustler funds opportunities exist for VMGs to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	The Langstroth hive is gaining world-wide attention. Kenya has embraced the technology but the fabrication of the hive should follow the standard dimensions for it to deliver on its advantages
Application guidelines for users	https://www.almanac.com/beekeeping-101-types-of-beehives
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa

Gaps

1. Manipulation of colonies and bee pest and disease management has been made possible by introducing movable frames to replace top bars.
2. Beekeepers require practical training in operation of Langstroth hives to empower them to directly manage bee colonies in order to maximize returns on investment in this technology

2.3.8 Improved complete log hive

2.3.8 TIMP Name	Improved Complete log hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low honey quality as a result of mixed brood and honey • Absconding due to over harvesting
What is it? (TIMP description)	<p>The improved complete log hive is made of a hollow trunk, with a queen excluder. This prevents the queen from accessing honey combs and restricting her to the brood chamber. This ensures the honey chamber contains pure honey which beekeepers can harvest without mixing it with the brood. Further, bee absconding is highly minimized due to little disturbance during harvesting, and preservation of enough honey for bees after harvesting.</p>  <p>Complete Log hive Source: Jeptarus Kipkurui</p>
Justification	<p>About 80% of honey produced in ASALs come from log hives. One of the major drawbacks of log hives is the mixing of brood and honey during harvesting, due to the nature of the hive which allows for unregulated egg laying by queen across the combs. This is largely because there is no separation of the brood chamber from the honeycombs.</p> <p>The Improved whole Log hive offers a solution to the challenges of mixing honey and brood, as well as avoiding over-harvesting and destruction of brood, both of which are major causes of bee absconding.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers (beekeeping groups and individuals, extension service, input suppliers, agripreneurs)
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP)

	<ul style="list-style-type: none"> • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion and adoption	<ul style="list-style-type: none"> • The cost of hives • User knowledge and understanding of the hive • Reliable honey market
Partners/stakeholders for scaling up and their roles.	<ul style="list-style-type: none"> • KALRO - Research on hive technologies • County governments - promote technology uptake in various counties • Self-help groups - promote technology uptake in various beekeeping zones • MoALD - promote technology uptake in the country's • NGOs - promote hive products and publicity/link farmers to markets • Supermarkets - buy and sell to final consumers of hive products
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Makueni, Machakos, Meru
Counties where TIMP will be up-scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate skills in making the improved complete log hive • Lack of knowledge by beekeepers about this type of hive
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Train artisans to make the improved complete log hive. • Capacity build beekeepers on the importance of the hive and its use • Link beekeepers to service providers
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • The technology is resilient to the effects/shocks of extreme weather conditions experienced in the ASALs of Kenya • Log hives form the highest population of hives in the country and thus need improvement for best honey quality production • Beekeepers hold strong cultural value for log hives which are easy to acquire
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • This hive will be acceptable among beekeepers • The use of the hive has limited adverse environmental effect • Enabling policy frameworks to support development and adoption of the technology is in place • The technology is socially acceptable, and any innovation to increase its productivity will be readily adopted • Increased productivity will provide supply to the markets


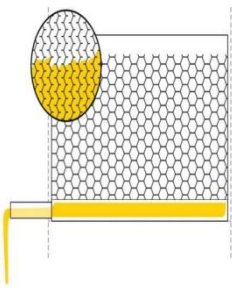
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive cost KES 3,500 / hive • Deploying the technology will need the following. These items are not based on single hive but can be used with many hives • Harvesting suit KES 5,000 • hive tool, bee brush, food grade bucket, smoker, gum boots (all KES 5,000) • Durability • average log hive will take a minimum of 10 years of quality service
Estimated returns	<ul style="list-style-type: none"> • 10kg of honey per harvest per hive; minimum harvest twice annually; approximately KES 700 per kg totaling KES 7,000 per harvest
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural factors are likely to hinder women from performing apiary management practices • Women may have bee sting phobia • Traditionally, hive ownership, honey production and harvesting is considered a man's job in most communities and should be targeted in training • Women may not be able to reach to far flung honey markets or have bargaining power
Gender related opportunities	<ul style="list-style-type: none"> • While honey bulking is done by the youth, women are involved in marketing • There will be creation of job opportunities for the youth in hives making • Need to enhance market linkages to trigger increased production • Adoption of a improved complete log hive will lead to improved productivity of honey hence, more income for women • Adoption will lead to enhanced product diversity and hence resilience; increased yields towards food and nutritional security
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision-making in the development and dissemination of technologies • VMGs face the barrier of accessing the improved complete log hives due to inadequate resources
VMG related opportunities	<ul style="list-style-type: none"> • VMG can be trained as artisans to sell hives to beekeepers • The VMG can be involved in sale of honey and honey products for income and improved nutrition • Affirmative action, capacity building and practical support to be provided
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers who adopted this technology sustained their bee colonies throughout the dry season.

Application guidelines for users	http://apicultureplatformkenya.com/types-of-hives/
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO
	Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa
Partner organizations	Institute, International Centre of Insect Physiology and Ecology, National Beekeeping Institute

Gaps

1. Improving the hive architecture to maximize on hive handling, beeswax and honey production
2. Improving on hive access and use by women and VMGs

2.3.9 Flow hives

2.3.9 TIMP name	Flow Hive
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Challenges with inspection of hives before harvesting • Low adoption of beekeeping due to bee phobia • Complexities of honey extraction
What is it? (TIMP description)	<p>The hive is vertically built, therefore reducing the horizontal space requirement. It has a flow-frames in the super.</p> <div style="display: flex; align-items: center;">   </div>

	<i>Flow hive</i> <i>Source: by J. Kinyanjui</i> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <i>The flow hive plastic comb and how the cells dislocate into channels for</i> </div>
Justification	<p>Inspection of the hive before harvesting is problematic. The Flow Hive allows a beekeeper to inspect and harvest honey without having to smoke the hive or open it. It also saves the beekeeper from having to extract honey from combs as the hive comes with collapsible plastic comb cells. By using a flow hive, one can observe the combs through a glass window to determine the maturity of honey. Once ready, honey is harvested by turning a lever through a mechanism that collapses the plastic hexagonal comb cells where it is packed. The honey then flows into a collecting jar. This operation mechanism is fitted to the back of the hive away from the bee entrance. The flow hive is suitable for farmers with bee phobia and who would otherwise not open or manage a hive. The hive has great aesthetics and looks good on lawns or balconies.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, extension service, input suppliers, research institution, Non Governmental Organizations, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Knowledgeable beekeepers • Artisans capable of constructing the product
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – provide technology and training facilitation • County governments- extension services and training facilitation • Common Interest groups, MoALD, Non-Governmental Organizations - technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi
Counties where TIMP will be up scaled if any	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makeni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of public awareness about the hive • The flow hive is a high cost hive, 5 to 10 times the cost of other hives • Local capacity to fabricate the hive not available

	<ul style="list-style-type: none"> • Technology not adequately tested locally • Limited extension services to disseminate the technology
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Create awareness about the hive • Deliberate equipment support to beekeepers • Equip artisans with skills to fabricate the hive • Evaluate the hive under local conditions • Targeted capacity building of extension service providers
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • It is user friendly to all genders • Easy to manage
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Generally accepted in the community • Gender friendly • Produces high quality honey • The hive can be used under the current regulations guiding beekeeping in the country • Subject to hive theft due to high cost
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Hive KES 70,000/ hive • Hive stand KES 2,000/hive • Harvesting suit KES 4,500 • Food grade bucket or jars, gum boots KES 4,000
Estimated returns	<ul style="list-style-type: none"> • Flow hive can give about 15 kg per harvest, with a minimum of 3 harvests annually. Honey price is about KES 700/kg
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have bee sting phobia • Women may have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youth males in construction of the Flow Hive • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in construction of improved Box Hive • Affirmative action and hustler funds opportunities exist for VMGs to acquire the required finances

E. Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> Embraced by beekeepers in Nairobi due to ease of use, aesthetics and improved honey quality
Application guidelines for users	<ol style="list-style-type: none"> Carrol, T. (2006) A beginner's guide to beekeeping in Kenya. https://infonet-biovision.org/sites/default/files/pdf/beginners_guide_to_beekeeping_kenya.pdf GoK (2023) Making money from beeshoney https://kilimo.go.ke/wp-content/uploads/2023/03/Beekeeping-making-money-from-bees.pdf
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Requires further research
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani.
	National Beekeeping Institute Jonah Kinyanjui
Partner organizations	International Centre for Insect Physiology and Ecology

Gaps

- There is need to evaluate the flow hive in the different agro-ecological zones (AEZs) of Kenya where beekeeping is practiced
- Undertake economic analysis on the use of the flow hive

2.3.10 Timber production for hive construction

2.3.10 TIMP name	Timber selection for hive construction
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Poor quality of timber available for hive fabrication Poor quality of hives which reduces colonization rates Low honey yields as a result of low colonization and bee stability in hives
What is it? (TIMP description)	This involves recommendation on the types of trees that may be grown for provision of timber for fabricating bee hives. Hives can

	be fabricated using hard and soft wood. Timber from pine, cypress, teak, cedar and indigenous trees (e.g. <i>Juniperus procera</i> , <i>Polyscias kikuyuensis</i> , <i>Podocarpus latifolius</i> , <i>Cupressus lusitanica</i> , <i>Pinus patula</i> , <i>Juniperus procera</i> , <i>Microglossa pyrifolia</i> , <i>Clematis brachiata</i> , <i>Prunus Africana</i>), which are strong and light in weight can be used for fabricating hives. These trees may also provide nectar, pollen or resins for bees.
Justification	Poor Quality of timber available for hive fabrication increases the cost of bee hives since the hives do not last for a long time thus get replaced frequently. Additionally, poor quality hives have low colonization rates resulting in low yields and bee stability in hives. Growing own trees will provide good quality timber and enable beekeepers to make quality hives that attract high colonization and yield of honey and hive products as a result of colony stability.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, foresters, farmers, researchers, crop growers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Availability of tree nurseries to provide the seedlings of recommended tree types • Enhanced awareness creation on the need to grow these trees • Mobile-based beekeeping app with adequate information on tree types that produce good timber for hive construction among other uses
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- provide training and mentorship • Training institutions- capacity building • County governments extension workers for farmer linkages and training) • Kenya Forestry Service (KFS) to mobilize farmers to grow trees • KEFRI- to conduct research and train on choice of good timber trees
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo


Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Low Smartphone penetration rate • Lack of suitable tree seedlings • Lack of suitable land for tree planting
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Beekeeping groups can be encouraged to share information • Using alternative dissemination channels to publicize trees that provide quality timber • Youth empowerment to start nurseries that grow tree seedling among others • Publicize farm planning that allows setting aside of minimum land for few trees per farmer
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Planting trees readily provides suitable timber for fabricating hives
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Practicing selection of timber suitable for fabricating hives will readily be accepted beekeeping communities • Planting these trees helps in mitigating negative effects of climate • Trees from which timber for hive fabrication should be planted as per the guidelines of the Kenya Forest Service (KFS) and NEMA Act • There will be demand for timber from planted trees
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Cost of 30 seedling KES 3000 • Labour for planting 30 seedlings KES 500 • Tree water supplementation for 2 years KES30,000
Estimated returns	<ul style="list-style-type: none"> • Selling whole tree, 30 trees @ KES 5,000 per tree after 5 years KES 150,000
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Hive fabrication is generally a man's and youth male's job • Most trees are owned by men at the household and community level • Women may have less access to information and knowledge on the management practice • Women have less access to land for planting the recommended trees • Women may have less access to training and extension services, which can lead to a knowledge gap in the innovation
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and male youths in hive fabrication • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men

	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in hive construction
E. Case studies/profiles of success stories	
Success stories from similar previous projects	None
Application guidelines for users	Apiculture ToT Manual
F: Status of TIMP readiness (1-ready for up scaling; 2 -requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Marigat Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	Kenya Forestry Research Institute, Kenya Forestry Service, National Museums of Kenya

2.4. Apiary

2.4.1 Permanent housing for bee hives

2.4.1 TIMP name	Permanent housing for bee hives
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low beehive colonization and absconding due to shock such as temperature variations leading to reduced productivity. • Honey-in-hive theft • Invasion by predators such as honey badger and crawling pests • Challenges in apiary management and husbandry practices

What is it? (TIMP description)	<p>This is the establishment of suitable modern bee houses adapted to either to cooler or warmer weather conditions, installation of ideal and modern beehives and modest water harvesting, monitoring of colonization and occupancy rate and honey production of placed beehives to document honey productivity and quality levels.</p>  <p><i>An Apiary house</i> <i>Source: Itambo Malombe</i></p>
Justification	<p>Bees need proper housing/shade like other animals to regulate shock from extreme weather conditions, effective control of pests & predators, enhance security of the hives and also to prevent theft of the honey or people from interfering with the bee hives. In addition, the roof catchments help to harvest rainwater for bees and pasture. Most bee colonies abscond during the dry spell in the ASALs due to high temperatures, inadequate or reduced pasture and lack of water. The upsurge in temperatures in these regions has been attributed to climate variability and climate change.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, extension service providers, input suppliers, researchers, artisans, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services

Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Locally available & affordable building materials such as stones and timber for walling, roofing and making stands for hive placement Management and conservation of floral resources Access to credit facilities and grants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO- provide designs and train on construction of modern apiaries South Eastern Kenya University (SEKU) & University of Nairobi (UoN)- capacity building County governments (Livestock)-extension workers for farmer linkages and training
Current situation and future scaling up	
Counties where already promoted if any	Kajiado, Nyandarua, Makueni, Kitui and Baringo, West Pokot, Murang'a, Kirinyaga
Counties where TIMP will be up scaled	Kajiado, Siaya, Kakamega, a, Machakos, Makueni, Kitui, Kilifi, Kwale, Tana River Migori, Nakuru
Challenges in dissemination	<ul style="list-style-type: none"> Low awareness levels on the TIMP Poor extension services Poor partnership and linkages Inadequate financial resources Negative cultural affiliations
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Increased awareness through social media and on farm demonstrations Mobilize credit facilities Utilization of various funding opportunities by the governments e.g. Inua jamii, youth enterprise fund etc.
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Reduced bees absconding Easier management of pests, diseases and predators Increased honey production Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> General acceptance by policy makers and local communities Improved bee pastures e.g. managed integrated bee flora Financing regulations that encourage investment Market availability
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> House structure, hosting 20 beehives, KES 450,000 Installation of water trapping tank, 10,000 L KES 70,000
Estimated returns	<ul style="list-style-type: none"> One hive can produce 10 kg honey per harvest each costing KES 700/kg Growing of vegetables using collected & stored water, in 1/8 of ha giving roughly 80 kg leafy vegetables
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Social and cultural constraints may hinder women from performing apiary cultural practices Women may suffer from bee-sting phobia Women have less access to information and knowledge on the technology


	<ul style="list-style-type: none"> • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology • The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and youth males in offering security, repairing the hives and harvesting the honey • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in offering security and constructing the house
Success stories from previous similar projects	Beekeepers have adopted this management practice in Makueni and Kitui counties and have experienced minimal absconding during the dearth period thus increased honey yields
Application guidelines for users	Construction manual of model bee housing
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO
	Muo Kasina, Richard Kimitei, Dan Toroitich and Caroline Kimani and Joseph Mulwa,

Partner organizations	Non-Governmental Organizations, National Beekeeping Institute, Baraka Agricultural College, National Museums of Kenya, Egerton University, South Eastern Kenya University
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Gaps

Optimization of the house space for honey production

2.4.2 Semi-Permanent housing for bee hives

2.4.2 TIMP name	Semi-Permanent housing for bee hives
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low productivity due to frequent absconding of bee colonies associated with shock extreme weather and effects of climate change • Low quality honey due to ineffective apiary management and husbandry practices • Honey-in-hive theft • Attacks by predators such as honey badgers and crawling pests
What is it? (TIMP description)	<p>A modified structure, constructed on a concrete floor and framework of metal with iron roof, that houses the beehives placed on shelves.</p>  <p><i>An Apiary house</i> Source: Muo Kasina</p>
Justification	Bees need proper housing/shade like other animals to regulate shock from external temperatures, control pests and predators, enhance security of the hives and also to prevent theft of the honey or people from interfering with the hives. Most bee colonies abscond during the dry spell in the ASALs due to high temperatures. The upsurge in temperatures in these regions has been attributed to climate variability and climate change.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> • Beekeepers, extension service providers, input suppliers, researchers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station

	<ul style="list-style-type: none"> • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of locally available materials such as grass for thatching/roofing, rafters and mud for walls and metals for hive stands • Management and conservation of floral resources • Access to credit facilities and grants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- provide designs and train on construction of the houses • Training institutions- capacity building • County governments extension workers for farmer linkages and training)
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Kajiado, Baringo, Nyandarua, West Pokot, Machakos, Bomet
Counties where TIMP will be up scaled	Makueni, Machakos, Kajiado, Kitui, Nakuru, Baringo, Kilifi, Lamu, Siaya,, Tana River, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Low awareness on importance of bee housing • Poor extension services • Poor partnership and linkages • Inadequate financial resources
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Mobilize credit resources • Utilization of various funding opportunities offered by governments e.g. Inua jamii, youth enterprise fund etc
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Reduced bees absconding • Easier management of bee pests and diseases • Increased honey production • Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • Beekeeping supports environmental conservation guidelines • Financing regulations that encourage investment • There is good market for bee honey and other products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • House structure, hosting 20 beehives (grass, rafters, posts, KES 300,000 • Installation of water trapping tank, 10,000 L KES 70,000

Estimated returns	<ul style="list-style-type: none"> • One hive can produce 10 kg honey per harvest each costing KES 700/kg • Growing of vegetables using collected and stored water, in 1/8 of ha giving roughly 80 kg leafy vegetables
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary cultural practices • Women may suffer from bee-sting phobia • Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology • The innovation may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and youth males in construction of the houses, offering security, repairing the hives and harvesting the honey • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in construction of the houses, offering security, repairing the hives and harvesting the honey
Success stories from previous similar projects	<ul style="list-style-type: none"> • Beekeepers have adopted this management practice in Makueni and Kitui counties and have experienced minimal absconding during the dearth period thus increased honey yields
Application guidelines for users	<ol style="list-style-type: none"> 1. The National Beekeeping Training and Extension Manual. 2012. Eds. Kanwe Alice, Butele, Cosmas Alfred, Onzoma Apollo and Kato Agapitus. Government of Uganda. 57.pdf (beekeeperstraining.com). pp.141


	2. Guidelines and briefs available from beekeeping training manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Dan Toroitich Caroline Kimani and Joseph Mulwa
Partner organizations	Non Governmental Organizations, National Beekeeping Institute, Baraka Agricultural College, National Museums of Kenya, Egerton University, South Eastern Kenya University and Common Interest Groups

Gaps

Work that may need to be done to improve TIMP

2.4.3 Temporary housing technology for bee hives

2.4.3 TIMP name	Temporary housing technology for bee hives
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low honey productivity is associated with frequent absconding and delayed colonization due to temperature variations leading to behavioral changes • Rising theft cases of hives and honey • Frequent predation and hive destruction by predators such as honey badger • Challenges in apiary management and husbandry practices
What is it? (TIMP description)	Temporary housing technology for bee hives involves construction of a housing structure for bee hives using locally available materials. The walls are constructed using timber and mud while the roof is grass thatched. The hives are placed in shelves also made from timber.

	 <p>An Apiary house Source:https://anthrome.wordpress.com/2009/10/08/bee-house-central-kenya/</p>
Justification	<p>Bees need proper housing/shade like other animals to regulate shock from external temperatures, control pests and predators, enhance security of the hives and also to prevent theft of the honey or people from interfering with the hives. Most bee colonies abscond during the dry spell in the ASALs due to high temperatures. The upsurge in temperatures in these regions has been attributed to climate variability and climate change.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, extension service providers, input suppliers, researchers, artisans, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of locally available housing materials such as grass for thatching/roofing, rafters and mud for walls and metals for hive stands • Management and conservation of floral resources • Access to credit facilities and grants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization - provide designs and train on construction of the beehive housing • National Museums of Kenya- provide designs and train on construction of the beehive housing • South Eastern Kenya University & University of Nairobi- capacity building


	<ul style="list-style-type: none"> County governments (Livestock)-extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Baringo, Nyandarua
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Low of awareness supporting the use of bee housing Poor extension services Poor partnership and linkages Inadequate financial resources
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Increased awareness through social media and on farm demonstrations Mobilize financial resources through cooperatives, various funding opportunities by governments e.g. financial inclusion funds, Inua Jamii, Youth Enterprise Fund etc
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Use of temporary housing recorded reduced bees absconding Easier management of pests and diseases Increased honey production Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> General acceptance of the temporary housing for apiary development by policy makers and local communities Improved bee pastures e.g. managed integrated bee flora Financing regulations that encourage investment Market availability for honey and honey products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	House structure , hosting 20 beehives (grass thatch, rafters, posts): KES 320,100 i.e. grass thatch supply costs, 90 batches @ KES 100 (KES 9000); 95 posts @ KES 300 (KES 31,500); rafts 115 @ KES 40 (KES 4,600); labour KES 65,000; 20 hives @ KES 7,000 (KES 140,000); Installation of water trapping tank, 10,000 L KES 70,000
Estimated returns	One hive can produce 10 kg honey per harvest each costing KES 700/kg, harvested twice in a year (KES 280,000) when fully colonized for 20 hives
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Social and cultural constraints may hinder women from performing apiary cultural practices Women may suffer from bee-sting phobia Women have less access to information and knowledge on the technology Women have less access to production resources such as land, capital and labour Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology

	<ul style="list-style-type: none"> The innovation may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> Employment opportunities exist for women in cleaning and maintaining the house Employment opportunities exist for men and youth males in constructing the colony house and offering security Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> VMGs may have limited access to finances to acquire the required inputs VMGs have limited access to education, training and extension services than men Due to their social status VMGs are often excluded from decision making in development and dissemination activities There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit Employment opportunities exist for youth males in offering security and constructing the colony house
Success stories from previous similar projects	Beekeepers have adopted this management practice in Makueni and Kitui counties and have experienced minimal absconding during the dearth period thus increased honey yields
Application guidelines for users	Beekeeping in ToT manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich and Caroline Kimani
Partner organizations	Non governmental organizations, National Beekeeping Institute, Baraka Agricultural College, National Museums of Kenya, Egerton University, South Eastern Kenya University, Common Interest Groups

Gaps

Long term effects of the housing against the expected benefits

2.4.4 Open Apiary

2.4.4 TIMP name	Open Apiary
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Frequent bee hive attacks by predators • Frequent bee absconding • Honey-in hive theft • Low honey productivity
What is it? (TIMP description)	<p>This is the installation of beehives with waterproof iron cover in open natural habitats composed of suitable flora and ambience, placed on a single metal stand and caged in a metal frame. Fencing of the apiary may also be necessary to reduce wildlife interference. It also involves monitoring colonization and occupancy rates and honey production of placed bee hives to document honey productivity and quality levels.</p>  <p><i>An open space apiary; Photo: Malombe</i></p> <p><i>An open apiary. Source: J Kilonzo and M Jeptarus, respectively</i></p>
Justification	Suitable apiary selection and management is necessary to hive and bee security from direct wind, sunlight, rain as well as bee flora supply. In addition, bees need to be protected from pests and predators, while minimizing conflicts with humans and other


	wildlife. The use of metal cages and stands, natural shedding, and modest fencing minimizes predator attacks, improves climatic conditions and reduces wildlife conflicts.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, extension service providers, input suppliers, researchers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of natural habitats including woodlands and forests as well as hedgerows • Management and conservation of floral resources • Access to credit facilities and grants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization-provide designs and train on the construction of the open apiary by the value chain leaders and all other value chain players • South Eastern Kenya University & University of Nairobi-capacity building • County governments (Livestock)-extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado, Nyandarua, Makueni, Kitui and Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Low awareness levels • Poor extension services • Poor partnership and linkages • Inadequate financial resources • Negative cultural affiliations
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Enhance extension and farmer outreach activities • Mobilize financial resources through cooperatives, NGOs • Utilize various funding opportunities by the governments e.g., Financial inclusion funds, Inua jamii, youth enterprise fund

	<ul style="list-style-type: none"> Targeted communication to change undesirable cultural attitudes
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Reduced bees absconding Easier management of honey bee pests and diseases Increased honey production Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> General acceptance by policy makers and local communities Improved bee pastures e.g., managed integrated bee flora Financing regulations that encourage investment Market availability spurs increased technology uptake
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> A field for 20 beehives costs KES 200,000/- (Clearing, treated fencing posts, Bee hive stands, Hive cages, labour and Padlock)
Estimated returns	<ul style="list-style-type: none"> One hive can produce 10 kg honey per harvest each costing KES 700/kg Minimum of 2 harvests per year, hence 20kg/hive Total harvests 400 kg per year Income: KES 28,000/year The hives are expected to last more than 10 years while the structure can last more than 15 years with minimal repairs
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Social and cultural constraints may hinder women from performing apiary cultural practices Women may suffer from bee-sting phobia Women have less access to information and knowledge on the technology Women have less access to production resources such as land, capital and labour Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology The innovation may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> Saved water encourages home gardening, attractive to women and youth Employment opportunities exist for women in cleaning and maintaining the house Employment opportunities exist for men and youth males in constructing the colony house and offering security Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> VMGs may have limited access to finances to acquire the required inputs

	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in offering security and constructing the colony house
Success stories from previous similar projects	
Application guidelines for users	https://apiconsult.com/wp-content/files/simple%20bee%20houses.pdf Construction manual of approved model
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich and Joseph Mulwa
Partner organizations	Non-governmental organizations, National Beekeeping Institute, Baraka Agricultural College, National Museum of Kenya, Egerton University, South Eastern Kenya University, Common Interest Groups, University of Nairobi

2.4.5 Use of multiple trees as an Apiary

2.4.5 TIMP name	Use of multiple trees as an Apiary
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Hive destruction by Predators • High rate of absconding • Low rate colonization of hives resulting to low honey productivity • Increasing stealing of hives and honey- human theft


What is it? (TIMP description)	<p>This apiary is set up in several trees under a fence and an entry. These trees host one or several hives. The trees offer a traditional system of beekeeping, guarantee protection from thieves and reduces animal-bee conflict since they are protected from access.</p>  <p>A hive in a multiple tree apiary Source: Caroline Kimani</p>
Justification	<p>Trees have been used since time immemorial as apiaries as they are accessible and not costly to set. Ring fencing some trees to offer more protection against access is becoming popular due to the theft challenges as well as management of animal-bee conflict. Multiple hive apiaries also enhance tree conservation and provide a better micro-climate for hives, where intense sun heat is minimized.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of natural habitats including woodlands and forests as well as hedgerows • Management and conservation of floral resources • Access to credit facilities and grants

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- provide designs and train on the construction of the open apiary by the value chain leaders and all other value chain players. • SEKU & UoN- capacity building • County governments (Livestock)-extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado, Makueni and Kitui, Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of awareness • Poor extension services • Poor partnership and linkages • Lack of financial resources • Cultural affiliations
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Enhance farmer outreach activities • Credit facilities through cooperatives, NGOs • Government various funding opportunities e.g., financial inclusion funds, Inua jamii, Youth Enterprise Fund • Targeted communication to change undesirable cultural attitudes
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Reduced bees absconding • Easier management of pests and diseases • Increased honey production • Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • Improved bee pastures e.g., managed integrated bee flora • Financing regulations that encourage investment • Market availability spurs increased technology uptake
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Cost of 20 hives @ 5000 • Labour for hive installation 2,000
Estimated returns	<ul style="list-style-type: none"> • One hive can produce 10 kg of honey per harvest each costing 700/kg • Minimum of 2 harvests per year, hence 20kg/hive • Total harvests 400 kg per year • Income: 280,000/year • The hives are expected to last more than 10 years while the structure can last more than 15 years with minimal repairs
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Women can easily do the routine management of the apiary in terms of cleaning and maintenance, as well as water provision.

	<ul style="list-style-type: none"> Multiple tree apiary can be established near the homestead, hence accessible and has no gender bias with modest husbandry exposure
Gender related opportunities	Saved water encourages home gardening, attractive to women and youth
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Vulnerable and marginalized communities can adopt Housing of bee colonies because it is easy to establish and manage Readily available local materials It is generally an acceptable Management Practice in the society
VMG related opportunities	Income generation from enhanced hive products and creation of jobs
Success stories from previous similar projects	<ul style="list-style-type: none"> It is working well in Baringo, e.g. the Irong beekeepers It is also working well at ABIRI, Baringo county
Application guidelines for users	Guidelines to be included in Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa,
Partner organizations	Irong beekeepers, Baringo county government, National Beekeeping Institute

2.4.6 Use of a single tree as an Apiary

2.4.6 TIMP name	Use of a single tree as an Apiary
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Hive destruction by predators High rate of absconding Low rate colonization of hives



What is it? (TIMP description)	<p>This involves the installation of beehives on top of a tree with suitable flora and ambiance. It also involves monitoring colonization, occupancy rates and honey production of placed bee hives to document honey productivity and quality levels.</p>  <p><i>Hives installed on a tree</i> <i>Source: J Kilonzo</i></p>
Justification	<p>Single tree apiary is the most common in Kenya. One tree will accommodate one or more hives. They are preferred based on traditional beekeeping over a period of time. However, with trees local species are the most preferred although the majority are facing extinction.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents

	<ul style="list-style-type: none"> Farmer to Farmer Extension Models Mass media – Electronic and Print Publications-Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Availability of natural habitats including woodlands and forests as well as hedgerows. Management and conservation of floral resources Access to credit facilities and grants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO- provide designs and train on the construction of the open apiary by the value chain leaders and all other value chain players. SEKU & UoN- capacity building County governments (Livestock)-extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado, Makueni and Kitui, Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Lack of awareness Poor extension services Poor partnership and linkages Lack of financial resources Cultural affiliations
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Increased awareness through social media and on farm demonstrations Credit facilities through cooperatives, NGOs Government various funding opportunities e.g., financial inclusion funds Targeted communication to change undesirable cultural attitudes
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Reduced bees absconding Easier management of pests and diseases Increased honey production Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> General acceptance by policy makers and local communities Improved bee pastures e.g., managed integrated bee flora Financing regulations that encourage investment Market availability spurs increased technology uptake
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Cost of 10 hives @ 5000 Labour for hive installation 500
Estimated returns	<ul style="list-style-type: none"> One hive can produce 10 kg of honey per harvest each costing 700/kg Minimum of 2 harvests per year, hence 20kg/hive

	<ul style="list-style-type: none"> • Total harvests 200 kg per year • Income: 14,000/year • The hives are expected to last more than 10 years while the structure can last more than 15 years with minimal repairs
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Climbing of trees by women is not common and a bit more challenging compared with men • Management of theft is more challenging for either gender
Gender related opportunities	Employment opportunities for youth and men to harvest or inspections in apiaries owned by women
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Vulnerable and marginalized communities can adopt Housing of bee colonies because it is easy to establish and manage • Readily available local materials • It is generally an acceptable Management Practice in the society
VMG related opportunities	Income generation from enhanced hive products and creation of jobs
Success stories from previous similar projects	ABIRI, across all traditional beekeepers
Application guidelines for users	Guidelines to be included in Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani
Partner organizations	Beekeeper groups, beekeepers, Apiculture Platform of Kenya

2.4.7 Swinging wire for honey badger prevention

2.4.7 TIMP name	Swinging wire for honey badger prevention
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	increased predation by honey badgers which results in the destruction of hives; combs and honey


What is it? (TIMP description)	<p>This is the use of flexible wire to hold a hive at a height of about 4 feet from the ground level. The hive swings when the honey badger tries to hold it, therefore preventing attacks.</p>  <p><i>Hives held in position by flexible wire.</i> Source: Muo Kasina</p>  <p><i>Hives held in position by flexible wire</i> Source: J. Kinyanjui</p>
Justification	<p>In East Africa, honey badgers are serious predators of bee colonies and destroyers of bee hives as they search for honey. They destroy hives, honey and brood combs, and disturb honeybee colonies, which may lead to honey bee absconding. A honey badger requires a ground or surface to anchor on as it pulls and rips the hive apart. The flexible swinging wire ensures that the badger loses grip whenever it tries to hold the hive. The wire is also strong to hold the weight of the hive and is weather resistant.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, researchers, extension service providers, input suppliers, agr-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP)

	<ul style="list-style-type: none"> • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Willing beekeepers to adopt the technology • Availability of funds to invest on or promote use of swing wires for preventing honey badgers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization – to generate and train on the innovation • County government - provide linkages with farmers and assist in dissemination • Skilled artisans to fix the swing wires
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Murang'a, Isiolo, Siaya, Lamu, Kitui, Wajir, Machakos
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Low awareness about the innovation • Inadequate space to employ the innovation • Limited source of finances for funding promotion and dissemination
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Sensitize beekeepers on the advantages of using swing wires • Sourcing for funds to promote the innovation through training and facilitation of extension work
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Reduced damage of hives and hive products by honey badgers • Reduced levels of bee absconding • Improved honey productivity
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • More appealing and user friendly to all genders and age groups • Reduces honey/honeybee colony loss hence increased income • No policy requirements needed for promoting the technology • Promotes stability of honeybee colonies thus high and stable supply of honey for markets. • An additionally employment opportunity for swing rod technicians
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Flexible wire KES 300/ hive • Hive stands KES 600/hive (where needed)

	<ul style="list-style-type: none"> • These accessories will exist in the life of the hive
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season • Harvesting could be twice or more • Price for honey could be KES 700 per kilo • Estimated return is KES 7,000 per hive per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary cultural practices • Women may have bee sting phobia • Women have less access to information and knowledge on the innovation • Women have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap on the innovation
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and youth males in offering security, repairing the hives and harvesting the honey • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in implementing the innovation
E. Case studies/profiles of success stories	
Success stories from previous similar projects	Highly embraced by beekeepers in parts of Kenya where wildlife-human conflict is a challenge as an innovation to fend off the challenge
Application guidelines for users	Apiculture ToT training manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat

	Director.Abiri@kalro.org
Lead organization and scientists	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, International Centre for Insect Physiology and Ecology, Baraka Agricultural College

2.4.8 Using Guard Sheets to manage honey badgers


2.4.8 TIMP name	Using Guard Sheets to manage honey badgers
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Increased predation by honey badgers which results in the destruction of hives; combs and honey
What is it? (TIMP description)	<p>This is the use of iron sheets around the base of a tree where beehives are placed (apiary). The iron sheets act as a barrier/guard and prevent honey badgers from climbing the tree hence limited access to the hives</p> <p>The guard sheets can also be used where wooden poles are used as hive stands.</p>  <p><i>Honey badger guard sheet</i> Source: Muo Kasina</p>
Justification	In east Africa, honey badgers are serious predators of bee colonies. Most beekeepers in Kenya are still placing hives on trees for bee colonization. To deter these predators, beekeepers need to adopt this technology for total protection of the hives placed on that tree.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, researchers, extension service providers, input suppliers, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station

	<ul style="list-style-type: none"> • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Availability of resources for promotion of the innovation • Willing beekeepers to adopt the innovation • Presence of honey badgers in an area • Hive placement on trees
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • County governments - farmer linkages • Extension service providers - for dissemination • Kenya Agricultural and Livestock Research Organization - training institutes for training of trainers/ beekeepers • Private partners • Non Governmental Organizations - for wider reach in dissemination (out scaling)
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Taita Taveta, Makueni, Machakos
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate funds for promotion of the innovation • Low skills in the use of the innovation among the extension service providers
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Sourcing for funds • Capacity build the farmers on the use of the innovation
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Guard sheets resulted in better performance, reduced damage by honey badgers hence less bee absconding • Affordable to majority of beekeepers
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Socially acceptable • Does not lead to environmental degradation since trees are preserved for hive placement and less risks of being burned for charcoal • No policy requirements needed for promoting these practices • Reduces honey loss and promotes stability of honeybee colonies thus high quality honey good for markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 50/ old quality iron sheet • 1-3 iron sheet per tree based on the girth size (KES 500-1000) • Labour to fix@ KES 50/tree
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season • Harvesting could be twice or more

	<ul style="list-style-type: none"> • Price for honey could be KES 700 per kilo • Estimated return is KES 7,000 per hive per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the innovation • Women have less access to production resources such as land and credit • Women have less access to training and extension services • The innovation may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youth males in implementing the innovation • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in implementing the management practice • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	Has reduced losses to beekeepers caused by honey badgers
Application guidelines for users	Apiculture ToT training manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready to up scaling
G: Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Non Governmental Organizations, Common Interest Groups, Community Based Organizations, County governments, National Museums of Kenya, South Eastern Kenya University, Kenya Forests Research Institute, National Beekeeping Institute,

	International Centre for Insect Physiology and Ecology, Baraka Agricultural College
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2.4.9 Hive stand against honey badgers

2.4.9 TIMP name	Hive stand against honey badgers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low honey production due to destruction of hives, combs and honey by honey badgers
What is it? (TIMP description)	<p>This is a metallic pole, anchored to the ground, with a support base that holds the hive off the ground, at a height of about 4 feet. The hive can be fastened to the support by a flexible wire. The honey badger is incapable of holding onto and climbing the stand and thus cannot reach the hive.</p>  <p><i>Hive stand hold the KTBH.</i> <i>Source: M Jeptarus and J Mutai</i></p>
Justification	In East Africa, honey badgers are serious predators of bee colonies and destroyers of the hives as they search for the honey. They destroy hives, honey and brood combs and disturb honeybee colonies, which may lead to honey bee absconding. A honey badger requires a ground or surface to anchor on as it pulls the hive apart. The single hive stand maintains the hive off the ground, denying the badger the ground grip. The metallic slippery surface is a hindrance to climbing by the honey badger. The stand is fairly weather resistant as opposed to wooden stands. It is easily transported.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All beekeepers, researchers, extension service providers, equipment suppliers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station

	<ul style="list-style-type: none"> • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and pPint • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Willing beekeepers to adopt the Innovation • Availability of skilled fabricators • Availability of funds to invest on or promote use of hive stands for preventing honey badgers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization – to generate and train on the innovation • County government - promote linkages with farmers and assist in dissemination • Masons - fix the hive stands
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Murang'a, Isiolo, Siaya, Lamu, Kitui, Wajir, Bomet, Mandera
Counties where TIMP will be up scaled	Kilifi, Migori, Tana River, Siaya, Nakuru, Kitui, Kwale, Kajiado, Kakamega, Machakos, Makueni
Challenges in dissemination	<ul style="list-style-type: none"> • Low level of awareness about the value of the innovation • Limited source of finances for funding promotion and dissemination
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Sourcing for funds to promote the practices through training and facilitation of extension work • Sensitize beekeepers on the advantages of using hive stands
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Reduced damage of hives by honey badgers • Reduce loss of production and income • Retention of bee colonies
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • More appealing and user friendly to all genders and age groups • Does not negatively impact the environment • Its use is in conformity with environmental regulations and NEMA Act • An additionally employment opportunity for hive stand technicians • Promotes stability of honeybee colonies thus high and stable supply of honey for markets.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 2,000/unit • It can last the life of the hive
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season • Harvesting could be twice or more • Price for honey could be KES 700 per kilo

	<ul style="list-style-type: none"> Estimated return is KES 7,000 per hive per season
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> Social and cultural factors hinder women from performing apiary management practices which are considered a man's job Limited access to land for bee production by women and youth Women may have bee sting phobia Women have less access to training and extension services The innovation may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<p>The use of hive stands will reduce the risks associated with tree climbing hence favorable for men, women and youth</p> <ul style="list-style-type: none"> Employment opportunity in hive stand making for the youth Increased land rights of women and youth allowing bee keeping adoption Adoption of hive stand technology will lead to improved productivity of honey, hence more income for women
VMG issues and concerns in development, dissemination adoption and scaling up	VMGs may venture into beekeeping enterprises which has been hard due to restrictions based on tree climbing
VMG related opportunities	<ul style="list-style-type: none"> VMGs can be trained as artisans to sell hives stands to beekeepers VMGs can be involved in sale of honey and honey products for income and improved nutrition Affirmative action, capacity building and practical support to be provided
E. Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Apiculture ToT training manual
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3-requires further research)	Ready for up scaling
G: Contacts	<p>Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org</p>
Lead organization and scientists	<p>KALRO</p> <p>Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani</p>

Partner organizations	National Beekeeping Institute, Baraka Agricultural College, Egerton University, South Eastern Kenya University,
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Gaps

Improvement of the innovation for various end users

2.4.10 Management of bird and wasp pests of bees

2.4.10 TIMP name	Management of bird and wasp pests of bees
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • High predation levels of honeybees by birds and wasps • Reduction of bee population due to predation • Reduced honey productivity due to bee predation
What is it? (TIMP description)	<p>This involves the control of predatory birds and wasps that feed on honey bees. The Birds and wasps attack bees at the hive entrance or at the point of collecting pollen, nectar or water. Hives are constructed without landing space which helps prevent predation. This prevents bees from landing and allows them to come directly to the hive entrance to get in.</p> <p>Further, removal/destruction of the bird and wasps nest near apiaries will reduce massive predation. Greasing or pasting a sticky substance on various hive spaces especially where predators frequently land can discourage them from landing.</p>
Justification	Bee predation the size of the colony and result in significant reduction of honey and beeswax production. Proper management of these predators will enhance colony growth and increase productivity.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, researchers, extension service providers, input suppliers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Availability of resources for promotion of the innovation • Willingness by beekeepers to adopt the innovation • Presence of birds and wasps in an area

	<ul style="list-style-type: none"> • Hive placement on trees
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • County governments - creating farmer linkages • Extension service providers - for dissemination • Kenya Agricultural and Livestock Research Organization, South Eastern Kenya University in training of trainers/ beekeepers • Private partners • Non Governmental Organizations - for wider reach in dissemination (out scaling)
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Machakos, Makueni
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Low awareness levels • Availability of funds for promotion of the innovation
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Create awareness among beekeepers on management of predatory birds and wasps • Sourcing for funds to promote the innovation through training and facilitation of extension work
Lessons learned in up scaling if any	Controlling predatory birds and wasps results in better performance, reduced damage by birds and wasps hence less bee absconding
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Management of predatory birds and wasps is socially acceptable • Does not lead to environmental degradation since trees are preserved for hive placement and less risks of being burned for charcoal • Control of birds and wasps is done in conformity with wildlife conservation regulations • Reduces honey loss and promotes stability of honeybee colonies thus high quality honey suitable for markets. • No policy requirements needed for promoting the innovation
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 50/ old quality iron sheet • 1-3 iron sheet per tree based on the girth size • Labour to fix @ KES 50/tree
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season • Harvesting could be twice or more • Price for honey could be KES 700 per kilo • Estimated return is KES 7,000 per hive per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, credit and labour

	<ul style="list-style-type: none"> • Women have less access to training and extension services
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and financial inclusion funds opportunities exist for women and youths to acquire the required finances • Employment opportunity in barrier making for the youth
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit
E. Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	<p>Identification and management of predatory birds honey bee. http://researchjournal.co.in/online/RKE/RKE%2013(1)/13_112-114.pdf Brochures, fliers and pamphlets</p>
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology
	Nelly Ndung'u
	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich and Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute

2.4.11 Management of ants in apiaries

2.4.11 TIMP name	Management of ants in apiaries
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Reduced bee population due to brood reduction by infestation of ants • Increase in absconding associated with ants' attacks • Low honey production and income due to low hive colonization as a result of ants' infestation
What is it? (TIMP description)	<p>This involves the control of ants from infesting bee hives. Several control approaches such as use of oil traps on metallic stands, application of grease on hive hanging wires and destruction of ant nests are used. This reduces ant infestation rates thus lowering absconding of bee colonies. It also prevents brood disturbance, destruction and loss of colony strength.</p> <div> </div> <p><i>Bee hive stand on soapy water.</i> <i>Source: Beekeeping basics</i></p> <div> </div> <div> </div> <p><i>Thousands of Safari ants of one colony</i> <i>Source: Beekeeping basics</i></p>

Justification	Ants infest bee hives to eat honey, kill and carry away bee eggs and larvae. They also contaminate the hive with their droppings which causes bees to abscond. Ants are controlled by keeping the apiary clean, using oil traps on metallic stands, application of grease on hive hanging wires, placement of hive stands on basins with soapy water and destroying their nests when spotted near the apiaries. This infestation thus reducing bee absconding leading to guaranteed honey yields.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeeping groups and individuals, extension service providers, research institutions and trainers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Capacity on pest identification and elimination (awareness creation) • Availability of funds
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Beekeepers - mobilizing fellow beekeepers • Kenya Agricultural and Livestock Research Organization – to develop, validate and transfer the management practice • International Centre for Insect Physiology and Ecology – to develop, validate and transfer the management practice • National Beekeeping Institute, Extension- validation, training and transfer of knowledge • County government - create linkages with farmers and management practice dissemination • Self-help groups/CIGs - promote uptake of management practice in various beekeeping zones) • Ministry of Agriculture and Livestock Development - promote uptake of management practice in the Country • Non-Governmental Organizations (NGOs) - funding and promote publicity of management practice
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Machakos, Kitui, Nakuru, Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Beekeepers holding onto their traditional practices

	<ul style="list-style-type: none"> • Inadequate funding for capacity building • Limited access to credit facilities • Gender bias toward facilitators
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased trainings to change traditions limiting dissemination and gender bias • Increased awareness through social media and on farm demonstrations • Engage the community leaders • Mobilize for access and acquisition of funds
Lessons learned in up scaling if any	The management practice helped in retaining more colonies in hives in those apiaries that adopted it in Kitui county
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Effective cultural and physical methods of control to be prioritized • Farmers need to be trained on safe pesticide use and application timing • No policy requirements needed for promoting the innovation • Improved honey production leading to promotion in family income and nutrition and supply for honey markets • There is diversity in job creation hence increased income generation
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • One basin @ KES 200 per hive stand • 1 litre liquid soap @ KES 200 for several hive stands • Grease @ KES 250 per unit for several wires and/or hive stands
Estimated returns	Beekeepers will benefit from saved losses in honey value which can be 40% of the value of honey harvested; (20kg per hive per harvest @ KES 700 per kg of honey, 30% improvement in quantity of honey harvested) per hive.
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary Good Beekeeping Practices (GBPs) • Traditionally, the apiculture is considered a man's enterprise • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women, men and youth males in implementing the management practice • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men


	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for both youth males and women in implementing the management practice • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
Success stories from previous similar projects	The Eburu Honey Cooperative (Naivasha) was capacity built on this management practice. The effect was enhanced honey production and investment with beekeepers increasing their hives by 10% due to retention of bee colonies
Application guidelines for users	https://edis.ifas.ufl.edu/publication/IN1181
F: Status of TIMP readiness (1-ready for up scaling; 2 - requires validation; 3-requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO -ABIRI Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, Community Based Organizations, Community Interest Groups, Training Institutions, Extension service providers

Gaps

1. Evaluate various ant management practices in honeybee hives
2. Determine cost-benefit analysis in the use of various ant management practices in honeybee hives

2.4.12 Management of snakes and rodents

2.4.12 TIMP name	Management of snakes and rodents
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Reduced honey production due to destruction of hives; combs and honey by snakes, lizards and rodents
What is it? (TIMP description)	This is the use of a single strand hive metal stand to support hive at a height of about 4 feet from ground level. Hive can be fastened

	<p>with a flexible wire to keep it firm. The snakes, lizards and rodents are incapable of holding on to the stand thus making it difficult to access the hive. Apertures and openings in the hive should be minimal to inhibit any entrance.</p> <p>Keep apiary clean and tidy to prevent attacks by these predators</p>  <p><i>Hive stands holding various hives.</i> <i>Source: Daniel Toroitich</i></p>
Justification	Snakes, lizards and rodents are predators of bees. Snakes also cause disturbances on honeybees as they inhabit the hives. Prevention of these animals reduces bee absconding hence an increase in honey production
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, researchers, extension service providers, input suppliers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Willingness by beekeepers to adopt the technology • Availability of funds to invest on or promote use of hive stands for preventing snakes, lizards and rodents
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization – to generate and train on technology • County government - linkages with farmers and dissemination • Masons - fix the hive stands
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Makueni and Machakos

Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Low awareness levels about the importance of management practices • Limited source of finances for funding promotion and dissemination of the technology
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Sourcing for funds to promote the practices through training and facilitation of extension work • Sensitize beekeepers on the advantages of using hive stands
Lessons learned in up scaling if any	Adoption of the management practice resulted in reduced damage of hives by rodents, reduced invasion of hives by snakes and lizards and increased honey production
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • More appealing and user friendly to all genders and age groups • Control of snakes, lizards and rodents is done in conformity with wildlife conservation requirements • Reduces honey/honeybee colony loss • An additionally employment opportunity for hive stand technicians • Promotes stability of honeybee colonies thus high and stable supply of honey for markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 2,000/unit • It can last the life of the hive
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season • Harvesting could be twice or more • Price for honey could be KES 700 per kilo • Estimated return is KES 7,000 per hive per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary Good Beekeeping Practices (GBPs) • Traditionally, the apiculture is considered a man's enterprise • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women, men and youth males in implementing the management practice • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men


	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for both youth males and women in implementing the management practice • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E. Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Muhammad Sarwar 2016. Predations on honey bees (Arthropoda) by vertebrate pests (Chordata) and control of nuisance. International Journal of Zoology Studies. Volume 1; Issue 2; February 2016; Page No. 12-17
F: Status of TIMP readiness (1-ready for up scaling; 2 - requires validation; 3-requires further research)	Ready for up scaling
G: Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat
Lead organization and scientists	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	Non Governmental Organizations, Common Interest Groups, Community Based Organizations, County governments, International Centre for Insect Physiology and Ecology, National Beekeeping Institute, National Museums of Kenya, South Eastern Kenya University, Baraka college

Gaps

Determining cost benefit analysis of various technologies used to manage snakes, lizards and birds in bee hives

2.4.13 Management of baboons

2.4.13 TIMP name	Management of baboons
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Baboons open hives and feed on honey and the brood. They scatter hive parts (frames or top bars) leaving the hive

	uninhabitable by bees. They also play and swing on the hives causing colony disturbance and absconding.
What is it? (TIMP description)	<p>This involves the establishment of barriers or erecting structures that keep off, scare or trap baboons before they invade bee hives.</p>  <p><i>Olive baboon</i> <i>Source: African Wildlife Foundation</i></p>
Justification	<p>Baboons like to eat honey and bee broods. They open hives and remove honey combs. The frames or top bars are scattered within and around the apiary, making the hive uninhabitable. Bees usually abscond after baboon invasion. They also play on apiaries and on hives creating a lot of disturbance even when the hives are secured sufficiently by wire. Baboons are best controlled by scaring, proper fastening of hives by wire, use of well-constructed bee-houses and trapping. Trapping of baboons can only be done with special traps used by the Kenya Wildlife Service (KWS). Electric fences can also help to keep baboons away from the apiary.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeeping groups and individuals, extension service providers, researchers, KWS, input suppliers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals

	<ul style="list-style-type: none"> Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Knowledge, skills and attitudes of the extension teams and beekeepers Availability of resources to secure apiaries Availability of resources to promote the interventions
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> Kenya Agricultural and Livestock Research Organization - Research on management practices National Beekeeping Institute and other training institutions- capacity building County governments - promote uptake of management practice various counties Self-help groups - promote uptake of management practice in various beekeeping zones) MoALD - promote uptake of management practice in the Country KWS - Control of baboons and other wildlife Non Governmental Organizations - promote publicity of management practice
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi, Kajiado, Nakuru,
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Inadequate skills in management of baboons Inadequate resources for publicity
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Sensitize beekeepers on baboon control Upgrade the capacity of extension service providers
Lessons learned in up scaling if any	The management practice helped in retaining more colonies in hives in those apiaries that adopted it in Ngong Road Forest Conservancy.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> Cultural and physical methods of controlling baboons will be prioritized and acceptable by bee keeping communities There is need to adopt control measures that conserve both the primate and the honeybee The control of baboons is done in strict adherence with wildlife conservation regulations by KWS Increased quality and quantity of honey will be availed to the market
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of materials, electrification of fence KES 60,000 (solar) Alternative cost, heavy gauge mesh wire fence around a bee house with concrete skirting, KES. 30,000 for 40 hive apiary
Estimated returns	Beekeepers will benefit from saved losses in honey value which can be 100% of the value of honey harvested; (20kg*KES 700*40) per 40 hive apiary annually through prevention of

	absconding. Prevented loss of 40 hives from baboon vandalism (KES. 7,000*40)
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Construction of baboon-proof structures is mostly done by men • Traditionally, the apiculture is considered a man's enterprise • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, credit and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for, men and youth males in implementing the management practice • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for and youth males in implementing the management practice • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
Success stories from previous similar projects	The Eburu Honey Cooperative (Naivasha) was capacity built on this management practice. The effect was increased production and investment with beekeepers increasing their hives by 10% due to retention of bee colonies
Application guidelines for users	Good bee keeping practices for sustainable apiculture. 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 Good beekeeping practices for sustainable apiculture
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
	National Beekeeping Institute

Lead organization and scientists	Jonah Kinyanjui jonamburu@gmail.com
	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Community Based Organizations, Community Interest Groups, Training Institutions, Extension service providers

Gaps

Evaluation of various traps in management of baboons

2.5 Bee handling

2.5.1 Bee sting prevention



2.5.1 TIMP Name	Bee sting prevention
Category (i.e. technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Bee sting that may result to allergic reaction Bee sting phobia leading to less adoption of beekeeping in the country
What is it? (TIMP description)	These are the practices that beekeepers can carry out while handling bees to reduce stinging instances. The following precautionary measures can be used to prevent bee stings: <ul style="list-style-type: none"> • When inspecting/harvesting hives, it is best to do it in pairs – one person to smoke and the other to work the bees • Dress appropriately (bee suit, gloves, veil, and gumboots) • Avoid the use of scented soap, perfumes, or the smell of beer • Depending on the activity, carry appropriate tools or materials • When approaching the hive, move silently and with a lit smoker. Make the first puff at the entrance, open the top cover, two puffs, close the cover, and wait for three seconds. The smoke will mask the communication of the bees and the bees will be calm • Avoid banging the hive lids
Justification	Sting phobia has been one of the hindrances to beekeeping. Learning how to prevent this can improve the acceptance of beekeeping to all genders.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, extension service providers, input suppliers, farmer groups, Pharmaceutical Industry, agripreneurs

Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Knowledge, skills and attitudes of the extension teams and beekeepers • Availability of resources to secure beekeeping equipment and protective gear
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization - Research on management practices • National Beekeeping Institute - capacity building • Training institutions- capacity building • County governments - promote uptake of management practice various counties
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, West Pokot, Machakos, Kitui, Makueni
Counties where TIMP will be scaled if any	Kilifi, Migori, Kwale, Kajiado, Kakamega, Machakos, Nakuru, Tana River, Siaya, Makueni & Kitui
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate skills in bee sting prevention • Unavailability of financial resources
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness creation on bee stings • Mobilize financial resources for procuring tools & equipment, training and upscaling of the practice
Lessons learned in scaling if any	<ul style="list-style-type: none"> • Preventing bee stings reduced the phobia in some beekeepers • Prevention of bee sting led to improved honey quantity and quality • Protective clothing led to recruitment of more beekeepers
Social, environmental, policy, and market conditions necessary	<ul style="list-style-type: none"> • Practices to prevent bee stings are generally accepted in beekeeping community • Use of modern tools such as smokers reduces the incidence of bush fires which could cause destruction of vegetation and harm the environment • Practices to prevent bee stings should be done in conformity with occupational safety and health safeguards • Quality honey sells better in the market
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Bee suit @ KES 4,000 • Smoker @ KES 2,000

	<ul style="list-style-type: none"> • Hive tool @ KES 200
Estimated returns	<ul style="list-style-type: none"> • Hive can produce 10kg per harvest @ KES 700
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural norms may hinder women from harvesting honey • Honey harvesting is mostly performed by men • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women may have less access to resources such as credit to purchase the required honey harvesting equipment • Women may have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youth males in the task of honey harvesting • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for men and youth males in the task of honey harvesting
Success stories from previous similar projects	None
Application guidelines for users	https://my.clevelandclinic.org/health/diseases/25093-bee-sting Good Beekeeping practices guidelines
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3- requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO - ABIRI Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa

Partner organizations	National Beekeeping Institute, International Centre for Insect Physiology and Ecology, Baraka College, Community Based Organizations, Beekeeping groups and beekeepers
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2.5.2 Managing honeybee attack to people and animals

2.5.2 TIMP name	Managing honey bee attack to people and animals
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Honeybee threats e.g., stinging people or livestock and sometimes leading to mortalities Difficulties practicing beekeeping in densely populated areas in fear of stings
What is it? (TIMP description)	<p>This is the practice of deliberately siting and placement of honeybee hives (apiary) away from human dwellings and livestock structures to minimize interactions with people and animals or their activities.</p>  <p><i>Photo of protected apiary. J Mulwa</i></p>  <p><i>Apiary sitting away from people and animals.</i> <i>Source: NBI</i></p>
Justification	<p>Although honeybees usually do not sting until they are provoked, their stings have life threatening effects in humans and domestic animals. In areas where conflicts and competition for shared resources like water & floral collection sites and during honey harvesting.</p> <p>Therefore, to prevent these massive losses due to these conflicts, protecting the apiaries, honeybee routes and resource collection points as well as minimizing unnecessary sounds in the bee environment could minimize these challenges.</p>

B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, commercial farmers, researchers, extension officers, input suppliers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Management and conservation of bee flora • Identification of ecology and area suitable bee flora • Availability of honeybee resources (feed and water) • Use of high barriers to minimize conflicts • Apiary proximity to people and animal dwelling areas • Manage honey harvesting time while avoiding people and animals near the apiary • Apiary siting and placement locations away from human and animal activities • Training on benefits of protecting bee resources to reduce conflicts with human and animals • Continuous honeybee inspection for taming
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – capacity building and research • ICIPE -Research & training • Universities) - training and research • County governments extension workers - Farmer linkages and training • Artisans - designing of barriers, siting of beehives, repairs
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Baringo, Machakos
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Some cultures do not encourage beekeeping is • Conflicts between farm enterprises • Inadequate land for various farm enterprises • Inadequate knowledge on apiary siting • Climate change resulting to insufficient feed and water to support honeybees
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness on beekeeping through social media, and farm demonstrations • Establishment and protection of bee forage plants.


	<ul style="list-style-type: none"> • Determination of cost-benefit analysis of various farm enterprises and their compatibility with beekeeping • Feed and water supplementation to honeybees when the resources are scarce
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Bee habitat conservation and protection reduces honey bee absconding • Avoidance of honeybee routes and raising of bee barriers reduces bee conflicts • Frequent inspection of beehives tames honeybees • Provision of clean feed and water minimizes bee conflicts and reduces absconding • Increased honey production and quality • Land demarcation and management for various farm enterprises promotes beekeeping • Community engagement in supporting beekeeping reduces attack to people and animals
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Inter-sectoral acceptance by policy makers and local communities • Conservation of honeybee foraging plants supports environmental conservation, diversity and safety • Acceptance of beekeeping by the community
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • About KES 30 per seedling; rate is 450 plants per acre • About KES 200 per kg seeds • Planting of one-acre seedlings: approx. KES 4,000 • Establishment of barrier - mesh nets - 50m long KES 5,000, 6 poles to support @ KES 150, Labour charges @ KES 2,000 • Water and feed supplements - 2kgs of sugar per month @ KES 250, 2 water and feed basins @ KES 200
Estimated returns	<ul style="list-style-type: none"> • Four bee colonies well supported annually • 1 colony will give minimum 10 kg per harvest, minimum twice annually, giving 20 kg x 4 hives; 80 kg • 1 kg is approx. KES 700 • Increased colony multiplication and expansion to produce 20-30 kg per harvest Langstroth hive • Beeswax minimum 10 kg per harvest x 4 hives x KES 500/kg • Enhanced income due to improved crop yields • Enhance safety in the farm
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital, credit and labour • Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology

Gender related opportunities	Employment opportunities exist for women in cleaning Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from similar previous projects	None
Application guidelines for users	Guidelines to be included in TOT Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO -ABIRI Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya

Gaps

1. Guides for the establishment of different practices used in minimizing the human/animal-honeybee conflicts.
2. Develop a flowering calendar guide for major bee forage plants in different agroecology.

2.5.3 Honeybee colony relocation from houses and buildings

2.5.3 TIMP name	Honeybee colony relocation from houses and buildings
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Presence of bees in human dwellings is a health threat in the event bees are distracted • High probability of bee attacks to livestock • Bee colony safety is unguaranteed
What is it? (TIMP description)	<p>This TIMP involves the use of various methods including use of catcher and breeder hives to relocate bees from houses and other structures where people or livestock dwell or frequent. This involves a number of steps which include pre-removal preparation, personal protection, timing of removal, smoking of bees, colony collection into a breeder hive, safe transfer to apiary. After successfully relocating the bee colony from the human house, the nested area is treated with suitable chemicals to prevent re-infestation. It is also advisable to repair any damages on the structure or completely remove the structure to prevent bees from accessing and re-infesting it.</p>  <p><i>honeybee colony in a chimney</i> Source: NBI</p>
Justification	<p>Honeybees can use any available space to nest, as long as the conditions of the space allow. They do so for protection from extreme weather, warmth for the brood, proximity to food and water sources and generally spaces with small or concealed entrances. It is important for beekeepers and the general population to have skills on safe removal and relocation of bee colonies. The colonies can be collected so as to stock empty hives in existing apiaries. Provision of alternative housing for honeybees is important due to their importance in pollination, enhanced honey production and reducing the chances of getting into houses. This is aimed at ensuring that the</p>


	honeybee colony, livestock and the people residing in the facility are all safe.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, honey cooperatives, extension service providers, research institutes, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Capacity/skills on relocation of bee colonies • Availability of resources for training and promoting the management practice
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research: Kenya Agricultural and Livestock Research Organization (KALRO) - to develop, validate and transfer the management practices • International Centre for Insect Physiology and Ecology (ICIPE) – to develop, validate and transfer the management practices • Kenya Bureau of standards (KEBS) - Quality standards • National Beekeeping Institute - Provision of extension services • County governments - to create linkages with farmers and practice dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi, Mombasa, Nakuru, Kakamega, Kitui
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited pest control services • Inadequate knowledge on implementing the practice • Limited access to credit facilities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Establish and support groups/cooperatives to serve as pest control service providers • Capacity build beekeepers on pest control approaches • Enhance access and acquisition of appropriate equipment and structures • Mobilize for funds to support training
Lessons learned in up scaling if any	In 2020, the apiaries at National Beekeeping Institute training apiaries received 9 colonies from distressed households. This

	TIMP helps to make use of colonies nesting in the wrong place by removing them safely and housing them in hives.
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Relocation of bees from human dwellings will readily be accepted • Methods used for relocating bees do not have any adverse effects to the environment • The handling and relocation of bees from houses should be done in strict conformity with regulations and guidelines to encourage their survival and preservation • The relocation of the bee colony boosts honey production hence the market is assured of honey. • There is need for capacity in relocating honeybee colonies • Safety of people, livestock and the colony is assured
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Equipment and tools – ladders, smokers, buckets
Estimated returns	<ul style="list-style-type: none"> • This TIMP will save honeybee colonies as well as prevent injuries to humans by bee stings which can lead to high medical bills and costs
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have limited honeybee relocation skills • Women who have limited access and control of resources such as finances to purchase equipment for honey bee relocation • Women have bee sting phobia • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Business opportunities for youth males in honeybee colony relocation • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the Single Hive Stand due to inadequate of resources • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology

VMG related opportunities	<ul style="list-style-type: none"> • Business opportunities for youth males in honeybee colony relocation • Affirmative action and hustler funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<p>The National Beekeeping Institute removed 9 colonies in 2022 from people's dwelling areas and successfully relocated them to training apiaries.</p> <p>This can be replicated in all apiaries across the country</p>
Application guidelines for users	<p>Apiculture ToT training manual</p> <p>Guidelines on apiary siting and establishment</p>
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	<p>Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org</p>
Lead organization and scientists	KALRO -ABIRI
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, International Centre for Insect Physiology and Ecology, Baraka College, Community Based Organizations, Beekeeping groups and beekeepers

2.5.4 Honeybee – Livestock conflict management

2.5.4 TIMP name	Honeybee – Livestock conflict management
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • People are unsafe from bee attacks • High probability of bee attacks to livestock • Bee colony safety is unguaranteed
What is it? (TIMP description)	<p>This TIMP involves the use of various management practices to keep bees and livestock coexist safely. Measures to be taken would include:</p> <ul style="list-style-type: none"> • Site selection for apiary establishment that considers livestock activity • Fencing off of apiaries possibly with a live fence around it


	<ul style="list-style-type: none"> • Raising of hives above normal livestock height to avoid accidental disturbance of hives • Ensuring hive stands are well anchored to avoid hives falling off and agitating the bees • Reducing undergrowth below hives • Grazing around hives only at times of bee inactivity, early in the morning or late in the evening • Maintaining forage around apiaries that is not highly preferred by grazers and browsers  <p><i>A honeybee colony in a chimney</i> Source: NBI</p>
Justification	Honeybees are very important in the ecosystem to ensure biodiversity and adequate pollination of pastures, not forgetting production of honey and other products and services. Maintaining bees within livestock areas is therefore unavoidable. This TIMP will address the management practices that should be employed to minimize risk of bees and livestock conflict, and that livestock handlers are also safe
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, honey cooperatives, extension service providers and research institutions, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Capacity/skills on management of the conflict • Availability of resources for training and promoting the management practice

	<ul style="list-style-type: none"> • The willingness of the community to learn on management of the conflict
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research: Kenya Agricultural and Livestock Research Organization/International Centre for Insect Physiology and Ecology – to develop, validate and transfer the management practices • Kenya Bureau of Standards (KEBS) • Extension: National Beekeeping Institute - Provision of extension services • County government to create linkages with farmers and practice dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado, Nairobi, Baringo, Mombasa, Nakuru, Kakamega, Kitui
Counties where TIMPs will be up scaled	All across the Country
Challenges in dissemination	<ul style="list-style-type: none"> • Limited land sizes in most areas • Limited knowledge and skills among beekeepers and extension service providers • Inadequate funding for capacity building • Limited access to credit facilities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Establish and support groups/cooperatives • Enhance access and acquisition of appropriate, materials, equipment and structures • Mobilize for availability of funds
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • This TIMP helps farmers to diversify productivity, by safely keeping honeybees alongside other livestock
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Availability of guidelines on apiary siting, establishment and management • Management of the conflict promotes biodiversity conservation. • Living standards for the community is improved due to diversified income sources and market for different products • Need for policy regulations in management of the conflicts
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Equipment and tools
Estimated returns	<ul style="list-style-type: none"> • This TIMP will enable the farmer to include apiculture in other livestock enterprises • The returns from each hive is estimated at 15kg of honey per harvest * two harvests per year * KES. 700/- per kg • The honeybees are likely to contribute to increased productivity in crops and livestock through pollination of flora

Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital, credit and labour • Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced has increased by 45% in Mwingi, Kitui from 2008. This is as a result of transportation to Nairobi and Mombasa. This has increased honey sales and other hive products.
Application guidelines for users	https://pestflash.com/bees-control-services-in-kenya/ Apiculture ToT training manual Training of extension service providers
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO -ABIRI
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Non-Governmental Organizations, National Beekeeping Institute, Baraka Agricultural College, National Museums of Kenya, , Egerton University, South Eastern Kenya University

2.6 Husbandry practices

2.6.1 Colony Inspection

2.6.1 TIMP name	Colony Inspection
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Many different types of stress factors on bee hives
What is it? (TIMP description)	<p>This is an examination of the apiary that involves scouting practices to monitor the status of the hives. The purpose is to detect presence of any form of stress causing things which may warrant immediate corrective actions for optimal survival of the bee colony and honey productivity.</p>  <p><i>Inspection of the beehive</i> Source: Kimani.C</p>
Justification	<p>Hive and colony inspection is done in already established apiaries. Without inspections, it is not possible to detect presence of pests and diseases, predators, hive damages, environmental challenges and determine the status of hive occupation. It gives the beekeeper an opportunity to note the presence of stress causing factors for immediate corrective actions. and act on any challenges affecting the apiary, hive, and colony hence triggering a timely management approach. Hive inspection ensures stability of the hive for strong bee colonies for enhanced productivity.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers (beekeeping groups and individuals), extension service, input suppliers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models


	<ul style="list-style-type: none"> • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media Short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Capacity building and awareness creation for beekeeper • Capacity building extension service providers on importance of apiary inspection • Adoption of beekeeping accessories such as bee suit, hive tools and hive stand that ease inspections
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - Research on the practices and training of trainers • ICIPE - Research and training • Universities- research and training of users • County governments - promote practice uptake in various counties • Self-help groups - promote technology uptake various beekeeping zones) • NGOs - promote hive products and publicity/link farmers to markets
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Kitui, Makueni
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate knowledge in hive management by beekeepers • Cultural barriers forbidding hive care • Honeybee sting phobia • Limited extension service providers • Inadequate knowledge on effects of colony management to crop production • Limited use of hive accessories
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Training of extension service providers and beekeepers on improved beekeeping managements practices • Create awareness on importance of inspecting hives to detect the different types of stress causing factors • Sensitize the bee keeping community on how to the importance of use the correct PPEs while inspecting the hives to reduce stings • Use service providers to provide alternative extension services • Encourage use of hive accessories
Lessons learned in up scaling if any	None
Social, environmental, policy and market conditions necessary for development	<ul style="list-style-type: none"> • The practice of bee hive inspection will be socially acceptable

	<ul style="list-style-type: none"> • Hive inspection does not adversely affect the environment • Existence of suitable bio-physical environments in target counties • Enabling policy frameworks that encourage beekeeping • Availability of reliable market for quality produce
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<p>Beekeeping accessories</p> <ul style="list-style-type: none"> • Full bee kit (suit, boots, hive tools): KES 5,000 per many hives • Hive stand: KES 2,000 per hive
Estimated returns	<p>More than 10kg per hive per season Assured long hive occupancy Frequent colony multiplication and therefore expanded apiary</p>
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Colony inspection is a task performed mostly by men. • Women may have less access to information and knowledge on the management practice • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	There will be creation of job opportunities for men and youth in colony inspection
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs have less access to information and knowledge on the management practice • VMGs have less access to training and extension services, which can lead to a knowledge gap in the management practice
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in in colony inspection • Affirmative action and hustler funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> • Baringo County: Rachemo beekeepers, Kapkuikui beekeepers, Irong beekeepers Association • Makueni County: Kibwezi women beekeepers group. • These groups have embraced these best apiary management practices.
Application guidelines for users	Refer to guidelines on beekeeping brochure available on KALRO website
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation;	Ready for upscaling

3-requires further research)	
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani
Partner organizations	International Centre for Insect Physiology and Ecology, National Beekeeping Institute

2.6.2 Integrated bee pasture management in high potential areas

2.6.2 TIMP name	Integrated bee pasture management in high potential areas
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Degraded semi-natural habitats and farmlands devoid of adequate suitable bee plants and quality due to agricultural intensifications, overgrazing, climate change and invasive alien species or weeds Limited knowledge on the climate smart bee flora diversity and floral patterns Inadequate knowledge on seed biology, processing for storage and propagation of suitable climate smart bee flora species Low hive productivity due to lack of bee forage
What is it? (TIMP description)	<p>It entails bee flora establishment and management, reseedling the pasture with more bee flora of both natural, establishment of bee plant interactions, floral calendars, seed harvesting, and preservation and propagation techniques for nursery establishment.</p> <p>In extreme droughts, the practice also involves modest drip irrigation of the integrated pastures to sustain biomass, forage and flowering of <i>Ocimum kilimandscharum</i> and suitable oil crops such as <i>Helianthus annuus</i> (sunflower) and <i>Brassica napus</i> (canola).</p>

	 <p>Bee forage establishment in Nyandarua county Source: Itambo Malombe</p>
Justification	<p>Integrated bee pastures in the high potential ecosystems, intermixed with <i>Ocimum</i> species, <i>Dombeya foetida</i>, <i>Callistemon</i> species and other climate smart plants and oil crops, exhibit appropriate diversity and flowering continuum which provide bee forage all year round within short distances. This ensures sustainable honey production. The oil crops are a double win for the ecosystem and farmers as they are a good bee forage source and also provide chicken feed and oil for markets.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Awareness creation and training on basic seed handling techniques including harvesting, processing for storage and propagation techniques in the form of nursery establishment and management • Low-cost drip irrigation of the bee pastures through water harvesting during dry seasons • Year-round availability of quality seed supply including establishment of seed libraries • Seeding of pastures for increased bee flora diversity • Management and conservation of floral resources including invasive and weed species control

	<ul style="list-style-type: none"> • Access to credit facilities and grants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research institutions (NMK, KEFRI, KALRO) – seed technology development, support ToT, backstopping and monitor implementation • County governments- extension service provision train farmers on basic bee flora agronomy, floral calendar establishment, etc. and monitoring implementation. • SEKU and UoN- capacity building
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado, Nyandarua, Makueni and Kitui, Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of awareness • Poor extension services • Poor partnership and linkages • Lack of financial resources • Frequent droughts • Inadequate land sizes
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Seek to partner with alternative extension service providers like NGOs, FBOs among others • Seek for financial resources from credit facilities • Government various funding opportunities e.g., Inua jamii, youth enterprise fund etc • Water harvesting and storage • Intensify apiary production
Lessons learned in up scaling if any	Use of integrated bee forages results in reduced bees absconding, increased honey production and improvement in habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • Improved bee pastures e.g., managed integrated bee flora • Financing regulations that encourage investment • Market availability of forage inputs
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • approximately KES 200000 (e.g., Seedlings/seeds- 35000; fencing -50000, labor in land preparation and management -30000, modest irrigation system- 50000) NB: fencing may be optional depending on location
Estimated returns	<ul style="list-style-type: none"> • KES 280000: One hive can produce 10 kg honey per harvest, twice are year, each costing 700/kg, 20 hives

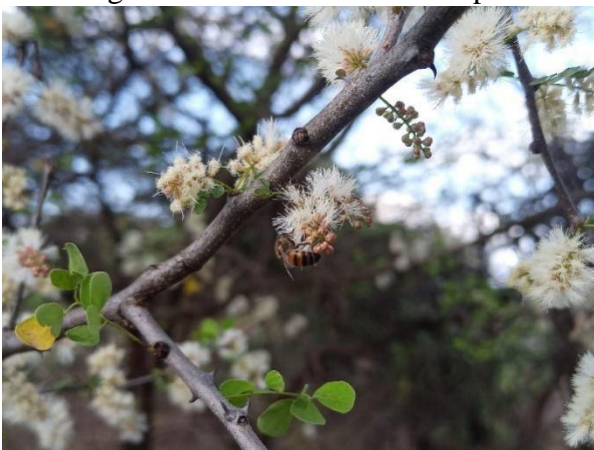
	<ul style="list-style-type: none"> • This excludes pollination services to crops, which will have increased yields and income
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, credit capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology
Gender related opportunities	Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers have adopted integrated bee forages in Nyandarua county and have experienced minimal absconding during the dearth period thus increased honey yields.
Application guidelines for users	<p>1. Bee flora propagation protocols for Increasing Bee productivity</p> <p>2. Grace Asiko, Kiptarus Julius , Mochorwa Jared and Koech Christine 2017. Forage for a Sustainable Bee Industry in Kenya. Journal of Food Science and Engineering 7: 262-266 doi: 10.17265/2159-5828/2017.05.004. https://www.davidpublisher.com/Public/uploads/Contribute/592e307ecef28.pdf</p>
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org

Lead organization and scientists	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitch, Caroline Kimani
Partner organizations	International Centre for Insect Physiology and Ecology, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute

Gaps

Upscaling phenology and colonization monitoring including pollen analysis

2.6.3 Integrated bee pasture management in ASALs

2.6.3 TIMP name	Integrated bee pasture management in ASALs
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Declining bee population due to lack of forage Frequent absconding due to lack of forage Degradation of natural habitats Low hive productivity due to lack of bee pastures
What is it? (TIMP description)	<p>This is the practice of cultivating and conserving bee pasture and forage resources to enhance bee productivity.</p>  <p><i>Acacia mellifera</i>, a major bee forage. Source: Muo Kasina</p>
Justification	<p>Bee habitat degradation is quite high. Unprotected areas have less plant densities and diversities which are unable to sustain bee populations. The protected areas have been encroached and less habitats are available. To address these challenges, beekeepers need to plan to conserve and plant/establish plants that are high in honeybee resources. This will also provide the required resources alternately through the year that translates to increase in honeybee populations and of good health. Habitat conservation</p>



	integrated with appropriate farming practices will enable beekeepers to sustain bees in the non-protected areas.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, farmers, researchers, extension, input suppliers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Management and conservation of bee flora • Identification of ecology and area suitable bee flora • Suitability map for the bee flora • Training on benefits of bee forage conservation • Integrate bee flora conservation with other farm practices
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – supply seedlings and seeds; suitability maps; capacity building • Other research institutions (ICIPE, KEFRI & universities) bee flora inventory • County governments extension workers - Farmer linkages and training; support seedlings and seed acquisition
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Makueni, Machakos, Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Poor extension services • Inadequate knowledge on honeybee forage plants • Climate change resulting to lack of water to support seedlings • culture, tree planting not enculturated
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media, and farm demonstrations • Bee forage inventory • Water conservation and water harvesting to support • Suitability maps for bee forage • Adoption of the 10% tree cover in unprotected land

Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Habitat conservation and associated ecosystem services • Increased honey production and quality • Integration of agro ecotourism with bee forage management • Conserved Kaya forest and Arabuko Sokoke Forest
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Inter-sectoral acceptance by policy makers and local communities • Conservation of honeybee foraging plants supports environmental conservation, diversity and safety • Markets require good agricultural produce (size, shape and taste) which are all related to sufficient pollination by bees
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • About KES 30 per seedling; rate is 450 plants per acre • About KES 200 per kg seeds • Planting of one-acre seedlings: approx. KES 4,000
Estimated returns	<ul style="list-style-type: none"> • Four bee colonies well supported annually • 1 colony will give minimum 10 kg per harvest, minimum twice annually, giving 20 kg x 4 hives; 80 kg • 1 kg is approx KES 700 • Increased colony multiplication and expansion to produce 20-30 kg per harvest Langstroth hive • Beeswax minimum 10 kg per harvest x 4 hives x KES 500/kg
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women and youths have limited access to land for establishing bee forage trees and plants • Women have bee sting phobia • Women and youth have limited finances to establish seedlings for establishing bee forage • Women have less access to information and knowledge on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Easy access to fuel wood exist for women from the established forage plants and trees • Business opportunities exist for men, youths and women in establishing forage tree nurseries • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities

	<ul style="list-style-type: none"> • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Easy access to fuel wood exist for VMGs from the established forage plants
E: Case studies/profiles of success stories	
Success stories from similar previous projects	Embraced by Arabuko Sokoke beekeepers in Malindi. Environment has been conserved.
Application guidelines for users	Guidelines and briefs available online on KALRO website from the previous work (manuals and factsheets)
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa,
Partner organizations	International Centre for Insect Physiology and Ecology, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute

2.6.4 Integrated bee pasture management for commercial plantations

2.6.4 TIMP name	Integrated bee pasture management for commercial plantations
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Decline of honeybee in plantations • Reduced pollination services as a result of low bee population in plantations • Frequent absconding of hives due to lack of forage
What is it? (TIMP description)	This is the practice of cultivating and conserving bee forage resources to enhance pollination services in commercial plantations as well as increased hive productivity.

	 <p><i>Photo of Acacia mellifera, a major bee forage.</i> Source: M Kasina</p>  <p>Honeybee foraging on <i>Hoslundia opposita</i>. Source: Joseph Mulwa</p>
Justification	<p>There are high rates of bee habitat degradation within and between commercial plantations characterized by less plant densities and diversities. These degraded and monoculture ecosystems are unable to sustain bee populations as forage diversity and seasonality is minimal. This TIMP provides a guide to commercial growers to enhance their ecosystems with appropriate plant diversity management plan for securing bee resources. In turn, they will benefit from enhanced pollination services.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, crop commercial farmers, researchers, extension services, input suppliers, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print

	<ul style="list-style-type: none"> • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Establishment, management and conservation of bee flora • Identification of ecology and area suitable bee flora • Suitability map for the bee flora • Training on benefits of bee forage conservation • Integrate bee flora conservation with other farm practices • Seed availability of bee forage plants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO– seedling and seeds; suitability maps; capacity building • Other research institutions (NMK, KEFRI, ICIPE & universities) bee flora inventory, provision of seed, seedlings. Flora calendar establishment • County governments extension workers - Farmer linkages and training; support seedlings and seed acquisition
C: Current situation and future scaling up	
Counties where already promoted if any	Laikipia, Nyandarua, Nakuru (Longonot farm)
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Poor extension services • Inadequate knowledge on honeybee forage plants • Climate change resulting to lack of water to support seedlings • Culture, tree planting not enculturated • Inadequate seed/seedling supply of suitable bee flora species • Continued habitat loss especially the natural ecosystems
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Use dissemination approaches such as social media, and farm demonstrations to spread message on conserving bee forages • Enhance knowledge of bee keeping communities on the available bee forages • Develop bee forage inventory • Adopt water harvesting and conservation strategies • Suitability maps for bee forage • Adoption of the 10% tree cover in unprotected land
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Habitat conservation and associated ecosystem services • Increased honey production and quality • Enhanced pollination services leading to improved crop yields

	<ul style="list-style-type: none"> • Integration of agro ecotourism with bee forage management • Conserved Kaya forest and Arabuko Sokoke Forest
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Conserving of bee forages will be an acceptable practice in the ASALs • Conservation of honeybee foraging plants supports environmental conservation, diversity and safety • Inter-sectoral acceptance by policy makers and local communities • Markets require good agricultural produce (size, shape and taste) which are all related to sufficient pollination by bees
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • About KES 30 per seedling; rate is 450 plants per acre • About KES 2000 per kg seeds • Planting of one-acre seedlings: approx. KES 10,000
Estimated returns	<ul style="list-style-type: none"> • Four bee colonies well supported annually • 1 colony will give minimum 10 kg per harvest, minimum twice annually, giving 20 kg x 4 hives; 80kg • 1 kg is approx KES 700 • Increased colony multiplication and expansion to produce 20-30 kg per harvest Langstroth hive • Beeswax minimum 10 kg per harvest x 4 hives x KES 500/kg • Enhanced income due to improved crop yields
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women and youths have limited access to land for establishing bee forage trees and plants • Women have bee sting phobia • Women and youth have limited finances to establish seedlings for establishing bee forage • Women have less access to information and knowledge on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Easy access to fuel wood opportunities exists for women from the established forage plants and trees • Business opportunities exist for men, youths and women in establishing forage tree nurseries • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities

	<ul style="list-style-type: none"> • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Easy access to fuel wood opportunities exist for VMGs from the established forage plants
E: Case studies/profiles of success stories	
Success stories from similar previous projects	Embraced by AAA growers in Laikipia county in production of berries.
Application guidelines for users	Guidelines and briefs are available online on the KALRO website
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	International Centre for Insect Physiology and Ecology, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Services, National Beekeeping Institute

Gaps

1. Determination of botanical origin of honey
2. Suitability map for various bee forage plants
3. Establishment guides for the bee forage plants conservation
4. Develop a flowering calendar guide for major bee forage plants

2.6.5 Water and feed supplementation

2.6.5 TIMP name	Water and feed supplementation
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • limited floral and water resources for honeybees • Frequent absconding as a result of lack of the floral and water resources

	<ul style="list-style-type: none"> • Rising bee-human-livestock conflicts while competing for water resources
What is it? (TIMP description)	This is a guide and practice of providing honey bees in apiaries with appropriate water and feed supplements across the year especially in their time of need.
Justification	Just like any other animal, honeybees require proteins (amino acids), carbohydrates (sugars), lipids (fatty acids, sterols), vitamins, minerals (salts), and water. These nutrients are acquired in the ecosystem where bees get their provisions. Bees collect pollen and nectar for their nutritive needs. They also collect raisins to make propolis for hive protection. They further collect water to manage their hive climatic conditions. It is thus essential to ensure that bees have access to these resources and in times of dearth, supplementation with basic needs is critical.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, research institutions, Extension services, Input suppliers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Management and conservation of bee flora • Identification of ecology and area suitable bee flora • Availability of honeybee resources (feed and water) • Training on benefits of conservation and protecting bee resources for progressive use
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- training on management of honeybee colonies • Beekeepers- allow bee colonies for demonstrations on feed and water supplementation • NBI - Supply of honeybee hives and training on management of honeybee colonies • International Centre of Insect Physiology and Ecology (ICIPE) – training on management of honeybee colonies • Counties - provision of extension

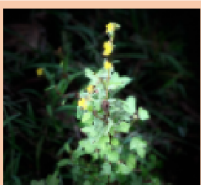
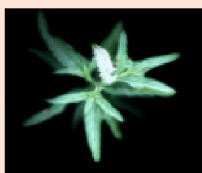
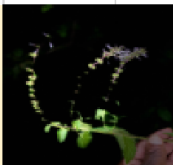
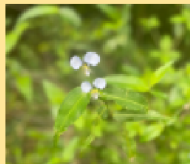
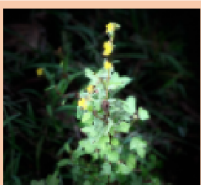
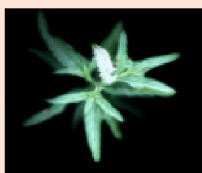
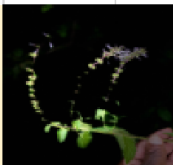
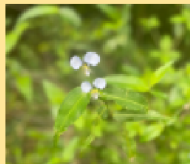
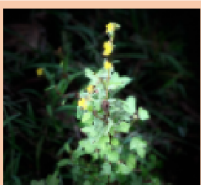
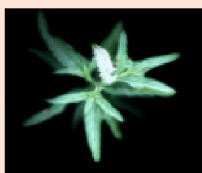
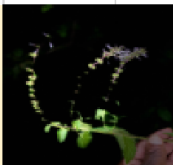
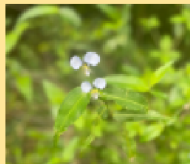
C: Current situation and future scaling up	
Counties where already promoted if any	Kakamega, Nakuru, Kiambu, Laikipia, Machakos, Murang'a, Tharaka Nithi, Meru, Nyeri, Uasin Gishu, Elgeyo Marakwet , Embu, Kitui, Makueni
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Insufficient number of model apiarists (beekeepers) who have adopted the technology and can be used for training • Culture where beekeeping is seen as a practice for men hence a challenge for female investors • Limited knowledge on honeybee feed and water provision
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Identify and assist a few apiary owners to develop into model apiarists • Capacity building beekeepers to adopt supplemental feed and water supply • Promote culture change for apiary to be viewed as a business • Capacity build extension services
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Feed and water supplementation maintains the colonies and makes them strong • Provision of clean feed and water reduces risks of bee toxicity
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • Practice of provision of supplemental feeds and water to bees will readily be adopted by bee keeping • Inter-sectoral acceptance by policy makers and local communities • Conservation of honeybee foraging plants supports environmental conservation, diversity and safety • Continued honey production enhances family income through creation of employment opportunities
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Water and feed supplements - 2kgs of sugar per month @ KES 250, 2 water and feed basins @ KES 200
Estimated returns	<ul style="list-style-type: none"> • 10kg of honey per harvest per hive; minimum harvest twice annually; approximately KES 700 per kg totaling KES 7,000 per harvest per hive • Reduced bee absconding • Strong hives established • Improvement in the amount and quality of honey produced • Additional returns from harvested bee products
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Handling of honey bee colonies is difficult for women • Social and cultural factors hinder women from performing apiary management practices • Women have bee sting phobia

	<ul style="list-style-type: none"> Traditionally, hive ownership, honey production and harvesting are considered a man's job in most communities
Gender related opportunities	<ul style="list-style-type: none"> Youth can easily establish these businesses because they are energetic. Affirmative action opportunities exist for women and youths to acquire credit to promote the practice Adoption of TIMP will lead to improved productivity of both commercial crops and honey hence, more income for women and youth Supply of inputs and training of beekeepers in adopting the TIMP will create employment to women and youth
VMG issues and concerns in adoption and scaling up	<ul style="list-style-type: none"> Cost to implement the TIMP may be a hindrance for some VMGs VMGs have less access to extension services due to prejudice and their social status
VMG related opportunities	<ul style="list-style-type: none"> Access to credit to start the management practice VMGs have better access to community support systems Promotes employment Promotes business for VMGs in supply of inputs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Guidelines to be included in ToT Manual
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

Gaps

1. Evaluation of various honey bee feed products
2. Determination of the economic benefits of water and feed supplementation

2.6.6 Region-specific beekeeping floral calendar

2.6.6 TIMP name	Region-specific beekeeping floral calendar																		
Category (i.e. technology, innovation or management practice)	Management practice																		
A: Description of the technology, innovation or management practice																			
Problem to be addressed	<ul style="list-style-type: none">Low honey production due to low floral resourcesLack of managing bee flora due to inadequate knowledge of the flora calendar.																		
What is it? (TIMP description)	<p>This is a guide on understanding the flora calendar of bee forage across the year. This can be done after every three months (quarterly). Different regions have different diversity of plants which provide bee resources at different times of the year.</p> <table><tr><th colspan="3">Floral calendar- West Pokot</th></tr><tr><th>Quarter</th><th>Dominant flowering plants</th><th></th></tr><tr><td>Quarter 1 (Jan-March)</td><td>Ocimum Commelina Acacia Tamarindus Combretum Plectnanthus Bidens</td><td></td></tr><tr><td>Quarter 2 (April-June)</td><td>Heliotropium Leonotis Euphorbia Rhus Ocimum Bidens Terminalia</td><td></td></tr><tr><td>Quarter 3 (July-Sept)</td><td>Syzygium Ageratum Solanum Hyptis Phaeoulus Zea Mays</td><td></td></tr><tr><td>Quarter 4 (Oct-Dec)</td><td>Commelina Ricinus Phaseolus Carica</td><td></td></tr></table> <p><i>An image showing an example of how a floral calendar can be developed with photos of the main plant species per season.</i> Source: R. N. Kinyanjui</p>	Floral calendar- West Pokot			Quarter	Dominant flowering plants		Quarter 1 (Jan-March)	Ocimum Commelina Acacia Tamarindus Combretum Plectnanthus Bidens		Quarter 2 (April-June)	Heliotropium Leonotis Euphorbia Rhus Ocimum Bidens Terminalia		Quarter 3 (July-Sept)	Syzygium Ageratum Solanum Hyptis Phaeoulus Zea Mays		Quarter 4 (Oct-Dec)	Commelina Ricinus Phaseolus Carica	
Floral calendar- West Pokot																			
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Quarter 4 (Oct-Dec)	Commelina Ricinus Phaseolus Carica																		
Justification	Vegetation cover and composition are critical components for the bee habitat. Developing a regional-specific floral calendar provides important information for beekeepers on when certain plant species are flowering and their diversity. This is a crucial management tool for beekeepers, who are deliberately diversifying																		


	the floral component available for the bees in any given season. This can reduce the chances of absconding.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, farmers, researchers, extension, input suppliers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Identification and recording of the flowering plant species based on seasonality. • Develop a regional-based floral calendar • Management and conservation of the identified bee flora • Identification of ecology and area suitable bee flora • Training on benefits of floral calendar • Integrate bee flora conservation with other farm practices
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – provide seedlings and seeds; suitability maps; capacity building • Other research institutions (NMK, KEFRI & universities) - bee flora inventory • County governments extension workers - Farmer linkages and training; support seedlings and seed acquisition
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate capacity and knowledge on honeybee forage plants and their flowering seasons • Climate change resulting to unpredictable seasons • Culture, tree planting not enculturated
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media, and farm demonstrations • Initial monthly documentation of the flowering plants as well as seasonal variation in flowering plants • Suitability maps for bee forage • Adoption of the 10% tree cover and suitable floriculture practices in unprotected land
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Habitat conservation and associated ecosystem services

	<ul style="list-style-type: none"> • Better bee-keeping practices and management for high production of quality honey • Maximum advantage on the opportunity presented in the diverse floral spectrum beforehand. • Integration of agro ecotourism with bee forage management • Better management and conservation practices by informed beekeepers.
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Promotion of floral calendars among bee keeping communities will be socially acceptable • Regional floral calendar will guide the conservation of honeybee foraging plants during different seasons. • Inter-sectoral acceptance by policy makers and local communities • Honey will be produced throughout the year to satisfy market needs
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • About KES 30 per seedling; rate is 450 plants per acre • About KES 200 per kg seeds • Planting of one-acre seedlings: approx. KES 4,000
Estimated returns	<ul style="list-style-type: none"> • Four bee colonies well supported annually • 1 colony will give minimum 10 kg per harvest, minimum twice annually, giving 20 kg x 4 hives; 80 kg • 1 kg is approximately KES 700 • Increased colony multiplication and expansion to produce 20-30 kg per harvest Langstroth hive • Beeswax minimum 10 kg per harvest x 4 hives x KES 500/kg
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology
Gender related opportunities	<ul style="list-style-type: none"> • Established plants can provide fuel wood for women and beautiful landscapes that are therapeutic • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit

	<ul style="list-style-type: none"> • Employment opportunities exist for young men in offering security, repairing the hives and harvesting the honey
Success stories from similar previous projects	Floral calendar was adopted and worked for beekeepers in West Pokot under CABESI project. Currently, they make predictions based on the three-year-round floral calendar.
Application guidelines for users	<p>1. Philip Onyango, Regina Nyunja, Stephen Fedha Sikolia, George Opande. 2019. Seasonal Availability and Floral Calendar of Apis mellifera Nectar and Pollen forage in Eastern Mau. International Journal of Life Sciences Research ISSN 2348-3148 (online) Vol. 7, Issue 1, pp: (88-97), Month: January - March 2019, Available at: www.researchpublish.com</p> <p>2. Guidelines and briefs are made available depending on the region</p>
F: Status of TIMP readiness (1-ready for upscaling; 2 requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat
Lead organization and scientists	KALRO Muo Kasina, Richards Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	Non Governmental Organizations, Egerton University, National Museums of Kenya, International Centre for Insect Physiology and Ecology National beekeeping Institute, Kenya Forestry Research Institute, County governments

2.6.7 Establishment of bee forage plants for the management of pests

2.6.7 TIMP name	Establishment of bee forage plants for the management of pests
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Environmental pollution with the synthetic pesticides causing honey bees decline. • Contamination of honey and hive products with synthetic pesticides ultimately leading to food safety issues and loss of the market.
What is it? (TIMP description)	This is cultivation of plant species for use as bee forage plants but also serve in the management of field pests due to their pesticidal attributes. The plants produce chemicals which repel the insect

	<p>pests and thus lower losses on forages. The involves planting and harvesting of plants from established habitats and processing the botanical extracts to control pests within the apiary and in the immediate orchards. This reduces environmental impacts and conserves plant diversity. There are many bio-pesticidal plants such as <i>Tithonia diversifolia</i>, <i>Lippia javanica</i>, <i>Azadirachta indica</i> (neem) and <i>Securidaca longependunculata</i>.</p>  <p>Propagation of pesticidal plants/ illustration by OPTIONS</p> <p>Source: http://projects.nri.org/options/options-media</p>
Justification	<p>Synthetic pesticides have been proven to have deleterious impacts on bee colonies, which has led to low and contaminated honey productivity in intensive agricultural regions. Habitat restoration involving suitable triple climate smart plant species will help to improve plant diversity, and exploit pesticidal properties with high knock-out success, sometimes equivalent to commonly used synthetic insecticides.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, farmers, researchers, extension, input suppliers, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Identification of ecological suitable bee and biopesticidal flora

	<ul style="list-style-type: none"> • Success in domestication and establishment of suitable plants • Training on the benefits of domestication of suitable bee flora, biopesticide extraction, and appropriate application to produce organic honey. • Management and conservation of the identified bee flora • Integrate bee flora conservation with other farm practices including biopesticide application in the immediate crop orchards within the apiary ecosystem.
Partners/stakeholders for scaling up and their roles	
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Tharaka Nithi, Nyandarua, Kajiado
Counties where TIMP will be upscaled	Kilifi, Tana river, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate capacity and knowledge on honeybee forage plants and their flowering seasons • Limited knowledge in conventional pesticide extraction and application • Poor extension services • Lack of adequate financial resources
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations on beeflora and organic honey production • Establish and distribute manuals • Demonstrate extraction and application of biopesticides • Credit facilities • Government various funding opportunities e.g. Inua jamii, youth enterprise fund etc
Lessons learned in upscaling if any	<ul style="list-style-type: none"> • Farmers are quick to adopt new technologies if convinced of the affordability, success in pest control and environmental safety. In addition, some of the applications have been used albeit with minimal success due to lack of standard protocols. • There are several plant species used as beeflora and also source of biopesticides. • Integration of agro ecotourism with bee forage management • Better management and conservation practices by informed beekeepers.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Bee keeping communities will embrace the bee forages which can also control pests • Conservation of honeybee foraging plants supports environmental conservation, diversity and safety • Inter-sectoral acceptance by policy makers and local communities



	<ul style="list-style-type: none"> • Good quality honey with minimal contamination from synthetic chemical pesticides will be produced and available to the market
D: Economic, gender, vulnerable and marginalized groups (VMGs)	
Basic costs of the TIMP	KES 153,500 (consisting of 1,200 seedlings, @KES 50 per seedling (60000); 1 kg seeds, @ 2500; labour in land preparation and seeding of one-acre seedlings approximately KES 15,000; knapsack pesticide sprayer KES 6000. In addition, modest water harvesting 10000 litre tank 1 @ KES 70000).
Estimated returns when using the TIMP	<ul style="list-style-type: none"> • KES 280,000 (1 langstroth hive to provide minimum 10 kg per harvest, minimum twice annually, giving 20 kg x 20 hives; 80 kg, @ KES 700, but with potential higher premium following organic branding). • KES 20000 (Beeswax minimum 10 kg per harvest x 20 hives x KES 500/kg)
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Limited access to land for establishing bee forage for women and youth due other competing farming practices and ownership. • Women and youth have limited finances to establish seedlings and seed nurseries and libraries. • Organized community groups with majority women members willing to adopt and disseminate apiculture investments or technologies
Gender related opportunities	<ul style="list-style-type: none"> • Changing land ownership rights supporting better share for women and youth-enhancing beekeeping adoption • Increased floral forage can act as livestock forage reducing costs and time taken by women and youth in grazing or buying animal feed. • Affirmative action opportunities exist for women and youths to acquire credit to establish seedlings and seed business • Bee flora and organic farming helps to improve health of the VMGs • Basic data collection using improved technologies such as android phones attractive to youth skills increasing the number of the employed.
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Cost to implement the TIMP may be a hindrance for some VMGs • VMGs have less access to extension services due to prejudice and their social status
VMG related opportunities	<ul style="list-style-type: none"> • Access to credit to start seedling and seed business • VMGs have better access to community support systems • Access to information about suitable bee forage for given ecologies
E: Case studies/profiles of success stories	
Success stories from similar previous projects	ABIRI is using neem extracts to manage pests. It has also been growing neem seedlings and has high density of neem in the compound

Application guidelines for users	KALRO Apiculture ToT Training manual available on the KALRO website
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich and Joseph Mulwa
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute, Directorate of Veterinary Services

2.7 Bee health

2.7.1 Wax moths and small hive beetles trap

2.7.1 TIMP name	Wax moths and small hive beetles trap
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Reduced bee honey yields High bee absconding Destruction of bee hives caused by wax moths and small hive beetles' infestation where they feed on wax, honey and other bee products
What is it? (TIMP description)	This is a food bait trap used to attract and kill adult moths and small hive beetles. The trapping component consists of a bottle with a concoction made from ripen banana peels, yeast (used in the normal cookery) or apple cider vinegar, sugar or honey and water for attracting moths and small beetle hives. The bottle has a hole at the neck where the moths and beetles enter from and once inside the bottle they get trapped.

	 <p><i>Wax moth trap</i> <i>Source: Irene Onyango</i></p>
<p>Justification</p>	<p>Both the wax moth larvae and adult as well as maggots of the hive beetles cause damage to the comb, by eating the wax and the contents therein, hence reducing working areas of bees as well as brood cells. Wax Moth worms make tunnels on the combs making them uninhabitable by bees. Further, the pupae of the wax moth construct cocoons on the walls and close bee pathways. All these injurious activities result in bees absconding the hives in the long run. Waxmoth also destroys hives. Initial losses include reduced honey production and bee densities per hive.</p>  <p><i>Greater wax moth worms and pupae.</i> <i>Source: B Nganso</i></p>

	 <p><i>Small hive beetle maggots.</i> <i>Source: B Nganso</i></p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	All Beekeepers, researchers, extension, input suppliers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Capacity/skills on the use of the technology • Availability of resources for training and promoting the technology • The willingness of the community to learn and adopt the technology
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization - training and promotion of the technology • Directorate of Veterinary Sciences-training and promotion of the technology • South Eastern Kenya University-training and promotion of the technology • County governments - creating/establishing farmer linkages • Extension service providers - for dissemination • Private partners - for funding of operations, market access • Non-Governmental Organizations - for wider reach in dissemination (out scaling)
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado
Counties where TIMP will be up scaled	Kilifi, Tana river, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega

Challenges in dissemination	<ul style="list-style-type: none"> • Limited extension services • Inadequate technical knowhow on hive pests' management • Limited source of finances for funding promotion and dissemination
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Encourage outreach activities for the benefit of bee keeping communities • Capacity building on pest management options • Sourcing for funds to promote the practices through training and facilitation of extension work
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Better performance and reduced absconding • Affordable to majority of beekeepers • More appealing and user friendly to all genders
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Socially acceptable • Does not lead to environmental degradation • No policy requirements needed for promoting these practices • Reduces honey loss and promotes stability of honeybee colonies thus high quality honey good for markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 250/ trap could be replaced every two months • One trap per apiary (within 6 m diameter)
Estimated returns	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw honey per season • Harvesting could be twice or more • Price for honey could be KES 700 per kilo • Estimated return is KES 7,000 per hive per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on beekeeping technologies • Women may have limited access to extension services leading to inadequate technical knowhow on hive pests management • Social-cultural factors may hinder women from performing apiary technologies • Women may have bee sting phobia • Traditionally, hive ownership, honey production and harvesting is considered a man's job in most communities • Women may have less access to production resources such as land, capital and labour
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in implementing the technology • Affirmative action opportunities exist for women and youths to acquire credit to establish seedlings and seed business
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may suffer from bee-sting phobia • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in implementing the technology


E. Case studies/profiles of success stories	
Success stories from previous similar projects	Highly embraced by beekeepers in Kajiado county due to bee stability and reduced attack
Application guidelines for users	<ol style="list-style-type: none"> 1. Wax moth and beetle control – immediate advisory October 2022 2. Charles A. Kwadha, George O. Ong’amo, Paul N. Ndegwa, Suresh K. Raina 1 and Ayuka T. Fombong 1. 2017. The Biology and Control of the Greater Wax Moth, <i>Galleria mellonella</i>. <i>Insects</i>, 8, 61; doi:10.3390/insects8020061 3. Nicholas Annand. 2008. Small hive beetle management options.https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/220240/small-hive-beetle-management-options.pdf
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Requires validation
G: Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimaani Directorate of Veterinary Services Irene Onyango and Kamau Kabochi
Partner organizations	South Eastern Kenya University, International Centre for Insect Physiology and Ecology, National Beekeeping Institute, National Museums of Kenya, Kenya Forestry Research Institute, Baraka Agricultural college

Gaps

1. Diversity and ecological spread of the waxmoths and hive beetles
2. Economic losses associated with waxmoths and hive beetles in Kenya

2.7.2 Open bottom board for managing mites and small hive beetles in bar-hives

2.7.2 TIMP name	Open bottom board for managing mites and small hive beetles in bar-hives
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Weak honey bee colonies due to varroa mites infestation, which transmit a number of viruses to honeybee colonies. • Reduced honey yield resulting from small hive beetle infestation in hives

What is it? (TIMP description)	<p>Open Bottom board is a technology used in monitoring and reducing the population of varroa mites and small hive beetles in honeybee colony. The open bottom has a screened insert which is removable.</p> <p>A sticky substance, either grease or cooking oil may be applied on the screened insert to catch the pests as they fall through as the bees groom themselves on the screened mesh wire leaving small mites on the bodies to fall through the mesh and stick on the sticky board beneath. The technology is for Langstroth and box hive types.</p>  <p><i>Open Bottom board</i> Source: Irene Onyango</p>
Justification	<p>Through bees hygienic and grooming behavior, the mites and small hive beetles fall off the bees bodies. When a screened sticky board is placed at the base of hive, these pests will fall through and are trapped thereby reducing their population in the colony. This method does not involve use of chemicals; therefore, it is environmentally friendly and safe for the bees and consumers of honey.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, hive producers, researchers, extension service providers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services

Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Awareness creation/Capacity building of hive producers and other relevant stakeholders. • Collaboration between county governments and national government • Researchers to promote the use of this technology in Langstroth hives.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Beekeepers - implementers • County government - extension services and reinforcement • National government – policy, regulations and capacity building • Agriculture Associations of Kenya – Advocacy, create awareness on safety limits in the use of chemicals • Regulatory bodies – ensures entry of bee safe products and prohibit registration of restricted chemicals in the market • Research institutions – conduct research and disseminate information • Donors – to provide funding • Manufacturers – to manufacture the item
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited extension services • Limited source of finances for funding promotion and dissemination • Most of the Langstroth hives have fixed bottom board
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Promote use of screened open bottom board in Langstroth hives • Source for funds to assist in promoting the technology • Modify the Langstroth hive to accommodate the open bottom board
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • None
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Socially acceptable • Environmentally friendly because it makes use of ordinary items • Does not require any policy changes to use it in apiculture production • Enhancing quality and quantity honey production • Market is able to take up increased supply of honey due to increased productivity
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The complete technology can cost about KES 3,000 per hive

Estimated returns	In presence of mites and small hive beetles, yields may be zero, and ends with absconding. Thus a saving of a minimum of KES 2,500 per season is envisioned. The board lasts many years
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the management practice • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice • The technology may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youth males in Open Bottom Board in construction • Affirmative action and hustler funds opportunities exist for youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may suffer from bee-sting phobia • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in Open Bottom Board in construction
Application guidelines for users	<ul style="list-style-type: none"> • Apiculture training manual available on the LARO website • Nicholas Annand. 2008. Small hive beetle management options.https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/220240/small-hive-beetle-management-options.pdf
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
G: Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	Directorate of Veterinary Services: Irene Onyango; Samuel Kamau South Eastern Kenya University: Eliud Muli KALRO ABIRI

	Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	Non-Governmental Organizations, Community Interest Groups, Community Based Organizations, County governments, International Centre for Insect Physiology and Ecology, National Beekeeping Institute, National Museums of Kenya, Kenya Forestry Research Institute, Baraka Agricultural college

2.7.3 Management of Nosema disease in honey bees

2.7.3 TIMP name	Good beekeeping practices and biosecurity
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Reduced production as a result of Nosemosis infections in honeybee colonies.
What is it? (TIMP description)	<p>Good beekeeping practices (GBPs) and biosecurity measures helps in managing nosema disease in honey bees. Good beekeeping practices are those integrative activities that beekeepers apply for on-apiary production to attain optimal health for humans, honey bees and the environment. Biosecurity measures in beekeeping (BMBs) are all those operational activities implemented by the beekeepers to reduce the risk of introduction and spread of specific honey bee disease causing agents.</p> <div> </div> <p>Bees Diarrhoea at the hive entrance.</p> <p>Source: Flickr/D. Broberg</p>
Justification	<i>Nosema</i> spp. are spore forming fungus (microsporidia) which cause nosemosis of honey bees. Infection of the bees occur through oral ingestion of the spore-contaminated honey, pollen or water. The disease inflames the lining of the midgut of the bees causing dysentery, indigestion of the pollen and weaknesses of the bee legs. Infected bees are unable to fly or forage hence reduced production. The use of antibiotics is not a suitable method in the control of nosema because of the danger of residues which may poison the honey. The best approach is the application of specific good beekeeping practices and

	biosecurity measures that reduce chances of contamination to the hives.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, extension officers, hive monitors, research institutions, county governments, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Capacity of the extension officers • Community associations (Apiculture and Beekeeping Associations) • Availability of Standard country document on Good beekeeping practices • Standard country document on Biosecurity measures • Established feed in form of foliage and water source • Digital platforms • Availability of funds for promoting the technology
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Extension service providers - to train farmers on good beekeeping practices, siting of the apiaries and helping with hive inspection • Directorate of Veterinary Services – Policy guidance, regulations, training of county staff as Trainers of Trainers • Kenya Agricultural and Livestock Research Organization – technology development and fine tuning, Trainers of trainers backstopping and monitor implementation • Beekeepers and Apiculture Association to -maintain records and advocacy • Donors - to offer financial assistance
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo
Counties where TIMP will be upscaled	Kilifi, Tana river, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of beekeepers' awareness on the disease and its impacts on hive production • Inadequate extension officers • Lack of enough funds to train on good beekeeping practices and biosecurity measures • Weak advocacy platforms that relate to beekeeping industry

Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Create awareness on bee diseases and their management • Enhance outreach activities on bee health • Sourcing for funds for regular trainings on good beekeeping practices and Biosecurity measures • Regular inspection of colonies • Promoting the use of Good Beekeeping Practices and Biosecurity Measures in Beekeeping in Apiculture documented protocols
Lessons learned in up-scaling if any	None
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Socially acceptable • Does not lead to environmental degradation • Promotion of bee health should adhere to laid down procedures and align to animal disease regulations by the DVS • Policy framework for enhancing use of safe use of good beekeeping practices and biosecurity measures for nascent value chain • Environmentally friendly as it lower chances of honey contamination • Reduces honey loss and promotes stability of honeybee colonies thus high-quality honey good for markets
Basic costs of the TIMP	Good practices and biosecurity measures may cost 20,000 (purchase of hive protective kit and hive equipment)
Estimated returns when using the TIMP	<ul style="list-style-type: none"> • One hive will produce 10kg • Each 1 kg hone is KES 700 • Each hive can give 5kg wax • Wax is KES 400 per kg
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	Perceptions of that beekeeping is for men and not women
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary GBPs • Traditionally, the apiculture is considered a man's enterprise • Women may suffer from bee-sting phobia • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice • The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youth males in implementing the management practice

	<ul style="list-style-type: none"> Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Women may suffer from bee-sting phobia VMGs have limited access to education, training and extension services than men Due to their social status VMGs are often excluded from decision making in development and dissemination activities There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Employment opportunities exist for men and youth males in implementing the management practice
VMG related opportunities	Affirmative action, capacity building and practical support to be provided for VMGs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	<p>Prevention and Management of Nosema Diseases in bee colonies KCSAP Pamphlet No.:2023.</p> <p>Formato, G.; Rivera-Gomis, J.; Bubnic, J.; Martín-Hernández, R.; Milito, M.; Croppi, S.; Higes, M. Nosemosis Prevention and Control. Appl. Sci. 2022, 12, 783. https://doi.org/10.3390/app12020783</p>
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	<p>Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org</p>
Lead organization and scientists	KALRO
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
	Directorate of Veterinary Services Irene Onyango, Samuel Kamau,
	South Eastern Kenya University Eliud Muli
Partner organizations	International Centre for Insect Physiology and Ecology

2.7.4 Management of bacterial diseases of honeybees


2.7.4 TIMP name	Management of bacterial diseases of honeybees
Category (i.e. technology, innovation or management practice)	Management Practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Reduced production as a result of death of infected honeybees, • absconding of honeybees from the hives, spread of the infection within the colonies • loss or ban on the local and export trade of honey and hive products.
What is it? (TIMP description)	<p>This involves sensitization of farmers to enhance awareness about the different types of bacterial infections in honeybee colonies and their impact on honey production and access to the export market. This sensitization stresses on how to identify bacterial diseases and also apply management practices that limit their occurrence and spread.</p> <div> </div> <div> </div> <p><i>Diseased Honey comb</i> <i>Source: Irene Onyango</i></p>
Justification	<p>Bacterial infection in bee colonies brood causing a foul smell hence infection is referred to as foulbrood disease. The disease results in death of bees thus, reduced production. Foulbrood infection could also result in ban of exports and hive products to external markets leading to loss of income and produce. Unregulated imports of infected live bees, contaminated products and equipment from an infected area is a major path through which the disease gets into the country or geographical area thereby threatening to cripple production in large areas. Training in identification and management of the bacterial diseases empowers the beekeepers with identification capacity.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> • Beekeepers • Counties where beekeeping is practiced • National Government • Private Sector and traders • Potential export markets such as the EU, USA and Far East Countries. • Research institutions • Agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station

	<ul style="list-style-type: none"> • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Trained extension officers in the counties • Trained hive monitors and inspectors • Proper maintenance of records and follow-ups of suspect cases • Availability of test kits and laboratory for diagnosis • Mapping of apiaries geographically • Update regulations on beekeeping, trade and health aspects
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Kenya Agricultural and Livestock Research Organization – to conduct research and capacity build • Extension service providers (public and private) – to train farmers on management of bacterial diseases • Hive monitors to inspect hives and report diseases in geographical area • Private bee queen rearing service providers/facilities under quarantine or secure biosafety conditions to prevent transmission and buildup of diseases free colonies • Directorate of Veterinary Services and Data Loss Prevention to maintain records of the imports related to bees and implements • Private sector - service providers
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited bee health surveillance activities which may have led to the assumption that the country is free of foulbrood disease • Most of the beekeepers and players in the apiculture are unaware of foulbrood disease and its impacts. • Inadequate extension services • Weak advocacy platforms that relate to beekeeping industry
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Institutionalize bee health surveillance as per the DVS disease control regulations • Sensitize beekeepers on common bacterial diseases such as foulbrood which after brood • Enhance outreach activities for bee keepers • Inspection of the hive produce at the ports of entry • Enforcement of the import –export regulations

	<ul style="list-style-type: none"> • Imposition of the quarantine measures as specified under relevant animal health act to reduce transfer of the infections • Support for beekeepers and apiaries recording and registration • Destruction of infected materials and colonies using documented protocols
Lessons learned in upscaling if any	<ul style="list-style-type: none"> • None
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Socially acceptable because the method makes use of knowledge that is readily available • Training to enable beekeepers to apply good bee husbandry that is environmentally friendly • Policy regulation to guide on importation of live bees • Market is likely to absorb all honey produced
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic Costs	Inspection labour 3 times in a season: KES 1,500
Estimated returns when using the TIMP	<ul style="list-style-type: none"> • One hive produces an average of 10 kg raw per season • Harvesting could be twice or more • Price for honey could be KES 700 per kilo • Estimated return is KES 7,000 per hive per season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Traditionally, the apiculture is considered a man's enterprise • Women may suffer from bee-sting phobia • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, credit, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youth males in implementing the management practice • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may suffer from bee-sting phobia • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in implementing the management practice
E: Case studies/profiles of success stories	
Success stories from previous similar projects	With proper inspections, it is possible to manage the disease
Application guidelines for users	Apiculture ToT Manual available online on the KALRO website

F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Directorate of Veterinary Services, South Eastern Kenya University, International Centre for Insect Physiology and Ecology

2.7.5 Management of bee pesticide poisoning

2.7.5 TIMP name	Management of bee pesticide poisoning
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Reduced hive productivity as a result of low colony strength caused by pesticide poisoning to worker bees Presence of pesticide residues in honey, wax and propolis as a result of bees carrying sublethal amounts of pesticides.
What is it? (TIMP description)	<p>This involves the continuous creation of awareness on how the use of pesticides in crop farming affects bee productivity. Unintended exposure of honeybees to pesticides may result in their death which may have a deleterious effect not only on production of honey but on ecosystem services like pollination. Importantly is the health of consumers of honey due to high levels of pesticide contamination. The use of safe chemicals especially botanical extracts is likely to safeguard the apiculture enterprise. The promotion and use of safer alternative pest control products is preferred.</p>  <p><i>Pesticide application on an orchard.</i></p>

	<i>Source: Mary Gikungu</i>
Justification	Pesticides toxicity causes death of honey bees and increases their sensitivity to pathogens. Pesticides contaminated pollen carried by bees into the hives may infect the colony and leave harmful residues on hive products. This scenario results in decline of pollinators, reduced productivity and compromised quality of hive products. Reduced use of pesticides, appropriate pesticide application timing and promotion of alternative ecofriendly-pest control options is essential.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Extension officers, beekeepers, national governments, county governments, crop farmers, chemical distributors, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension Models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Trained extension officers Consultative forum for beekeepers, crop and Livestock keepers; and chemical distributors. Government regulations
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> Extension service providers - to train farmers on good beekeeping practices and siting of the apiaries Directorate of Veterinary Services – Policy guidance, regulations, training of county staff as Trainers of trainers Directorate of crop protection - recommendations on use of pesticides Kenya Agricultural and Livestock Research Organization – technology development and fine tuning, ToT, backstopping and monitor implementation Donors- mobilize funding Beekeepers and Apiculture Association - to - records and advocacy
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be up scaled	Kilifi, Tana river, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Lack of beekeeper’s awareness on the pesticides and its impacts on hive production

	<ul style="list-style-type: none"> • Inadequate extension officers • Resistance from crop and livestock keepers on timely pesticide application • Resistance from chemical distributors • Weak advocacy platforms that relate to beekeeping industry • lack of enough funds for awareness creation
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Create awareness on effects of pesticides on honey bee productivity • Encourage outreach activities to build the capacity of bee keepers • Regular scouting and environmental audit of the use of pesticides • Form a consultative forum for beekeepers, crop farmers, livestock keepers and chemical distributors • Consultative forums for beekeepers, crop and livestock keepers; chemical distributors and regulators (Pest Control Products Board and Veterinary Medicine Directorate(VMD))
Lessons learned in up scaling if any	Kenyans have limited knowledge on the effects of pesticides on bees. They have also limited knowledge on the effects of bees to human livelihood.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • This management practice is socially acceptable • Adoption of the advisory on rational use of pesticides would reduce environmental contamination • Policy and regulations on safe use of chemicals in the agriculture system to protect the bees • Improved bee health due to reduce impact of pesticide would increase productivity of honey and hive products to meet the high market demand
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not established
Estimated returns	More than 30% increase in honey and hive products production
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology
Gender related opportunities	Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have less access to production resources such as land, capital and labour • VMGs have limited access to education, training and extension services than men

	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Affirmative action and financial inclusion funds opportunities exist for VMGs to acquire the required credit
Success stories from previous similar projects	None
Application guidelines for users	Registered biocontrol products against pests found at the Pest Control Products Boards website: www.pcpb.or.ke
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO -ABIRI Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani, Joseph Mulwa
Partner organizations	Directorate of Veterinary Service, National Beekeeping Institute, International Centre for Insect Physiology and Ecology, Baraka College, Community Based Organizations, Beekeeping groups, and, beekeepers; Plant Protection and Food Safety Department, National Museums of Kenya

Gaps

Impact of pesticide poisoning on bees in Kenya

2.7.6 Mobile app for bee health

2.7.6 TIMP name	Mobile app for bee health
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Wrong identification and diagnosis of the pests and diseases infesting honeybees, leading to delay and or wrong interventions; • Declining honey bee population due to pests and diseases that go unnoticed or unidentified due to lack of knowledge • Low hive productivity as a result of weak colonies, caused by pests and diseases

What is it? (TIMP description)	This is a mobile application (mobile App) developed and now available in play store for use by the beekeepers, extension staff and hive monitors to correctly identify and report on the pests and disease symptoms observed when carrying out colony inspection using mobile phone.
Justification	<p>Bee pests and diseases are least understood among the livestock enterprises in the country. This App provides a tool in beekeeper hands to be able to confirm the bee health challenges that they may face.</p> <p>The App encourages frequent hive inspections during the day, which will ensure challenges can be seen compared with visiting at night when it is difficult to see pests or diseases well.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> • Beekeepers • Counties where beekeeping is practiced • Hive monitors • Extension officers • National Government • Private Sector and traders • Potential export markets such as the EU, USA and Far East Countries. • Farmers • Researchers • Agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Trained extension officers on how to use the mobile App in the counties and carry out inspections • Trained hive monitors and inspectors • Proper maintenance of records • The mobile Apps domain name • Internet web Hosting Servers. • Mobile phones • Laptops for the Web Administrator
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Extension service providers (public and private) - Extension service provision • Hive monitors to inspect hives - report diseases in geographical area

	<ul style="list-style-type: none"> • DVS - policy on use of APP • DLP - Support initiatives to enhance bee productivity • KALRO -Develop APP for use in bee health initiatives • County government - provision of extension service • Private sector - Support to the functioning of the APP • Beekeepers - Users of the APP
C: Current situation and future scaling up	
Counties where already promoted if any	Siaya, Tana River, Kajiado
Counties where TIMP will be upscaled	Kilifi, Tana river, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Poor network in some areas • Lack or insufficient Web hosting server • Some farmers lack an Android driven mobile phone for usage application
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Lobby mobile service providers to erect masts in strategic areas to strengthen signal and network connectivity • Host the Application in a secure server • Train community hive monitors on use of the App. • Encourage group formation to benefit those without android phones.
Lessons learned in upscaling if any	Beekeepers and extension personnel eager to adopt the technology
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Use of mobile app is acceptable • It has limited or no negative impact to the environment • The use of the app has to be in conformity with regulation by the Communication Authority of Kenya (CAK) • There will be willingness to pay for the use of the app
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs of the TIMP	Basic android mobile phone cost @ 5000/= per piece
Estimated returns when using the TIMP	Expected knowledge gain and understanding of the pests and diseases leading to improved Bee Health and increased production
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital and labour • Women have less access to ICT equipment e.g. mobile telephones • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances

VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of the technology • VMGs face the barrier of accessing the super log hives due to inadequate of resources • VMGs have less access to information and knowledge on the technology • VMGs have less access to production resources such as land, ICT equipment, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the management practice
VMG related opportunities	Affirmative action and hustler funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Guidelines are available online on the KALRO website
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	Directorate of Veterinary Services: Irene Onyango, Samuel Kamau, South Eastern Kenya University: Eliud Muli Kenya Agricultural and Livestock Research Organization Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, Egerton University, Insect Physiology and Ecology , Baraka college, Community Based Organizations and private beekeepers

2.8 Quality Assurance

2.8.1 Food safety along the apiculture value chain

2.8.1 TIMP name	Food safety along apiculture value chain
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Rising incidences of contaminated and low quality honey products in the market

	<ul style="list-style-type: none"> • Inability to access markets due to food safety challenges for honey
What is it? (TIMP description)	<p>This is a guideline/protocol for ensuring honey and other hive products based market products are safe for consumption and use. It includes identification of critical control points along the value chain and how to initiate and monitor implementation of good beekeeping practice that ensures reduction in contamination of the honey. The target is to prevent introduction of pesticides, drugs (human/livestock) and heavy metals residues to avoid breaching the allowable respective maximum residue levels (MRLs). It ensures hygiene is mainstreamed across the value chain.</p>
Justification	<p>There is an increasing need for bee products to comply with food safety standards. A protocol similar to what is used on other foods is needed and should be implemented at the various nodes of the value chain.</p> <p>To comply with the maximum residue levels (MRLs) for Veterinary drugs, pesticides and pharmacologically active substances in the hive products. The country residue monitoring plan as well as the national laboratories conducting residue monitoring need to be operationalized.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, County government, National government, both local and export traders, processors, packagers and transporters, researchers, agri-preneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of risk assessment tools, sampling plans, hygiene monitoring plans, laboratory testing procedures. • Availability of customized honey standards to meet Kenyan needs.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Beekeepers - implementers • County government -extension services and reinforcement • National government – policy, regulations and capacity building

	<ul style="list-style-type: none"> • Agriculture Associations of Kenya – Advocacy, create awareness on safety limits in the use of chemicals • Regulatory bodies – ensures entry of safe bee products and prohibit registration of restricted chemicals in the market and • Research institutions – research • Donors for funding • Manufacturers - designing packages and processing of bee products
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited funding for data collection and review of the Residue monitoring plan • Limited knowledge of the laboratory and extension staff • Low awareness levels • High levels of chemical contamination
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Mobilize for funds from donors and collaborators • Training of laboratory staff and extension • Public sensitization appropriate use of veterinary drugs and pesticides • Promote organic farming
Lessons learned in up scaling if any	None
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Food safety practices will be acceptable by bee keepers • Safe environmental conditions are required to ensure reduced contamination of honey and other bee products • General acceptance by policy makers and local communities • Market availability for quality hive products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not available
Estimated returns	Quality hive products have premium returns in the market
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to agricultural information, technology and knowledge on food safety along the value chain • High illiteracy level of women makes them unable to read the dissemination documents and other materials on food safety along the value chain • Women may have less access to extension services on the management practice

Gender related opportunities	Proper application of the management practice will lead to improved health of men, women and youths due to consumption of clean health honey that is free from hazards.
VMG issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • MGs have less access to agricultural information, technology and knowledge on the management practice • High illiteracy level of the VMGs makes them unable to read the dissemination documents and other materials on the management practice. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities
VMG related opportunities	Proper application of the management practice will lead to improved health of men, women and youths due to consumption of clean health honey that are free from hazards
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to agricultural information, technology and knowledge on food safety along the value chain • High illiteracy level of women makes them unable to read the dissemination documents and other materials on food safety along the value chain • Women may have less access to extension services on the management practice
Gender related opportunities	Proper application of the management practice will lead to improved health of men, women and youths due to consumption of clean health honey that is free from hazards.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	KALRO Apiculture ToT Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Requires validation
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO ABIRI Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich and Caroline Kimani


Partner organizations	Directorate of Veterinary Services, National Beekeeping Institute, Egerton University, International Centre for Insect Physiology and Ecology, Baraka agricultural college, Community Based Organizations and private beekeepers
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Gaps

Determine the availability of hazardous products in bee products and their health implications

2.9 Harvest and post-harvest practices

2.9.1 Honey harvesting Indicators

2.9.1 TIMP name	Honey harvesting guideline
Category (i.e. technology, innovation or management practice)	Management Practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Poor time of honey harvesting hence low quality honey in the market Harvesting of contaminated honey as a result of mixing honey combs with bee bread, pollen and/or brood
What is it? (TIMP description)	<p>This is the guideline with harvest indicators to show when honey harvesting should be done. Harvesting of honey is done when it is ripe/mature. When harvesting is done at the right time, the quality of the honey and other bee hive products is good. The shelf-life of honey harvested at the optimal stage is long and honey can be kept for many years without getting spoiled. Honey harvesting should happen when the 75% to 100% of the honeycombs have been capped. Only the honeycombs that are ready should be harvested.</p> <p>The comb shown here is at the right stage of harvesting</p>  <p><i>A 75% capped comb can be harvested. below this stage it is unripe</i></p>

	 <p><i>Fully capped honeycomb</i></p> <p>Source: Jonah Kinyanjui</p>
Justification	<p>Premature honey will have high moisture content, often above 20% (low grade). Nectar that is not fully processed into honey will indicate high sucrose content, similar to adulterated honey.</p> <p>The high moisture content will result in fermentation of honey, increasing acidity. The effect is therefore reduced marketability and value of honey.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers (beekeeping groups and individuals, extension service), agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	Knowledge, skills and attitudes of the extension teams and beekeepers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - Research on hive technologies • County governments - promote technology uptake in various counties • Self-help groups - promote technology uptake various beekeeping zones) • MoALD - promote technology uptake in the Country • NGOs - promote hive products and publicity/link farmers to markets • Supermarkets - buy and sell to final consumers of hive products.

C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Machakos, Nakuru, Baringo, Kitui
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate skills in making the improved Kapkuikui log hives with queen excluder • Lack of knowledge by beekeepers about this type of hive
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Train artisans to make the improved Kapkuikui super Log hive • Capacity build beekeepers on the hive qualities and its use, • Link beekeepers to service providers
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • The technology is resilient to the effects/shocks of extreme weather conditions experienced in the ASALs of Kenya • Log hives form the highest population of hives in the country and thus need improvement for best honey quality production • Beekeepers hold strong cultural value for log hives which are easy to acquire
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • The technology is socially acceptable, and any innovation to increase its productivity will be readily adopted • The technology is environmentally friendly therefore any efforts to increase its production will be readily adopted • Enabling policy frameworks to support development and adoption of the technology is in place • Increased productivity will provide supply to the markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Extension service costs,
Estimated returns	<p>Beekeepers will benefit from saved losses in honey value which can be 40% of the value of honey harvested; (20kg*KES 700*30%) per hive per year</p> <p>There will be better customer retention by reducing adulteration suspicion</p>
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may suffer from bee-sting phobia • Women have less access to information and knowledge on the management practice • Women may have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice

Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youth males in performing the task • Affirmative action and hustler funds opportunities exist for youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may suffer from bee-sting phobia • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Employment opportunities exist for youth males in performing the task
E. Case studies/profiles of success stories	
Success stories from previous similar projects	Success stories from previous similar projects
Application guidelines for users	Muli, E., Munguti, A., Raina, S. K. 2007. Quality of Honey Harvested and Processed Using Traditional Methods in Rural Areas of Kenya. ACTA VET. BRNO 2007, 76: 315–320; doi:10.2754/avb200776020315. https://actavet.vfu.cz/media/pdf/avb_2007076020315.pdf
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for Upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani.
Partner organizations	International Centre for Insect Physiology and Ecology, National Beekeeping Institute

2.9.2 Honey harvesting and pre-processing handling


2.9.2 TIMP name	Honey harvesting and pre-processing handling
Category (i.e. technology, innovation or management practice)	Management Practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Poor quality of honey due to mixing of honey with honey combs and brood combs during harvesting, • Destruction of brood and killing of bees due to over-harvesting • High rate of absconding after harvesting
What is it? (TIMP description)	Honey harvesting and pre-processing handling involves empowering beekeepers to harvest pure honey devoid of brood. This makes it easy to process honey without compromising on its quality. Proper harvesting and pre-process handling ensures sustainability in the production of honey and other hive products.
Justification	Maintaining the quality of honey starts from harvesting and handling practices during harvesting and preprocessing period. Majority of beekeepers continue to use traditional methods that result in a mixture of honey and brood combs, which lower the quality of honey. Further, the majority of beekeepers do not preserve some honey for bees when harvesting, a condition which, together with bee and brood destruction contribute to absconding of hives after harvesting.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, Beekeeping practitioners, research and extension, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Availability of funds to support training • Willingness of beekeepers to adopt proper harvesting methods • Linking honey quality with harvesting methods • Linking harvesting methods with bee absconding • Adopting improved hives

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO to provide technology/ innovation/ management practice and training • Other research institutions (Icipe and universities) to generate more researches and training • County government - linkages with farmers and dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Nairobi, Kitui, Machakos
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Aging beekeepers • Cultural beliefs such as honey harvesting at night • Low knowledge and capacity of beekeepers • Low acceptance
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Motivate youths to embrace bee keeping • Sensitize communities on behaviour change to discard retrogressive practices • Capacity building of beekeepers • Incentivise bee keepers to adopt proper harvesting and pre-pre-processing practices
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • It is possible to work with beekeepers for improving their product value • Bee keepers are ready to take up practices that improves on produce quality • Women have honey bee sting phobia • There is slow adoption in use of new harvesting practices due unavailability of tools and knowledge which is also associated to financial inability to purchase all the requirements
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Harvesting and pre-process handling practices will be acceptable and easily taken up by bee keepers • Proper honey harvesting practices where smokers are used instead of fires will minimize environmental pollution • Regulations on honey and honey trade should be put in place • Improved harvesting practices will increase honey quality and expand market access
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Complete bee suit KES 4,000 • Hive tools, assorted: KES 2,000 • Smoker, KES 1,000 • Harvesting rope, KES 1,000 • Food grade plastic buckets 20 L KES 500/piece • All the items are used for many hives and have more than 5 years longevity

Estimated returns	<ul style="list-style-type: none"> • Honey KES 700/kg; 1 hive yield per harvest 10-15 kg depending on hive type; • Beeswax KES 1,500/kg. for fixed and moveable combs, 10 kg of honey will produce 1 kg wax. For framed combs, 75 kg honey will produce 1 kg wax
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Honey harvesting is a male domain • Men are involved in most of the honey harvesting activities, therefore most of the decisions pertaining to bees are made by men • Social and cultural factors hindering women from honey harvesting • Women may have bee sting phobia • Women's triple role may hinder them from attending training on honey harvesting
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for the youth in honey harvesting • Need to enhance market linkages for harvested honey • Adoption of Improved honey harvesting technologies leads to increased productivity of honey hence, more income for women
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in technology development and dissemination process • With appropriate protective gear and proper training, VMG could easily participate in harvesting and post harvesting activities • VMGs face the barrier of accessing the super log hives due to inadequate of resources
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action, capacity building and practical support to be provided to VMGs • The management practice can provide food and nutrition security and a window for increased income • Enhance market linkages to trigger increased production • Harvesting, post harvesting, processing, packaging and marketing
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced increased by 45% in Mwingi, Kitui from 2008. This has increased honey sales and other hive products.
Application guidelines for users	Apiculture ToT training manual available on KALRO website
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling

G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	International Centre of Insect Ecology and Physiology , universities, Common Interest Groups and Beekeepers

2.9.3 Honey processing by centrifuging

2.9.3 TIMP name	Honey processing by centrifuging
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low quality honey in the market • Low implementation of food safety procedures
What is it? (TIMP description)	<p>This is the extraction of honey from combs in framed bars using the centrifugation method. The technology is mainly for processing honey harvested from framed bar combs. An innovation that allows for use of non-framed combs has widened the use of this technology.</p>  <p><i>Honey Centrifuge Machine</i> Source: Jeptarus Kipkurui</p>
Justification	Honey is a human food derived from nectar from flowers. It thus must be properly harvested and handled for it to be processed. The basic procedures of handling foods apply across

	honey processing systems. Proper honey processing leads to high quality products, resulting in diversification of its uses.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Honey processors, beekeepers, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer extension models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on honey quality • Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – to develop, validate and transfer the technologies and/or management practices • ICIPE – to develop, validate and transfer the technologies and/or management practices • KEBS - quality assurance and standard setting • NBI - Extension- validation, training and transfer • County government linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Baringo, Nairobi, Kitui, Kakamega
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Aging beekeepers • Inadequate funding for capacity building • Limited access to credit facilities • Costly equipment • Cultural issues challenging honey processing, packaging and storage
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Motivate youths to take apiculture • Improve access to credit facilities • Regulate honey processing and marketing • Capacity building processors • Enhance access and acquisition of appropriate equipment and structures • Sensitization of the bee keeping communities for behaviour change to discard retrogressive cultural practices

Lessons learned in up scaling if any	<ul style="list-style-type: none"> • It is possible to capacity build beekeepers and honey processors • These honey processing methods enhances the quality value of the honey products and other new products can be produced. • There is diversity in job creation hence increased income generation
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Beekeepers will readily adopt honey processing • Processing honey and other hive products must be done in safe and hygienic environments • Regulations on honey processing, packaging and storage are required • Honey trade require regulations, including aspects of quality, packages and storage conditions
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Pack house where equipment are housed • Equipment and tools • Stainless steel honey dripping tanks (50 l, 100 l) each about KES 150,000; • Three (3) set sieves of various sizes (KES 1,000/unit) • Stainless steel honey storage tanks (100- 200 l), KES 200,000 • Honey warmer, 20-50 l (KES 50,000/unit) • Stainless steel honey extractor 4-6 frames; KES 70,000 • Uncapping tray/tank, 40 l capacity- KES 20,000 • Uncapping comb/fork/knife, KES 1,000 • Food grade plastic honey buckets 20L, KES 2,000
Estimated returns	<ul style="list-style-type: none"> • Honey KES 1,000/kg of final product • Hired extraction at KES 70/kg • The processing plant can be used for extraction of honeys and rented out for extraction. • Durability: more than 20 years
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Honey processing is mostly done by women • Women may have less access to information and knowledge on the technology • Women may have less access to credit to purchase the required inputs • Women may have less access to extension services • Women's triple role may hinder them from attending training on honey processing
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services on the technology


	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced has increased by 45% in Mwingi, Kitui from 2008. This has increased honey sales and other hive products.
Application guidelines for users	Apiculture ToT training manual is available on the KALRO website
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	NBI, ICIPE, CBOs, Baraka college and private beekeepers

Gaps

1. Effects of centrifuging honey processing method on honey quality and keeping qualities
2. Commercialization opportunities for honey processing by centrifuging method

2.9.4 Honey press processing

2.9.4 TIMP name	Honey press processing
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low quality honey in the market due to poor processing methods • Inadequate ways of honey handling for food safety assurance

What is it? (TIMP description)	<p>This is the extraction of honey from combs by pressing combs using a honey press machine. The technology targets mainly honey processing from hives with no framed combs such as log hives, box hives and KTBH</p>  <p><i>Honey press.</i> <i>Source: M Jeptarus and J Mutai</i></p>
Justification	<p>Honey is a human food derived from nectar from flowers. It thus must be properly harvested and handled for it to be processed. The basic procedures of handling foods apply across honey processing systems. Proper honey processing leads to high quality products, resulting in diversification of its uses.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	honey processors, beekeepers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on honey quality • Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research: KALRO– to develop, validate and transfer the technologies and/or management practices • ICIPE – to develop, validate and transfer the technologies and/or management practices • KEBS - Quality assurance and standardization: • National Bee Institute (NBI) Extension services, validation, training and transfer • County government - to form linkages with farmers and technology dissemination
C: Current situation and future scaling up	


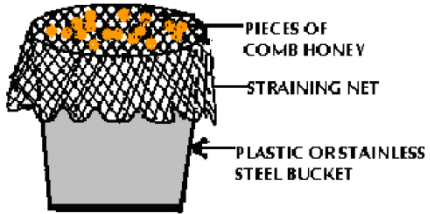
Counties where already promoted if any	Baringo, Kitui, Kakamega
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Traditional practices of harvesting and handling • Inadequate funding for capacity building • Limited access to credit facilities • Costly equipment
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Establish and support production and processing groups/cooperatives • Capacity building producers and processors • Link the bee keepers to credit facilities • Regulate honey processing and marketing • Enhance access and acquisition of appropriate equipment and structures
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • It is possible to capacity build beekeepers and honey processors • Improved honey processing adds value to the honey products and other new products can be produced. • There is diversity in job creation hence increased income generation
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Beekeepers will readily accept honey processing • Honey processing should be done under safe and hygienic conditions • Regulations on honey processing, packaging and storage are required • Honey trade require regulations, including aspects of quality, packages and storage conditions
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Equipment and tools • Stainless steel honey dripping tanks (50 l, 100 l) each about KES 150,000; or food grade plastic dripping tanks 50L KES 5,000/unit • Three (3) set sieves of various sizes (KES 3,000) • Stainless steel honey storage tanks (100- 200 l), KES 200,000 or food grade plastic storage tanks KES 10,000 • Honey warmer, 20-50 l (KES 10,000/unit) • Stainless steel Honey press 10-20 L capacity, KES 50,000
Estimated returns	<ul style="list-style-type: none"> • Honey KES 700/kg own source • Hired Processing cost at KES 70/kg • The equipment will be useful over 10 years and can process many kg of raw honey
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • The management technology may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey processing • Women may have less access to information and knowledge on the technology

	<ul style="list-style-type: none"> • Women may have limited access to credit to purchase the required inputs such as honey presser equipment • Women may have less access to extension services on the technology • Women may have less access to extension services on the technology • The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for women to process and package Propolis for sale
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for women to process and package Propolis for sale
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced has increased by 45% in Mwingi, Kitui from 2008. This has increased honey sales and other hive products.
Application guidelines for users	Beekeeping training manual available on KALRO website
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani

Gaps

1. Effects of pressing honey processing method on honey quality and keeping qualities
2. Commercialization opportunities for honey processing by honey press method

2.9.5 Honey processing by dripping

2.9.5 TIMP name	Honey processing by dripping
Category (i.e. technology, innovation or management practice)	innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Post-harvest losses due to low honey quality • Deterioration of honey due to impurities
What is it? (TIMP description)	<p>This technology is the extraction of honey from combs using a membrane for the purpose of collecting pure honey into a food grade bucket. Combs are broken into small pieces before placement on the membrane. The technology targets mainly honey processing from hives with no framed combs such as log hives, box hives and KTBH.</p> <div style="display: flex; align-items: center;">   </div> <p><i>Honey dripping</i> Source: Muo Kasina Source: Illustration by NBI</p>
Justification	<p>Honey is a human food derived from nectar from flowers. It thus must be properly harvested and handled for it to be processed. The basic procedures of handling foods apply across honey processing systems. Proper honey processing leads to high quality products, resulting in diversification of its uses.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Honey processors, beekeepers, researchers, extension service providers, regulators, trainers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to farmer extension models

	<ul style="list-style-type: none"> • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms–Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on honey quality • Funds for promotion
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research: KALRO– to develop, validate and transfer the technologies and/or management practices • ICIPE – to develop, validate and transfer the technologies and/or management practices • KEBS - quality assurance and standardization • NBI - Extension, validation, training and transfer • County government - form linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	All counties
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega and all other NAVCDP counties.
Challenges in dissemination	<ul style="list-style-type: none"> • Beekeepers holding onto their traditional practices • Inadequate funding for capacity building • Limited access to credit facilities • Gender bias toward facilitators
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Educate beekeepers to discard retrogressive cultural practices • Link beekeepers and honey processors to credit facilities • Establish and support processing groups/cooperatives • Enhance access and acquisition of appropriate equipment and structures • Ensure gender balance at the point of selecting and training facilitators
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • It is possible to capacity build beekeepers and honey processors • Improved honey processing, packaging and storage adds value to the honey products and other new products can be produced • There is diversity in job creation hence increased income generation
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Community involvement is required to have a technology buy-in • Conducive and clean environment for honey processing • Waste management after processing required • Supportive policy and regulation environment • Existing market demand for quality honey

D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<p>Equipment and tools</p> <ul style="list-style-type: none"> • Food grade plastic honey dripping tanks (50 l) each about KES 2,000 • Two (2) set sieves of various sizes (KES 2,000) • Food grade plastic storage tanks (100- 200 l), KES 2,000 • Local honey warming sufuria, 10-20L capacity (KES 2,000/unit) • Muslin cloth 2-metre fabric: KES 500 • Food grade plastic bucket, 40 l capacity- KES 1,000 • Uncapping knife, KES 200
Estimated returns	<ul style="list-style-type: none"> • Yield loss due to lack of dripping technology. KES 250 • 1 hive gives 10kg/harvest unprocessed • Total benefit per 1 hive per harvest KES 2,500
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Honey processing is mostly done by women • Women may have less access to information and knowledge on the innovation • Women who have limited access and control of resources such as credit to purchase the required tools for honey processing • Women may have less access to extension services • Women's triple role may hinder them from attending training on honey processing
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Employment creation for some VMGs in processing and sale of honey • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Apiculture ToT Manual available on the KALRO website
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling

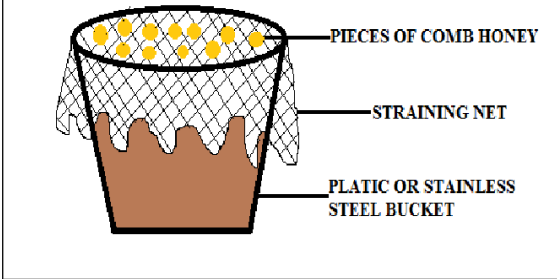
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Email: Director.Abiri@kalro.org
Lead organization and scientists	KALRO -ABIRI Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, International Centre for Insect Physiology and Ecology, Baraka College, Community Based Organizations, Beekeeping groups, and, beekeepers

Gaps

1. Effects of dripping honey processing method on honey quality and keeping qualities
2. Commercialization opportunities for honey processing by dripping method

2.9.6 Honey processing by Straining

2.9.6 TIMP name	Honey processing by Straining
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Poor quality honey • Increasing contamination levels which can cause food safety challenges
What is it? (TIMP description)	This is extraction of honey from combs by gravity. The honey is placed on a muslin cloth placed on top of a food grade bucket. This is done to an extent that most of the larger particles including comb, propolis and other debris normally found in honey are sieved out. Before the extraction, combs are broken into small pieces before straining them through the muslin cloth. This method of honey processing is appropriate when used honey from hives with no framed combs such as log hives, box hives and KTBH. It is suitable for beekeepers to add value to their honey and improve farmgate pricing.


	 <p><i>Simple Straining method for honey processing</i> <i>Source: NAFIS, (2016)</i></p>
Justification	Honey is a human food derived from nectar from flowers. It thus must be properly harvested and handled for it to be processed. The basic procedures of handling foods apply across honey processing systems. Proper honey processing leads to high quality products, resulting in diversification of its uses.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Honey processors, beekeepers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass Media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on honey quality • Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research: KALRO/ICIPE – to develop, validate and transfer the technologies and/or management practices • Regulators: KEBS • Extension: NBI, Extension- validation, training and transfer • County government linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	All parts of Kenya
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Beekeepers holding onto their traditional practices • Inadequate funding for capacity building

	<ul style="list-style-type: none"> • Limited access to credit facilities • Gender bias toward facilitators
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Educate beekeepers to discard retrogressive cultural practices • Link beekeepers and honey processors to credit facilities • Establish and support processing groups/cooperatives • Enhance access and acquisition of appropriate equipment and structures • Ensure gender balance at the point of selecting and training facilitators
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • It is possible to capacity build beekeepers and honey processors • Improved honey processing, packaging and storage adds value to the honey products and other new products can be produced. • There is diversity in job creation hence increased income generation
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Beekeepers will readily adopt straining as a method of honey processing • Straining should be undertaken under hygienic environmental conditions • Regulations on honey processing, packaging and storage are required • Honey trade require regulations, including aspects of quality, packages and storage conditions
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Equipment and tools • Food grade plastic honey settling tanks, each about KES 2,000; • Two (2) set muslin cloths of various sizes (KES 1,000) • food grade plastic storage tanks (100- 200 l), KES 2,000 • Local honey warming sufuria, 10-20L capacity (KES 2,000/unit) • Food grade plastic bucket, 40 l capacity- KES 1,000 • Uncapping knife, KES 200
Estimated returns	<ul style="list-style-type: none"> • Honey KES 700/kg own source • Hired Processing cost at KES 70/kg • The equipment will be useful over 10 years and can process many kilograms of raw honey
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Honey processing is mostly done by women • Women may have less access to information and knowledge on the innovation on honey processing • Women may have less access to production resources such as credit to purchase the required inputs on the technology • Women may have less access to extension services • Women's triple role may hinder them from attending training on honey processing

Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs lacks access to information on honey processing • VMGs have limited skills relating to honey processing • Due to their social status VMGs are often excluded from technology dissemination activities
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced has increased by 45% in Mwingi, Kitui from 2008. This has increased honey sales and other hive products.
Application guidelines for users	Apiculture ToT training manual available on the KALRO website
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Email: Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	NBI, ICIPE, Baraka college, SEKU, CBOs and private beekeepers

2.9.7 Honey Packaging



2.9.7 TIMP name	Honey Packaging
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low quality honey due to poor packaging methods • Low use of quality assurance and food as part of food safety assurance
What is it? (TIMP description)	This is the handling of the honey after processing. It involves placing honey in convenient jars and drums while ensuring product purity and safety. The packaging material must be food

	<p>safe, clean and light, with a design that allows convenience of use. Final user packages must be appealing as well.</p>  <p><i>Honey packaged in plastic jars.</i> <i>Source: D Toroitich</i></p>
Justification	<p>Honey is a human food of plant origin. It requires safe and hygienic packaging. Moreover, the packaging function should be available, affordable and socially acceptable. Packaging must protect the product from contamination and deterioration. It should also support marketing by appealing to the target customer.</p> <p>Packaging of honey also helps in standardization of quantities-availed for sale.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Honey processors, beekeepers, extension service providers, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on honey packaging • Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research: KALRO – to develop, validate and transfer the technologies and/or management practices • ICIPE – to develop, validate and transfer the technologies and/or management practices • KEBS - Quality assurance and standardization • NBI, - Extension, validation, training and transfer

	<ul style="list-style-type: none"> County government - to form linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	All parts of Kenya
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Unwillingness to discard traditional practices Lack of packaging materials in local markets Inadequate funding for capacity building Limited access to credit facilities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Educate honey producers and processors to discard retrogressive practices Make provisions for the supply of packaging materials Capacity building processors Establish and support processing groups/cooperatives Regulate honey packaging Enhance access and acquisition of appropriate equipment and structures
Lessons learned in up scaling if any	<ul style="list-style-type: none"> It is possible to capacity build beekeepers and honey processors Improved packaging adds value to the honey products and therefore incomes to beekeepers There is diversity in job creation hence increased income generation
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> Beekeepers will accept to process and package honey packaging of processed honey must be done in hygienic environments to minimize risk of contamination Regulations on packaging and storage are required Honey trade require regulations, including aspects of quality, packages and storage conditions
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Equipment and tools Food grade plastic honey jars with sealable lids 1kg capacity at KES. 45.00 each, 20 pcs per hive KES. = KES. 900/= A honey packaging equipment KES. 300,000 A settling tank with a honey gate maybe used to facilitate manual packaging Food grade plastic honey jars with sealable lid 500g 100pcs at KES. 30 each
Estimated returns	<ul style="list-style-type: none"> Honey KES 700/kg own source Hired Packaging cost at KES 20/kg The equipment will be useful over 10 years and can process many kilograms of raw honey

Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on honey processing • Women and youth have less access to production resources such as credit to purchase the required inputs • Women may have less access to extension services on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for women and youth in packaging honey for sale
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced has increased by 45% in Mwingi, Kitui from 2008. This is as a result of packaging the product after harvesting, This has increased honey sales and other hive products.
Application guidelines for users	<ol style="list-style-type: none"> 1. Apiculture ToT training manual available on the KALRO website 2. Packaging equipment user operation manual
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Email: Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani
Partner organizations	NBI, ICIPE, SEKU, CBOs and Private Beekeepers

2.9.8 Honey Storage

2.9.8 TIMP name	Honey Storage
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Honey quality assurance and food safety assurance • Contamination, adulteration and deterioration are some of the issues that may happen with improper storage
What is it? (TIMP description)	<p>This is the preservation of honey after processing until it is required for bulk breaking or consumption. It involves placing honey in convenient jars and drums while ensuring product purity and safety. The packaging material must be air-tight, food safe and oxidation stable, either made of glass, food grade plastic or stainless steel. The choice of material is determined by the cost, the volume and the method of handling of the cargo. The containers must be kept under room temperature away from risks of contamination.</p>  <p><i>Food grade honey storage plastic drum.</i> <i>Source: National Bee institute (NBI)</i></p>  <p><i>Wooden barrels for honey storage</i> <i>Source: National Bee institute</i></p>


Justification	<p>Honey is a human food of plant origin. It requires safe and hygienic storage. Moreover, the storage function should be available, affordable and socially acceptable. Storage vessels must protect the product from spillage, contamination and deterioration. It should also support marketing by appealing to the target customer.</p> <p>Preservation of honey in terms of physical, nutritional and chemical aspects is very important during storage.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, honey cooperatives, honey traders/exporters, honey aggregators, honey processors, honey re-packers, transporters and extension service providers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on honey storage • Development partners • Manufacturers of honey storage equipment
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO– to develop, validate and transfer the technologies and/or management practices • ICIPE – to develop, validate and transfer the technologies and/or management practices • KEBS - Quality assurance and standardization • NBI - Extension, validation, training and transfer • County government - to form linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi, Mombasa, Nakuru
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya and Kakamega counties
Challenges in dissemination	<ul style="list-style-type: none"> • Traditional honey storage practices • Availability of food safe storage facilities in local markets • Inadequate funding for capacity building • Limited access to credit facilities

Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Educate honey processors to discard retrogressive practices • Establish and support groups/cooperatives • Regulate honey packing and storage • Capacity building processors • Enhance access and acquisition of appropriate equipment and structures
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Improved storage maintains the quality of honey and ensures good market prices. When beekeepers earn more, they produce more,
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Honey producers and processors will readily adopt appropriate honey storage methods • Storage of honey must be done under suitable conditions to minimize spoilage • Regulations on honey storage are required • Honey trade require regulations, including aspects of storage conditions
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<p>Equipment and tools</p> <ul style="list-style-type: none"> • Initial cost on honey storage barrel plastic/ wooden/ stainless steel 100 litre (150kg) capacity KES. 10,000 • Honey storage area with right conditions KES. 3,000 per sq. metre annually
Estimated returns	<ul style="list-style-type: none"> • Honey stored 150kg, value KES. 105,000 • With improper storage, 30% may be lost to KES. 31,500. This amount is salvaged.
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have limited honey storage skills due to inadequate education and training • Women may have less access to information and knowledge on the innovation • Women and youths may have less access to production resources such as credit to purchase the required inputs for storage • Women may have less access to extension services
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for women and youths in honey storage
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services on the innovation • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances

E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced has increased by 45% in Mwingi, Kitui from 2008. This is as a result of packaging the product after harvesting, this has increased honey sales and other hive products.
Application guidelines for users	<ol style="list-style-type: none"> 1. Apiculture ToT training manual available on the KALRO website 2. Packaging equipment user operation manual
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa
Partner organizations	National Beekeeping Station, Egerton University, International Centre for Insect Ecology and Physiology, Baraka college, South Eastern Kenya University, Common interest Groups and private beekeepers

2.9.9 Honey Transportation

2.9.9. TIMP name	Honey Transportation
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Honey is produced in ASAL areas with limited facilities for transportation. • Contamination, adulteration and deterioration are some of the issues that may happen with improper transportation
What is it? (TIMP description)	This is the movement of honey from where it is produced to the bulking points, processing points and finally to the market where the consumers procure it from. It is advisable to use of transportation media that provide the right conditions for safe transportation of honey. It also involves appropriate packaging and storage so that it retains the original quality from the point of production to the place utility.

	 <p>A typical cargo truck for honey transportation. Source: Vector Stock®</p>
Justification	<p>Honey is a human food of plant origin. It requires safe and hygienic transportation. Moreover, the function should be available, affordable and socially acceptable. The method and medium of transportation must ensure that temperatures remain at room temperature or below. Dust must be kept away. The product must be safe from adulteration, contamination and deterioration. Notably, high temperatures will lead to an increase in HMF (5-Hydroxymethyl) Furfural} which indicates reduced quality. The vehicle must be prepared one day before moving honey. Any toxic residues must be totally eliminated. Strong smells and perfumes must be eliminated too. A canvas cover, if the vehicle has no closed body, should be used. During transit, the vehicle must when have needed, be parked under a shade. A cold van may be required in extreme weather conditions to regulate temperatures without freezing the honey.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Beekeepers, honey cooperatives, honey traders/exporters, honey aggregators, honey processors, honey re-packers, transporters and extension service providers, agri-preneurs</p>
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer extension models • Mass media – Electronic and Print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message service
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on honey storage • Development partners • Manufacturers of honey storage equipment


Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – to develop, validate and transfer the technologies and/or management practices • ICIPE – to develop, validate and transfer the technologies and/or management practices • Kenya Bureau of Standards - Quality assurance and standardization • National Beekeeping Institute - Extension, validation, training and transfer • County government -to form linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi, Mombasa, Nakuru
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Traditional honey transportation practices • Unavailability of food safe transport facilities in local markets • Inadequate funding for capacity building • Limited access to credit facilities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Create awareness on the available modern honey transportation methods • Mobilize and lobby private companies to invest in food safe transportation • Establish and support groups/cooperatives • Regulate honey transportation • Capacity building transporters • Enhance access and acquisition of appropriate equipment and structures
Lessons learned in up scaling if any	Improved transportation of honey helps maintain the quality of honey and ensure access to markets for good prices. When beekeepers earn more, they produce more
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Honey producers and processors to adopt modern transportation methods • Transport honey in environments that are safe and hygienic • Regulations on honey transportation are required • Ensure honey is transported properly to reach the market when wholesome
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Equipment and tools • Cost of transport KES. 3 to 5 per kilogram per kilometer, depending on scale
Estimated returns	Transportation provides place utility, availing the product where it is required. It is not possible to sell without

	transportation. Value of the product may increase by up to 40%.
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women who have limited access and control of resources such as finances to purchase equipment for honey transportation • Women may have less access to information and knowledge on the management practice • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youth males in honey transportation • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Due to their social status VMGs are often excluded from decision making in development and dissemination of technologies • VMGs may have less access to information and knowledge on the management practice • VMGs may have less access to production resources such as land, capital and labour • VMGs may have less access to training and extension services, which can lead to a knowledge gap in the management practice
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youth males in in honey transportation • Affirmative action and hustler funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The volume of honey produced has increased by 45% in Mwingi, Kitui from 2008. This is as a result of transportation to Nairobi and Mombasa. This has increased honey sales and other hive products.
Application guidelines for users	<ol style="list-style-type: none"> 1. Apiculture ToT training manual available on the KALRO website 2. Transportation equipment user operation manual
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org

Lead organization and scientists	KALRO -ABIRI
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, Egerton University, Insect Physiology and Ecology , Baraka college, South Eastern Kenya University, Community Based Organizations and private beekeepers

2.10 Value Addition

2.10.1 Pollen harvesting and identification



2.10.1 TIMP name	Pollen harvesting and identification
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low yields of hive and hive products • Low product diversification from hive and hive products due to lack of awareness of identification of pollen • Low availability of locally produced natural hive products in the market.
What is it? (TIMP description)	<p>Pollen harvesting and identification is the process of harvesting pollen from the hive and identifying its content. It involves the safe extraction of the pollen bread and transferring it to dry containers for transportation. A composite sample is then taken for identification of the pollen spectrum for each harvest and hive. Major plant species identified by pollen are recorded and kept safely for reference during packaging and characterization. Bee pollen harvesting and consumption is a new opportunity for natural organic human health products. Bee pollen contains many vitamins, minerals and antioxidants, making it incredibly healthy. Studies have linked bee pollen and its compounds to health benefits such as decreased inflammation, improved immunity, menopausal symptoms and wound healing.</p> <div>  </div> <p><i>Pollen grains under the microscope, photo by R. N. Kinyanjui, and pollen bread</i> (https://www.honeybeesuite.com/what-happens-when-bees-make-pollen-into-magic-bee-bread/)</p>

Justification	Pollen is a highly nutritional and medicinal bee product. Pollen composition and diversity vary between agro-ecologies and seasons. It is therefore critical to identify the plant species that constitute the pollen bread before it reaches the market. Commercial pollen harvesting is a new trading opportunity in the country, even though constrained by lack of knowledge and capacity for harvesting and identification of pollen. Moreover, with the increased preference for organic products for boosting the immune system, the demand for pollen in the market in the country is expected to rapidly increase.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, processors, consumers, farmer groups, Entrepreneurs in apiculture, extension service providers, agripreneurs and NGOs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Availability of bee pollen bread whose pollen is identified • Steady supply of pollen and other raw materials • Consumer market availability
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - develop and promote the technology • Training/extension institutions - promote the technology • County governments extension workers - Training farmers on the application of the technology and farmer linkages with other stakeholders • Government of Kenya- create enabling environment to catalyze utilization of the technology for the growth of the hive industry
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited pollen harvesting across the country • Limited skills and capacity to identify and classify pollen

	<ul style="list-style-type: none"> Limited pollen supply with high consumer market demand due to the high medicinal and nutritional value of the pollen Limited extension services
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Train personnel from among local communities for dissemination activities Improved extension services to promote pollen harvesting and identification Train more people on pollen harvesting and analyses for identification
Lessons learned in up scaling if any	None
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> The product is environmentally friendly and fits within the government policies on the use of natural products The product is socially acceptable across cultural and religious groups Pollen harvesting and identification is associated with the conservation of the environment, ecosystems and improved human health
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Harvested pollen per hive @ KES 50/Pollen trap per hive Packing containers @ KES 2.5 Pollen identification cost @ KES 250/sample Total cost=402.5
Estimated returns	<ul style="list-style-type: none"> Harvest from 1 hive =120g, packaged in 20gms sold @ 300 Total revenue= KES 1800. Net income=KES 1397.5
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Limited access to product information for either gender Limited access to credit facilities may disadvantage women and youth in establishing beeswax cream processing unit Common challenges in establishing business by either gender
Gender related opportunities	<ul style="list-style-type: none"> Availability of government grant opportunities gives women an advantage in establishing the business Employment for women and youth from the sale of pollen bread Improved health for both genders and VMG
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Limited access to agricultural information and extension services VMGs have limited skills due to limited mobility and exposure
VMG related opportunities	<ul style="list-style-type: none"> Availability of government grant opportunities give VMGs advantage to establish the business

E: Case studies/profiles of success stories	
Success stories from similar previous projects	None
Application guidelines for users	KALRO Apiculture ToT Training manual
F: Status of TIMP readiness	Ready for upscaling
G. Contacts	
Contacts	Institute Director Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani, Rahab Kinyanjui
Partner organizations	National Museums of Kenya, Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Beekeeping Institute, Common Interest Groups

2.10.2 Pollen packaging and storage

2.10.2 TIMP name	Pollen packaging and storage
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low quality of pollen in the market • Loss of produce due to low keeping qualities of pollen for market needs.
What is it? (TIMP description)	<p>It is the preparation, packaging and storage of pollen. This process involves the handling of pollen after harvesting and identification. The pollen is packaged in dry and safe glass jars/tablets, which are clearly labelled. On the label, the region from which the pollen is harvested is indicated and the major pollen species identified. Since it has a short shelf life, dates of harvesting and packaging are included. Pollen is then stored in a cool and dry place ideal for a longer shelf life</p> <div>   </div> <p>life <i>Pollen bread.</i></p>

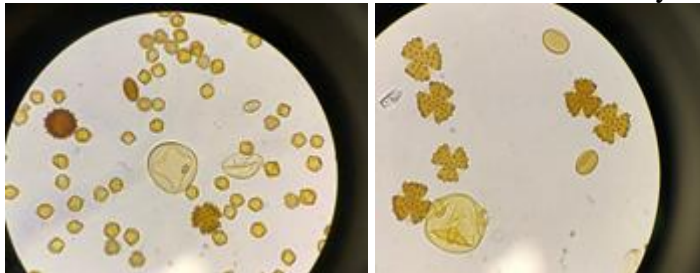
	Source: https://sweetdrop.eu/wp-content/uploads/2014/08/bee_bread_stik_pak8-1200x800.jpg
Justification	Contamination and contact of pollen with water that can lead to fermentation and loss of quality. Pollen is for human consumption and therefore requires safe handling. Proper pollen handling ensures medicinal and nutritional value is preserved resulting in consumer trust of the hive products.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Honey processors, beekeepers, researchers, farmer groups, Entrepreneurs in apiculture, extension service providers, agripreneurs and NGOs.
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Regulations on pollen quality • Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research: KALRO – to develop, validate and transfer the technologies and/or management practices • NMK – to develop, validate and transfer the technologies and/or management practices • KEBS - Quality assurance and standardization • NBI - Extension, validation, training and transfer • County government - to form linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makeni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of support processing groups • There are no structures for honey processing and marketing • Processors have limited knowledge • Inappropriate equipment and structures
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Establish and support processing groups/cooperatives • Regulate honey processing and marketing • Capacity building processors

	<ul style="list-style-type: none"> • Enhance access and acquisition of appropriate equipment and structures
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • It is possible to capacity build beekeepers and bee product processors • Improved pollen handling and packaging adds value to the bee products especially honey products produced. • There is diversity in job creation hence increased income generation
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Pollen packaging and storage will be acceptable • Pollen packaging and storage will not negatively affect the environment • Regulations on pollen packaging and storage are required • Pollen trade require regulations, including aspects of quality, packaging and storage conditions
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<p>Equipment and tools</p> <ul style="list-style-type: none"> • Glass jars and or tablets (50g, 100g) to package the pollen each about KES 1000.00. • Stainless steel container (1kg) for storage of pollen before it is packaged each about KES 5,000.00 • Labels each roll @ KES 1000.00
Estimated returns	<ul style="list-style-type: none"> • Pollen KES 1000/100gms own source • The storage equipment will be useful over 10 years and can process many kg of harvested pollen.
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural factors that may hinder women from pollen packaging • Limited access to credit facilities for women and youth to acquire appropriate equipment and structures • Women have less access to information, technology and knowledge on pollen packaging and storage. • Availability of the equipment at local markets
Gender related opportunities	<ul style="list-style-type: none"> • Improved marketability of pollen leading to increased income and improved livelihood for women and youth • Business opportunities for women and youth from sale of well packaged pollen • Employment creation for women and youth in packaging, storage and sale of pollen • Enhanced access and acquisition of appropriate pollen packaging and storage equipment and structures
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs lack access to information on pollen packaging and storage • VMGs have limited skills relating to pollen handling activities • Due to their social status VMGs are often excluded from technology dissemination activities • VMGs have limited access to credit facilities

VMG related opportunities	<ul style="list-style-type: none"> Affirmative action, capacity building and practical support to be provided to VMGs Employment creation for VMGs in packaging, storage and sale of pollen Enhance access and acquisition of appropriate pollen packaging and storage equipment.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers in Baringo County have been harvesting and selling bee pollen
Application guidelines for users	KALRO ToT Beekeeping training manual
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, and Caroline Kimani
	National Museums of Kenya Rahab Kinyanjui
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Beekeeping Institute

2.10.3 Honey Characterization

2.10.3 TIMP name	Honey Characterization
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Loss of honey sales due to inadequate demand for honey products arising from allergies. Loss of premium price and hence income due to limited consumer preference for honey products as a result of non-identification of pollen from certain plant species.


What is it? (TIMP description)	<p>This is the identification of plant species from which the pollen has been collected by the bees. Honey is a sweet sticky substance made by bees from nectar collected from plants and is mainly used as human food. Honey contains pollen, which may cause severe allergies in humans. Such allergies are person-specific. It is therefore important to characterize honey so that each individual can easily identify honeys that are safe for him or her. Honey is then named according to the nectar type making up the greatest proportion, e.g., Acacia honey. Some honey may contain a high/low diverse pollen spectrum, this aspect is more often used to characterize the medicinal/nutritious value of honey.</p>  <p><i>micro-photographs of pollen grains of different plant species identified in honey.</i> Source: R.N. Kinyanjui</p>
Justification	<p>There is a need for the beekeepers and the consumers to know the plant species from which the honey is made. This will help the beekeeper to understand consumer preference for honey variants. Honey characterization assists consumers in selecting honey that will not cause allergic reactions and helps the beekeeper produce and present unique honey lines based on the main plant species. Beekeepers keep a record of honey variation between seasons and therefore they can predict the kind of honey harvested in any given season. They can also identify the most preferred plant species in any given season and as such the beekeeper can deliberately avail the species.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Processors, researchers, beekeepers, farmer groups, Entrepreneurs in apiculture, extension service providers, agri-preneurs and NGOs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms -Wenssite, Dashboards, APPs, Social media, short message services

Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Consistent identification of pollen content • Consistent inclusion of the main species on the label
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - develop and promote the Innovation • Training/extension institutions - promote the Innovation • County governments extension workers for farmer linkages and training • Government of Kenya- catalyze the growth of the industry
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited funding to undertake laboratory analysis • Low awareness levels • Lack of extension services on pollen identification • Lack of policies on pollen harveting
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Proposals to raise funds to cater for lab analyses • Increased awareness through social media and on-farm demonstrations • Improved extension services to promote pollen Identification • Training workshops for pollen identification • Policies to promote collaborations and partnerships
Lessons learned in upscaling if any	Consumers have specific preferences in honey consumption
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • The practice will be socially acceptable • The knowledge will contribute positively to the conservation and sustainable use of the identified major plant species • The knowledge will help the consumer to make informed choices when consuming honey and enhance health and safe consumption of honey. • Market linkages is key in terms of honey preferences
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Basic laboratory consumables and chemicals used for analyses Ksh 12,000/ • Microscopy analyses costs 5,000/
Estimated returns	<ul style="list-style-type: none"> • 1kg honey sold @ksh 700/
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to information and knowledge on the innovation • Women have less access to production resources such as land, credit, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the innovation

Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for learned youths in implementing this innovation in the laboratory • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for learned youths in implementing the innovation • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
Success stories from similar previous projects	None
Application guidelines for users	KALRO Apiculture ToT Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO, Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.10.4 Propolis harvesting, processing and packaging

2.10.4 TIMP name	Propolis harvesting, processing and packaging
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Loss of propolis yield due to loss of product from poor post-harvest handling.


<p>What is it? (TIMP description)</p>	<p>Thus is the gathering, post harvest handling and packaging of propolis. The Technology is intended to guide the beekeepers on how to harvest, process and package the propolis product. Propolis is formed from plant resins gathered by bees to build a protection barrier in the hives against bacteria, fungi and viruses. Harvesting should therefore be sustainable to ensure the hive is not exposed to risks. This is done by scraping off excess propolis or use of propolis collectors from the top bars/frames.</p> <p>Processing and packaging of propolis should be in consultation with registered competent authority. Propolis is stored in clean, safe and dry containers away from sunlight.</p>  <p>Packed propolis. Source: Jonah Kinyanjui</p>
<p>Justification</p>	<p>Loss of propolis yield due to loss of product from poor post-harvest handling is a challenge to optimization of hive products. Propolis has beneficial health properties owing to the phenolic compounds. It is antimicrobial, anti-inflammatory and has wound healing properties. Considering these medicinal properties and it being a natural product, the demand in the market creates an opportunity for expanding bee keeping production enterprise and employment creation through the value-added products.</p> <p>There is need for natural remedies in the market, propolis is one of the bee products that have successfully been used as a healing product, especially on wounds and skin-related ailments. It is user friendly and its wide use indirectly promotes the conservation of the bee rearing environments.</p>
<p>B: Assessment of dissemination and scaling up/out approaches</p>	
<p>Users of TIMP</p>	<ul style="list-style-type: none"> • Beekeepers • Processors • Training and research institutions
<p>Approaches to be used in dissemination</p>	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals

	<ul style="list-style-type: none"> Digital Platforms-Website, Dashboards, APPs, social media, short message
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Steady supply of propolis Market access
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO - develop and promote the technology Training/extension institutions - promote the technology County governments extension workers for farmer linkages and training Government of Kenya- catalyze growth of the industry
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Kakamega, Nairobi, Nakuru, Baringo
Counties where TIMP will be up scaled	All beekeeping counties, including Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Inadequate extension services Lack of appropriate policies
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Improved extension services to promote propolis harvesting and processing Policies to promote partnerships
Lessons learned in up scaling if any	<ul style="list-style-type: none"> There is low trade volume for propolis products Propolis is available in the market and its demand is increasing
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> The product is socially acceptable across cultural and religious groups The product is environmentally friendly and fits within the government policies on use of natural products Propolis business is associated with conservation of environment and ecosystems across the country
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Propolis @ KES 1,500/kg Clear grain alcohol for mixing @KES 1000/litre, Packaging containers (@ KES 300/pc; Labels @ KES 30/unit;
Estimated returns	1 kg propolis will be packed in 10 (100g) containers, each selling at KES 500/piece.
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Women have less access to information and knowledge on the technology Women have limited access to credit to purchase the required inputs such as processing and packaging equipment Women have less access to extension services on the technology Women have less access to extension services
Gender related opportunities	<ul style="list-style-type: none"> Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances Employment opportunities exist for women to process and package Propolis for sale

VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for women to process and package Propolis for sale
E: Case studies/profiles of success stories	
Success stories from similar previous projects	Beekeeping processors have adopted this innovation in Makueni, Baringo, and Kitui Counties (KAMAKI Farmers' Cooperative) have generated income for their families
Application guidelines for users	KALRO Apiculture ToT Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3- requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO, Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.10.5 Beeswax Candle

2.10.5 TIMP name	Beeswax Candle
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low uptake of organic natural hive products
What is it? (TIMP description)	Beeswax candle is a product made of processed natural beeswax plus a cotton wick. Beeswax is a creamy-coloured natural hive product which is used by bees to build the comb and forms the structure of their nest. The combs are used to store honey and pollen as well as for development of the brood to adult bee.

	 <p><i>Beeswax candles</i> Source: M Jeptarus and J Mutai</p>
Justification	<p>The advent of synthetic products has resulted in low market access for natural hive products. Beeswax provides an opportunity for expanding beekeeping production enterprise and employment creation through the value added products. Beeswax candles being natural products have niche markets and have impact on the beekeepers' incomes through selling of beeswax. Honeybee products are organic and their consumption in the market directly promotes conservation and sustainable use of natural resources and land-use practices.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> • Processors • Training and research institutions • Input suppliers • Beekeepers • Agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Steady supply of beeswax • Availability of cotton strings • Market access
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - develop and promote the technology • Training/extension institutions - promote the technology • County governments - extension workers for farmer linkages and training • Government of Kenya- catalyze growth of the industry
C: Current situation and future scaling up	
Counties where already promoted if any	<p>Makueni, Kitui, Kakamega, Nairobi, Nakuru, Baringo and others</p>

Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited supply of raw material • Low consumer market due to competing synthetic products • Limited extension services
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on-farm demonstrations • Improved extension services to promote wax processing • Policies to promote partnerships
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • There is low trade volume for beeswax products • Beeswax candles are available in the market with diversified product outlook
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • The product is environmentally friendly and fits within the government policies on use of natural products • The product is socially acceptable across cultural and religious groups • Beeswax candle business is associated with conservation of environment and ecosystems
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • The products below can be used to make many candles: • Beeswax @ KES 1,100/kg, • Edible oil for lubrication @KES 800/litre, • Candle wick (@ KES 350/roll; • Candle moulds @ KES 30/unit; • Source of heat e.g. 6 kg gas cylinder @ 6,000/unit; • Wax warmer (e.g. sufuria) @ 2,000/unit
Estimated returns	<ul style="list-style-type: none"> • 1kg beeswax will make 10 (100g) candles each selling at KES 50/piece. Many candles can be produced at very low cost
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Limited access to product information for either gender • Limited access to credit facilities may disadvantage women and youth to establish beeswax candle processing unit • Common challenges in establishing business by either gender
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to information and knowledge on the innovation • Women have limited access to and control of resources such as credit to purchase the required tools for honey processing • Women have less access to extension services • Women's triple roles may hinder them from attending training on beeswax processing
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youths in making and sale of beeswax candles • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances

VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
E: Case studies/profiles of success stories	
Success stories from similar previous projects	Honey processors have adopted this innovation in Makueni, Baringo and Kitui Counties and have generated income for their families
Application guidelines for users	<ol style="list-style-type: none"> 1. KALRO Apiculture ToT Training Manual 2. Carrol, T. (2006) A beginners guide to beekeeping in Kenya. https://infonet-biovision.org/sites/default/files/pdf/beginners_guide_to_beekeeping_kenya.pdf 3. GoK (2023) Making money from bees, honey. https://kilimo.go.ke/wp-content/uploads/2023/03/Beekeeping-making-money-from-bees.pdf
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO, Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani,
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.10.6 Bee venom harvesting, processing and packaging

2.10.6 TIMP name	Bee venom harvesting, processing and packaging
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Inadequate supply of bee venom to satisfy market demand
What is it? (TIMP description)	This is the process of harvesting, processing and packaging bee venom. There are various ways of harvesting venom from worker

	bees. A market available equipment uses low voltage electrical stimulation, which causes the bee to release venom.
Justification	Bee keeping activity is increasingly expanding across the country. This comes with increased risks for bee attack. There are many reported cases related to bees' attack on people, causing them harm and sometimes death. This is due to bee venom released by the bee to the victim through stinging. Harvesting bee venom is critical to develop bee anti-venom for treatment when one is attacked by bees.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> • Beekeeper • Processors • Training and research institutions • Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms – Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Steady supply of bee venom • Market access
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - develop and promote the technology • Training/extension institutions - promote the technology • County governments extension workers for farmer linkages and training • Government of Kenya- catalyze growth of the industry
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Kakamega, Nairobi, Nakuru, Baringo
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Low awareness levels • Inadequate extension services • Lack of appropriate policies
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Improved extension services to promote bee venom harvesting and processing • Policies to promote partnerships

Lessons learned in up scaling if any	<ul style="list-style-type: none"> • There is low trade volume for bee venom • Bee venom is available in the market and its demand is increasing. • Bee venom is costly
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • The product is socially acceptable across cultures and religious groups • The product is environmentally friendly and fits within the government policies on use of natural products • Bee venom harvesting does not compromise the wellbeing and welfare of bees • Bee venom business is associated with conservation of environment and ecosystems across the country and promoting healthy lifestyles in the society
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Bee venom@ KES 8,000/1g Bee venom collection apparatus @KES 15000/apparatus Bee venom storage bottles (@ KES 500/pc; Labels @ KES 30/unit;
Estimated returns	1 kg bee venom will be packed in 1000 (1g) containers, each selling at KES 8000/piece
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Bee venom harvesting is mostly done by men • Women have less access to information and knowledge on the management practice • Women may have limited access resources such as credit to purchase the required ingredients • Women have less access to extension services • The practice of harvesting bee venom may not be adopted if it increases the work drudgery for women who are already overburdened
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances • Business opportunities exist for men and male youth in Bee venom harvesting, packaging and selling
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Business opportunities exist for male youth in Bee venom harvesting • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from similar previous projects	<ul style="list-style-type: none"> • Beekeeping processors have adopted this technology in Makueni, Baringo and Kitui Counties and have generated income for their families

Application guidelines for users	KALRO Apiculture ToT Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute



2.10.7 Royal Jelly harvesting, processing and packaging

2.10.7 TIMP name	Royal Jelly harvesting, processing and packaging
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Increasing market demand for royal jelly which does not match production
What is it? (TIMP description)	This is a guide on royal jelly harvesting, processing and packaging. Royal jelly is harvested from the queen's cells using a stainless royal jelly scraping bar. The royal jelly is transferred to a clean and safe bottle for storage.
Justification	Natural and organic products have gained increased popularity as remedial and health products. Royal Jelly has high medicinal and health benefits and is being administered as an omega health supplement. It is consumed as alpha foods and as a health supplement for both men and women. Royal jelly is also used popularly by women to ease premenstrual and post-menopausal challenges related to reproduction. It is also thought to increase the quality of sperm in men. The continued demand and use of organic bee products in the market contribute to the expansion of bee keeping industry, which is a healthy and less destructive agricultural practice that helps in the conservation of natural habitats and ecosystems.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> • Beekeepers

	<ul style="list-style-type: none"> Processors Training and research institutions Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital Platforms-Website, Dashboards, APPs, Social media and short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Steady supply of royal jelly Market access
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO - develop and promote the technology Training/extension institutions - promote the technology County governments - extension workers for farmer linkages and training Government of Kenya - catalyze growth of the industry
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Kakamega, Nairobi, Nakuru, and Baringo.
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Limited supply of raw material Low capacity for proper handling of the royal jelly Limited extension services Social and status barriers classify royal jelly as foods/supplements for the rich and wealthy
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Increased awareness through social media and on farm demonstrations Improved extension services to promote royal jelly harvesting and processing Policies to promote partnerships
Lessons learned in up scaling if any	<ul style="list-style-type: none"> There is low trade volume for royal jelly Royal jelly is available in the market and its demand is increasing
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> The product is socially acceptable across cultures and religious groups The product is environmentally friendly Does not contravene the welfare and wellbeing of bees Royal jelly business is associated with conservation of environment and ecosystems across the country and promoting health lifestyles in the society
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	

Basic costs	<ul style="list-style-type: none"> Royal Jelly@ KES 42,000/1kg Stainless steel royal jelly scraping bar @KES 5000/bar Royal jelly storage bottles (@ KES 500/pc; Labels @ KES 30/unit;
Estimated returns	1 kg royal will be packed in 10 (100g) bottles, each selling at KES 5000/bottle.
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Women have less access to information and knowledge on the technology Women may have limited access to resources such as credit to purchase the required ingredients Women have less access to extension services The technology may not be adopted if it increases the work drudgery for women who are already overburdened
Gender related opportunities	<ul style="list-style-type: none"> Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> VMGs have limited access to education, training and extension services Due to their social status VMGs are often excluded from decision making in development and dissemination activities There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> Business opportunities exist for women and female youth in royal jelly processing Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from similar previous projects	<ul style="list-style-type: none"> Beekeeping processors have adopted this innovation in Makueni, Baringo and Kitui Counties and have generated income for their families
Application guidelines for users	<ul style="list-style-type: none"> KALRO Apiculture ToT Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.10.8 Processing and packaging comb honey

2.10.8 TIMP name	Processing and packaging comb honey
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Increased and unmet market demand for comb honey
What is it? (TIMP description)	<p>This is a guide on the preparation of comb honey for the market. Comb honey can be prepared into the required shapes and sizes right from the hive by use of innovative comb-honey frames. These allow the beekeeper to package the honey without cutting or shaping the comb</p> <p>Comb honey can also be carefully cut from fully capped honeycombs into the right shapes and sizes to suit the packaging material. The packaging should be of clear glass or plastic, to allow the product to be viewed without opening the jar.</p> <p>Comb honey must be stored at or below room temperature to avoid leaking of honey from the comb. Handling must be gentle.</p>  <p>Comb honey presented in glass-lidded stainless steel pans</p>  <p>Comb honey in rectangular packages</p> <p>Source: Jonah Kinyanjui</p>
Justification	<p>Honey is organic food from plant origin containing high calorie levels. It has medicinal and health properties derived from its constituents- Amino Acids, Phenolic compounds and vitamins</p> <p>Comb honey is a highly marketable product due to the following reasons:</p> <ul style="list-style-type: none"> • It assures the consumer that it is unaltered and unadulterated • It fetches a price 50% better than refined honey • It is easier to make, involving fewer activities, since it doesn't undergo normal processing.

B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, honey processors, input suppliers, extension services, Academicians, traders, researchers, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital platforms-websit, dashboard, APPS, social media, short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Awareness creation Promotion of comb honey Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO – to develop, validate and transfer the technologies and/or management practices ICIPE – to develop, validate and transfer the technologies and/or management practices KEBS - quality assurance and standardization NBI -Extension, validation, training and transfer County government - to form linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi, Nakuru, and Baringo
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Pre-mature harvesting of honey Inadequate knowledge and skills Inadequate funding for capacity building Limited access to credit facilities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Establish and support processing groups/cooperatives Variety of honey variants availed to consumers Enhance access to financing and credits
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Comb honey is a high quality product, which preserves all the amino acids, phenolic compounds, enzymes and vitamins as it is not processed or warmed. Beekeepers earn 100% more by selling comb honey than when they process it. While a kilo of processed honey sells at KES. 700/-, a kilo of comb honey sells at KES. 1,500/-. Demand for comb honey is always far much higher than supply

Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Pakaging honey combs will be socially acceptable • This practice does not affect the environment • Regulations on making honey products is required. • Regulations on trading with honey products is required
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Ingredients and tools • Comb honey hive frames • Comb honey packaging material • Knife
Estimated returns	<ul style="list-style-type: none"> • A kilo of comb honey sells at KES1,500, which is an additional income of KES. 800/- per kilo of honey, due to sale as comb honey
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the innovation • Women may have less access to production resources such as land and credit • Women may have less access to extension services
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Beekeeping training manual
F: Status of TIMP readiness (1ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
	KALRO

Lead organization and scientists	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	National Beekeeping Institute, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences


2.10.9 Beeswax harvesting and processing procedure

2.10.9 TIMP name	Beeswax harvesting and processing procedure
Category (i.e. technology, innovation or management practice)	Management Practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Increasing and unmet demand for beeswax in Health and cosmetics industry Low quality of beeswax supplied in the market
What is it? (TIMP description)	This is a guide on how to harvest and process the Beeswax. The Beeswax is harvested during honey harvesting process. Beeswax is a product processed from combs after extracting honey.
Justification	<p>Beeswax is a natural wax produced by the honeybees; it is the main constituents of the bee honeycomb. It is a major raw material for industries dealing with beeswax candles, shoe-, furniture-, and floor polish, modelling, cosmetics.</p> <p>Its extensive and intensive use creates a large market hence creating job opportunities for the beekeepers and those working in the industries. Production of beeswax is environmentally friendly, making it a safe economic activity. It can be accessed by all people regardless of age or gender. Essential oils can be added to give flavor to the beeswax depending on the intended product.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> Bee keepers Processors Industries Training and research institutions Agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Steady supply of beeswax Market access

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO - develop and promote the technology • Training/extension institutions - promote the technology • County governments - extension workers for farmer linkages and training • Government of Kenya- catalyze growth of the industry
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Kakamega, Nairobi, Nakuru, and Baringo
Counties where TIMP will be up scaled	Kilifi, Migori, Tana River, Siaya, Nakuru, Kitui, Kwale, Kajiado, Kakamega, Machakos, Makueni
Challenges in dissemination	<ul style="list-style-type: none"> • Limited raw material supply • Low consumer market due to competing synthetic products • Limited extension services
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Improved extension services to promote wax processing • Policies to promote partnerships
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • There is low trade volume for beeswax products • Beeswax candle are available in the market with diversified product outlook
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • The product is socially acceptable across cultures and religious groups • The product is environmentally friendly • Fits within the government policies on use of natural products • Beeswax business is associated with conservation of environment and ecosystems
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Beeswax @ KES 1,500/kg, • Edible oil for lubrication @KES 800/litre, • Candle wick (@ KES 350/roll; • Candle moulds @ KES 30/unit; • Source of heat e.g. 6 kg gas cylinder @ 6,000/unit; • Wax warmer (e.g. sufuria) @ 2,000/unit
Estimated returns	Depending on the intended end product, 1kg of Beeswax can produce many products that can yield quick returns
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Limited access to product information for either gender • Limited access to credit facilities may disadvantage women and youth to establish beeswax processing unit • Common challenges in establishing business by either gender
Gender related opportunities	<ul style="list-style-type: none"> • Availability of government grant opportunities give women and youth advantage to establish the business • Employment for women and youth from the sale of beeswax
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Limited access to agricultural information and extension services

	<ul style="list-style-type: none"> • VMGs have limited skills due to limited mobility and exposure
VMG related opportunities	<ul style="list-style-type: none"> • Availability of government grant opportunities give VMGs advantage to establish the business
E: case studies/profiles of success stories	
Success stories from similar previous projects	Beekeeping processors have adopted this innovation in Makueni, Baringo and Kitui Counties and have generated income for their families
Application guidelines for users	KALRO Apiculture ToT Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO, Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani
Partner organizations	NGOs, NBI, Baraka Agricultural College, Egerton University, CIGs, National Museums of Kenya

2.10.10 Beeswax body cream

2.10.10 TIMP name	Beeswax body cream
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Scarcity of natural products for skincare
What is it? (TIMP description)	<p>Beeswax body cream is a cosmetic skin product largely made of natural beeswax</p>  <p><i>Beeswax body cream.</i> <i>Source: M Jeptarus and J Mutai</i></p>

Justification	The beeswax trade is quite low in the country owing to poorly developed trade in beeswax products. Kenya has seen increased cosmetic industry that increasingly is demanding natural products. Beeswax body cream has excellent skin care properties with low competition from other products available in the market. Its exploitation can increase the demand for beeswax, supporting beekeepers' livelihood through diversified incomes from hive products.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, processors, beauty industry, extension service providers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Availability of beeswax Steady supply of beeswax and other raw materials Consumer market availability
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO - develop and promote the technology Training/extension institutions - promote the technology County governments' extension workers - for farmer linkages and training Government of Kenya- catalyze growth of the industry
C: Current situation and future scaling up	
Counties where already promoted if any	Makueni, Kitui, Kakamega, Nairobi, Nakuru, and Baringo
Counties where TIMP will be up scaled	<ul style="list-style-type: none"> Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Limited raw material supply Limited extension services
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Increased awareness through social media and on-farm demonstrations Improved extension services to promote wax cream processing Policies to promote partnerships
Lessons learned in up scaling if any	<ul style="list-style-type: none"> There is low tradable volume for beeswax cream products Beeswax cream are available in the market with diversified product outlook High consumer market due to competitive nature of beeswax cream products

Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • The product is socially acceptable across cultures and religious groups • The product is environmentally friendly • Fits within the government policies on use of natural products • Beeswax cream business is associated with conservation of environment and ecosystems
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Bees wax @ KES 1,500/kg • lemon grass hydrosol oil @ KES 1000/litre, • Organic Camellia oil @ KES 1000/litre, • Lavender essential oil @ KES 1000/liter • Chamomile essential oil @ KES 1000/liter • Labels @ KES 1000/roll, • Packing containers @ KES 10 • Other ingredients @ KES 1000 overall (lavender, olive oil • The ingredients above, apart from beeswax, can make many body cream products.
Estimated returns	<ul style="list-style-type: none"> • 1 kg of beeswax can produce 100 pieces of 50g beeswax cream • Body beeswax cream @ KES100/50g piece
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to information and knowledge on the innovation • Women have limited access to and control of resources such as credit to purchase the required inputs • Women have less access to extension services • Women's triple roles may hinder them from attending on Beeswax body cream trainings
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youths in making and sale of Beeswax body cream • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youths in making and sale of Beeswax body cream • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from similar previous projects	<ul style="list-style-type: none"> • Beekeeping processors have adopted this innovation in Makueni, Baringo and Kitui Counties and have generated income for their families

Application guidelines for users	KALRO Apiculture ToT Training manual
F: Status of TIMP readiness (1-ready for up scaling; 2 -requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich and Joseph Mulwa
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.11 Honey for nutrition and health

2.11.1 Honey for food, nutrition security and resilience

2.11.1 TIMP name	Honey for food, nutrition, security and resilience
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> High market demand for honey Increasing use of honey for food, Nutrition and Health
What is it? (TIMP description)	This is a guide on how honey can be harnessed to sustainably provide food and nutrition to meet human needs all year round to supplement other foods and especially when other food sources are scarce.
Justification	Beekeeping is expanding rapidly across the country regardless of the eco-zones. Beekeeping can be productive in most of the areas across the country and hence can be a great alternative source of food and nutrition all year round. Honey products are known for their high nutritional value and they can be packaged in various volumes. They also have a long shelf life. With increased climate variability and unpredictable seasons food security from other agricultural sources-crops and livestock-becomes unpredictable. Honey becomes an alternative source for food and nutrition especially during droughts.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Honey processors, beekeepers, extension services, research institutions, agri-preneurs

Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Awareness creation • Promote bee keeping and honey food products • Promote integration of bee keeping with other agricultural practices • Promote indigenous knowledge on honey food and nutrition products • Promote conservation of ecosystems ideal for bee keeping • Packaging should consider the wide range of socio-economic classes • Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO– to develop, validate and transfer the technologies and/or management of bee keeping practices • ICIPE – to develop, validate and transfer the technologies and/or management of bee keeping practices • NBI-Extension, validation, training and transfer • County government - to form linkages with bee keepers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Inadequate funding for installation of bee keeping facilities • Inadequate knowledge in handling honey foods and nutrition products • Limited certification of honey foods and nutrition products • Limited access to credit facilities • High costs for long-term storage facilities for honey foods and nutrition products during time of abundance for the time of scarcity.
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Establish and support bee keeping industry • Establish and support honey foods and nutrition products processing groups/cooperatives • Standard recipes to be availed to consumers • Enhance certification process for honey foods and nutrition products

	<ul style="list-style-type: none"> Enhance access and acquisition of appropriate recipes
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Honey foods and nutrition products that are well prepared preserve the medicinal and nutrition properties and have been alternative source of food during seasons of food scarcity.
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> The practice of using honey for its nutritional qualities of honey will be acceptable by all age groups The use of honey as food has no negative impacts on the environment Regulations on availing foods and nutrition products in the market is required Regulations in trading with honey food and nutrition products is required including aspects of quality and consumption
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Honey KES 1000/kg or own source Materials, ingredients, recipes and tools Bee hives Honey harvesting, processing and packaging equipment Honey food processing and packaging equipment Trade licensing costs
Estimated returns	<ul style="list-style-type: none"> Honey foods sales depending on recipe
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Women have less access to information and knowledge on the innovation Women may have limited access to resources such as credit to purchase the required ingredients Women have less access to extension services
Gender related opportunities	<ul style="list-style-type: none"> Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> VMGs have inadequate access to information on honey food and nutrition products VMGs have limited access to education, training and extension services Due to their social status VMGs are often excluded from decision making in development and dissemination activities There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	There is existing demand in the market for honey food and nutrition products.
Application guidelines for users	Beekeeping training manual
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling

G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute, Kenya Forestry Research Institute

2.11.2 Making infused Honey products

2.11.2 TIMP name	Making infused Honey products
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Increased and unmet demand for various ways to utilize honey
What is it? (TIMP description)	This involves making of honey mixed with other food components such as spiced honey, chili honey etc to expand value for honey. Honey infusions are created to specifically deliver specific benefits of the food product in addition to the honey benefits. It enhances the health value of honey.
Justification	Honey is very sensitive to handling and when mixed with other foodstuff, especially when it gets in contact with water. To ensure its quality and value is preserved, great care is required when it is used as an ingredient in any infused honey product. There is need to know which ingredients blend well with honey and at what stage of preparation honey can be added.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	honey processors, beekeepers, consumers, farmer groups, Entrepreneurs in apiculture, extension service providers, agripreneurs and NGOs
Approaches used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals

	<ul style="list-style-type: none"> Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Awareness creation Market access for the products Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO – to develop, validate and transfer the technologies and/or management practices ICIPE – to develop, validate and transfer the technologies and/or management practices KEBS - quality assurance and standardization NBI - Extension, validation, training and transfer County government - linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Traditional believes limiting the mixing of honey with other substances Inadequate funding for capacity building Limited access to credit facilities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Establish and support processing groups/cooperatives Standard recipes to be availed to consumers Enhance access and acquisition of appropriate recipes
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Infused honey products that are well prepared preserve the medicinal and nutritional value of the honey.
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> Infused honey products will be acceptable The making of infused honey products does not negatively impact on the environment Regulations on making infused honey products are required. Infused honey product trade requires regulations, including aspects of quality and consumption
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Equipment and tools Dawa- only 2 tablespoons used in 500ml ginger-lemon concoction which cost @ 200/glass Baking facilities for Pastries @ KES 10,000.00 Packaging costs @5000.00
Estimated returns	<ul style="list-style-type: none"> Honey KES 1000/kg own source Hired Processing cost at KES 70/kg The equipment will be useful over 10 years and can process many kgs of raw honey
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> Social and cultural factors that may hinder either gender from making honey-infused products

	<ul style="list-style-type: none"> • Limited access to credit facilities for women and youth to acquire appropriate equipment and structures • Women have less access to information, technology and knowledge on making infused honey products • Availability of the equipment at local markets
Gender related opportunities	<ul style="list-style-type: none"> • Improved marketability of honey leading to increased income and improved livelihood for women and youth • Business opportunities for women and youth from sale of processed honey • Employment creation for women and youth in the processing and sale of infused honey products • Enhanced access and acquisition of appropriate honey processing equipment and structures
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs lack access to information on honey-infused products • VMGs have limited skills relating to honey-infused products • Due to their social status VMGs are often excluded from innovation dissemination activities • VMGs have limited access to credit facilities
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action, capacity building and practical support to be provided to VMGs • Employment creation for VMGs in the processing and sale of honey-infused products • Enhance access and acquisition of appropriate processing equipment needed for honey-infused products
E: Case studies/profiles of success stories	
Success stories from previous similar projects	There is existing demand in the market for infused honey products.
Application guidelines for users	<ol style="list-style-type: none"> 1. KALRO ToT Beekeeping training manual 2. Carrol, T. (2006) A beginner's guide to beekeeping in Kenya. https://infonet-biovision.org/sites/default/files/pdf/beginners_guide_to_beekeeping_kenya.pdf 3. GoK (2023) Making money from bees, honey. https://kilimo.go.ke/wp-content/uploads/2023/03/Beekeeping-making-money-from-bees.pdf
F: Status of TIMP readiness (1ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat
Lead organization and scientists	KALRO (Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich and Caroline Kimani

Partner organizations	National Beekeeping Station, Egerton University, International Centre of Insect Ecology and Physiology, Baraka college, Common Interest Groups and Private beekeepers
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2.11.3 Honey food recipe


2.11.3 TIMP name	Honey food recipe
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Expanded and unmet demand for food products with honey as an ingredient High and unmet demand for honey in the market
What is it? (TIMP description)	This TIMP is the making of food products that include honey as a major ingredient. Examples include but not limited to pastries, cakes and inclusion of honey to marinate roast meat or to sweeten foods.
Justification	The health benefits of honey is credited to its diverse plant source. It is such a rich source that it is used to add quality and value to the various other foods. This is facilitated by the rich cultural history of various ethnic groups coupled with new knowledge about recipes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Honey processors, beekeepers, nutritionists, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Awareness creation Market access for the honey food recipes Development partners
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO – to develop, validate and transfer the technologies and/or management practices ICIPE – to develop, validate and transfer the technologies and/or management practices KEBS - Quality assurance and standardization NBI - Extension, -validation, training and transfer

	<ul style="list-style-type: none"> County government - linkages with farmers and technology dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Murang'a, Kiambu, Nairobi
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Traditional practices that discourage the mixing of honey with other foods Inadequate funding for capacity building Limited access to credit facilities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Establish and support processing groups/cooperatives Standard recipes to be availed to consumers Enhance access and acquisition of appropriate recipes
Lessons learned in up scaling if any	Well prepared honey food recipes preserve the medicinal and nutrition value of the honey.
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> Honey food recipes will be socially acceptable The use of honey food recipes does not negatively impact the environment Regulations on making honey food products is required. Honey food product trade requires regulations, including aspects of quality and consumption
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> Materials, ingredients, recipes and tools Honey @ 700/- a kg or own source Baking facilities for Pastries @ KES 10,000.00 Packaging costs @5000.00
Estimated returns	<ul style="list-style-type: none"> Product sales
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> Women may have less access to information and knowledge on the innovation Women may have limited access to resources such as credit to purchase the required ingredients Women have less access to extension services The innovation may not be adopted if it increases the work load for women who are already overburdened
Gender related opportunities	<ul style="list-style-type: none"> Business opportunities exist for women and female youth in making the recipes Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> VMGs have limited access to education, training and extension services Due to their social status VMGs are often excluded from decision making in development and dissemination activities There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	

Success stories from previous similar projects	There is existing demand in market for honey food recipes products.
Application guidelines for users	Beekeeping training manual
F: Status of TIMP readiness (1ready for upscaling; 2- requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO -ABIRI Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Station, Egerton University, International Centre of Insect Ecology and Physiology, Baraka college, Common Interest Groups and Private beekeepers

2.11.4 Honey recipe for common colds

2.11.4. TIMP name	Honey recipe for common colds
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Reduced human resource productivity due to frequent common colds, flu and allergies such as mouth sores Low utilization and uptake of honey product, particularly during glut
What is it? (TIMP description)	This is a concoction of honey and commonly found medicinal plant products that have been known to provide relief from common colds, flu and allergies. The mixture consists of water, honey and any combination of; ginger, lemon and garlic, colloquially known as <i>Dawa</i> .

	 <p>Water/Ginger/Lemon/honey drink. Source: Muo Kasina</p>
Justification	<p>Reduced human resource productivity due to frequent ailments and allergies can significantly affect household earnings. Uptake of honey can be low, with unattractive prices, especially during a glut. Honey is a nutritive food, mainly providing energy (carbohydrates) but also contains various elements essential for body growth and development. It combines well-known medicinal plant products such as ginger, lemon and garlic, in various combinations to make a medicinal herbal drink that has human immune boosting and curative effects. The honey based medicinal drinks can be prepared and sold for profit during periods of low honey uptake in the market.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Consumers (hotels, restaurants, hospitality entities), extension staff, medicinal plant product suppliers, researchers, dieticians, agripreneurs</p>
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Policy support that ensure honey quality supplied to the market is high • Availability and affordability of ingredients
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- develop recipes, provide training and mentorship • NMK- development of recipes • ICIPE- development of recipes • Training institutions- capacity building

	<ul style="list-style-type: none"> County governments - extension services, farmer linkages and mobilisation
C: Current situation and future scaling up	
Counties where already promoted if any	All Counties in Kenya
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega.
Challenges in dissemination	<ul style="list-style-type: none"> Inadequate extension staff with knowledge of local dialect of target communities Remoteness and difficult access to some of the potential beekeeping communities
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Capacity building of the extension agents with knowledge of the local dialects Alternative approaches to dissemination such as e-extension and electronic media
Lessons learned in up scaling if any	<ul style="list-style-type: none"> There are few recipes available in various eateries, implying the honey consumption potential is still unreached.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> The honey-based recipes will not be in conflict with the target communities' cultures and practices around honey. Environment will be conducive for production of and supply of honey and the medicinal plant products Policy environment such as standards and regulations on food-based products will be conducive for production and sale The market will be able and willing to uptake and appreciate the value of the recipes
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<p>1 kg honey costing KES 700/- can provide about 400 spoons (2.5g)</p> <p>Other costs (KES 2000)</p> <ul style="list-style-type: none"> Variable costs associated with the business Fixed costs associated with the business Procurement of garlic and ginger
Estimated returns	<ul style="list-style-type: none"> 100 servings each minimum KES 300 will realize KES 30,000
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> The concoction is mostly done by women at home Women may have less access to information and knowledge on the innovation Women may have limited access to resources such as credit to purchase the required ingredients Women may have less access to extension services The innovation may not be adopted if it increases the daily work for women who are already overburdened
Gender related opportunities	<ul style="list-style-type: none"> Business opportunities exist for women and female youth in making the concoction and youth in honey processing Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances

VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision-making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
Gender-related opportunities	<ul style="list-style-type: none"> • Business opportunities exist for women in making the concoctions and female youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None recorded
Application guidelines for users	Guidelines are included in TOT manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, International Centre for Insect Physiology and Ecology, Baraka College, Community Based Organizations, Beekeeping groups, and, beekeepers

2.11.5 Honey recipe for infants, children and lactating mothers

2.11.5 TIMP name	Honey recipe for infants, children and lactating mothers
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Frequent common colds and flu • Infant and children discomfort • Lactating mother discomforts
What is it? (TIMP description)	<p>Honey is a product that is known for ages across human history to deliver health and natural healing to consumers. It is frequently used for infants, children and lactating mothers to manage various discomforts.</p> <p>However, the consumer needs to be fully aware of the source due to the market dynamics. It is recommended that natural honey is used, not infused or integrated with other products.</p>

	Further, infants are given low/tiny doses based on the age and this increases with age. An indication of allergic reaction once given requires immediate withdrawal of honey from the child or mother. While honey is frequently used as a home remedy for small ailments, it is recommended that parents should consider medical opinion about health matters from a nearby health provider.
Justification	<p>Honey is a nutritive food, containing various elements essential for body growth and development. It mainly provides energy (carbohydrates) but also various vitamins, proteins and microelements that is supplied to the body when natural honey is consumed.</p> <p>Honey has different traits based on its source. It is therefore essential to know and be keen on the qualities. Some people react to honey from some regions- this is because of the nectar source. Therefore, consumers need to grow experience with consuming honey from different sources.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Households, extension providers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Policy support that ensures honey quality supplied to the market is high
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> Kenya Agricultural and Livestock Research Organization (KALRO) National Museums of Kenya (NMK) International Centre for Ecology and Insect physiology and Ecology (ICIPE) National Beekeeping Institute
C: Current situation and future scaling up	
Counties where already promoted if any	All Counties in Kenya
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Linking household consumers with beekeepers to buy honey from, hence reducing honey handling

Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Beekeeping groups formation for them to support market needs
Lessons learned in up scaling if any	None
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Using honey on infants, children and lactating c]mothers will positively be embraced • The use of honey on infants, children and lactating mothers has no negative impact on the environment • There is need to institutionalize the use of honey on infants, children and lactating mothers within the public healthcare delivery system • Demand will provide beekeepers with opportunity to sell products even locally
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • 1 kg honey costing KES 700/- can provide about 400 spoons (2.5g)
Estimated returns	<ul style="list-style-type: none"> • Savings from non-hospital visits amounting to thousands
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • These concoctions are mostly made by women at home • Women may have less access to information and knowledge on the innovation • Women may have limited access resources such as credit to purchase the required ingredients • Women have less access to extension services • The innovation may not be adopted if it increases the work load for women who are already overburdened
Gender related opportunities	<ul style="list-style-type: none"> • Business opportunities exist for women and female youth in making the concoction and youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making • There is low adoption by the VMGs due to lack of awareness
Gender related opportunities	<ul style="list-style-type: none"> • Business opportunities exist for women in making the concoction and youth in honey processing • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	
Application guidelines for users	
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3- requires further research)	Ready for upscaling

G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	ICIPE, NMK, NBI

2.11.6 Wound management using honey

2.11.6. TIMP name	Wound management using honey
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	There are many cases of humans and livestock wounds that are becoming difficult to manage.
What is it? (TIMP description)	Honey has antibacterial properties and a unique pH balance that promotes oxygen and healing compounds to a wound. This is the use of medical-grade honey in healing chronic wounds.
Justification	The use of antibiotic therapy in wound management has become ineffective due to drug-resistance. Honey has antibacterial properties, therefore, it is considered as an alternative wound treatment therapy. The use of honey has recently gained clinical popularity for possible use in wound treatment and regenerative medicine.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	General public, hospitals, Extension staff, Researchers,
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Policy support that ensures honey quality supplied to the market is high • Good collaboration within the county departments of health and agriculture

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- provide training and mentor-ship • Training institutions- capacity building • MOH- Uptake of TIMP • County governments – Extension services and farmer linkages
C: Current situation and future scaling up	
Counties where already promoted if any	All Counties in Kenya
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	Funds for use in production of pamphlets and airing on radio and TV
Suggestions for addressing the challenges	Donors to support publicity through funding. Collaboration between Ministries of Health and Agriculture in the Counties
Lessons learned in up scaling if any	None
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • The practice of treating wounds using honey will be acceptable • The practice is not associated with any negative environmental impact • The use of honey in wound management needs to be institutionalized within the public health delivery system • Policy and regulation in place to ensure quality honey which lacks residues of heavy metals, pesticides and veterinary drugs. • Demand for quality honey without contamination for use in treatment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	1 kg honey costing KES 700/- Cost of honey-impregnated dressing or Medi-Honey brand dressing
Estimated returns	Savings on purchase of antibiotics
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the technology • Women may have less access to money to buy the honey • Women may have less access to training and extension services, which can lead to a knowledge gap in improved treatment through the management practice
Gender related opportunities	Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination this activity • There is low adoption by the VMGs due to lack of awareness

VMG related opportunities	<ul style="list-style-type: none"> Affirmative action and Hustler funds opportunities exist for VMGs to acquire the training and required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Electronic wound journal: http://www.smtl.co.uk/World-Wide-Wounds/ .
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO -ABIRI Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Beekeeping Institute, National Museums of Kenya, Egerton University, Apiculture Platform of Kenya

2.11.7 Diet Honey



2.11.7. TIMP name	Diet Honey
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Increasing challenges of lifestyle diseases associated with high use of starch among others
What is it? (TIMP description)	<p>This is the use of honey as a viable sweetener other than sugar for management of lifestyle diseases such as obesity and type II diabetes.</p> <p>Honey is a viable alternative source of glucose for dietary needs. It can be used as an ingredient in tea, coffee, as a spread for bread, bakery, for coating e.g. roasted nuts (macadamia, cashew nuts) coated with honey in biscuits, and in honey beverages.</p>
Justification	Honey is a nutritive food, containing various elements essential for body growth and development. It mainly provides energy (carbohydrates) but also various vitamins, proteins and microelements. Honeys with less sucrose are best. Avoiding sugary honey (honey with high sucrose content) is better for managing

	lifestyle diseases. Intake of sugar and fast carbohydrates can result in health issues and especially for the aged. Honey can be used instead of sugar and sugar syrup as natural and healthier food.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Consumers, hotels, restaurants, hospitality entities, health institutions, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful adoption and promotion	Policy support that ensures honey quality supplied to the market is high
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> KALRO- develop, provide training and mentorship Training institutions- capacity building County governments extension workers - for farmer linkages and training)
C: Current situation and future scaling up	
Counties where already promoted if any	All Counties in Kenya
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	Linking hospitality and other users' agencies with beekeepers to buy honey from, hence reducing brokerage
Suggestions for addressing the challenges	Beekeeping group formation for them to support market needs
Lessons learned in up scaling if any	There is increased demand for healthy nutrition in various eateries and homes, implying the honey consumption potential is yet to be attained.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> Socially acceptable consumer practices that are compliant with the community Enabling policy framework to support development and adoption of the technology Diet honey is likely to provide market for beekeeping farmers and generate more income and keep the farming community healthy
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	1 kg honey costing KES 700/- can provide about 400 spoons (2.5g) Other costs (KES 2000)

	<ul style="list-style-type: none"> • Variable costs associated with the business • Fixed costs associated with the business
Estimated returns	<ul style="list-style-type: none"> • 100 servings each minimum KES 300 will realize KES 30,000/-
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women may have less access to information and knowledge on the management practice • Women may have less access to inputs such as credit and honey • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	
Application guidelines for users	KALRO Apiculture ToT Training manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3- requires further research)	Ready for upscaling
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO ABIRI
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	International Centre for Insect Physiology and Ecology, National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute

2.12 Apiculture Services

2.12.1 Watermelon pollination management


2.12.1 TIMP name	Watermelon pollination management
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low yields of watermelon • Low quality and sweetness of watermelon as a result of insufficient pollination management
What is it? (TIMP description)	<p>This is a management practice whereby the farmer deliberately keeps and manages bee colonies for watermelon pollination. Most watermelon plants produce separate male and female flowers. The yield and quality of watermelons depend on effective cross-pollination. 2 hives are recommended per acre.</p> <div>   </div> <p>Source: https://kansasruralcenter.org/krc-news/keeping-bees-on-the-farm Source: Mercy Gichora</p>
Justification	<p>Natural pollination of watermelons in the field is usually by honeybees that visit the flower to collect pollen and nectar. These agents of pollination cannot be guaranteed to be naturally present in adequate numbers in an area where the crop is grown. Since watermelon flowers are only viable for one day, managed honey bees and other pollinating insects need to be present every day during the pollination period to obtain the highest level of fruit set.</p>
B: Assessment of dissemination and scaling up/out approaches	


Users of TIMP	Farmers, trainers and extension agents, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural innovation platforms (AIP) Demonstrations - On-farm and on station Agricultural shows/exhibitions/field days Trainings - workshops/Seminars/Meetings Public and private Extension Agents Farmer to farmer extension models Mass media – Electronic and print Publications-posters/brochures/leaflets, manuals Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Good husbandry practices and knowledge of the phenology of watermelon plants. Best practices in management of honeybees to achieve strong colonies.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> County governments to fund training projects, agricultural extension staff Financial institutions to develop incentive packages
C: Current situation and future scaling up	
Counties where already promoted if any	Siaya
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Language barriers, especially in communication of technical concepts Availability of good quality farm inputs and beekeeping supplies
Suggestions for addressing the challenges	Train trainers in English and have them translate the technical concepts into local languages in verbal and written form
Lessons learned in up scaling if any	Watermelon can increase food security and the resilience of households through the marketing of farm produce
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> Have socially acceptable practices management Have management practices that are compliant to both national and county environmental policies Enabling policy framework to support development and adoption of the technology Water melon farming has recorded the need of provision of pollination service Good transport network for transporting bee colonies Available friendly hive types for pollination trade Demand for more good quality water melon by both domestic and export markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	These fall into 2 categories 1) Crop production

	<ul style="list-style-type: none"> – labor and materials for land preparation, apiary fencing, planting, weeding, harvesting - farmer field school training facilitation, melon seed, pesticides, fertilizer, M&E visits by agricultural extension staff <p>2) Honeybee management</p> <ul style="list-style-type: none"> – beehives, inspection and product processing accessories, farmer training, colony protection by fencing, M&E visits by trainers
Estimated returns	2 hives giving 50kg per annum at the gate price. Optimum watermelon yields and strong bee colonies yielding more honey and other hive products can augment income by >50%
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary cultural practices • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap in the management practice • The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities.
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for male youth in offering security, repairing the hives and harvesting the honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Honeybees are considered the most effective pollinating insects for melon crops. Cross-pollination has also been shown to produce heavier, sweeter and fuller fruit.
Application guidelines for users	At least 4 hives per acre of flowering watermelon installed at least 1 month prior to flowering to allow for stability.

F: Status of TIMP readiness (1-ready for up scaling; 2 requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.12.2 Avocado pollination management



2.11.2 TIMP name	Avocado pollination management
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Insufficient pollination resulting to low fruit yield and quality of avocado
What is it? (TIMP description)	<p>Establishing honeybee colonies for pollination of avocado orchards for enhanced fruit yields and quality. This involves identification of suitable apiary siting in the avocado orchard and training of the farmers on management of the honeybee colonies.</p> <p>The stocking density is minimum of four (4) hive colonies per one (1) hectare with the colony having about 10,000 workers and above.</p> 

	<p><i>Honey bees pollinating avocado flowers. Photo: J Mulwa</i></p>  <p><i>Honey bee colonies adjacent to avocado orchard for pollination provision.</i> <i>Source: Joseph Mulwa</i></p>
Justification	<p>Insufficient pollination of avocado trees leads to depressed fruit set and of low quality. Establishment of honeybee colonies in avocado orchards enhances pollination resulting in excellent fruit set. In Kenya, insufficient pollination in avocado trees could lead to 65.4% suppression in avocado fruit yields. Avocado orchards will require pollinator supplementation for enhanced performance.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, avocado growers and research institutions
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Appropriate bee hive density • appropriate crop husbandry practices during pollination period • Presence of alternate flowering plants during the avocado trees off-flowering season
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- training on management of honeybee colonies • Beekeepers- avail honeybee colonies for pollination services • National Beekeeping Institute (NBI) - Supply of honeybee hive and training on management of honeybee colonies • International Centre of Insect Physiology and Ecology • (ICIPE) – training on management of honeybee colonies • Avocado growers - appropriate crop husbandry practices
C: Current situation and future scaling up	
Counties where already promoted if any	Kakamega, Nakuru, Kiambu, Laikipia, Machakos, Murang'a, Tharaka Nithi, Meru, Nyeri, Uasin Gishu, Elgeyo Marakwet, Embu

Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Insufficient number of avocado model growers who have adopted the technology and can be used for training • Lack of beekeepers practicing hired pollination service • Culture where beekeeping is seen as a practice for men hence a challenge for female avocado growers • Limited knowledge on honeybee management for pollination services by the extension services providers
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • capacity building avocado growers to adopt supplemental pollination service inputs • capacity build extension providers • capacity build beekeepers for provision of pollination service
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Insufficient pollination of avocado trees has resulted in suppressed avocado fruit yields • Training is important for success in using honeybees for pollination services • Unfriendly farm practices to bees such as use of synthetic insecticides should be avoided
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • Enabling policy framework to support development and adoption of the technology • Avocado farming has shown the need of provision of pollination service • Good transport network for transporting bee colonies • Availability of friendly hive types for pollination trade • Demand for more avocado fruits and of good quality by both domestic and export markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 7000 per bee hive, 4 hives per ha of avocado orchard. About 28,000 per ha for the entire avocado production period • Honeybee colony management costs, based on the number of colonies demanded
Estimated returns	<ul style="list-style-type: none"> • More than 64.5% yield improvement in avocado fruit production. • Additional returns from harvested bee products
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary cultural practices • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women may have less access to training and extension services, which can lead to a knowledge gap the management practice

	<ul style="list-style-type: none"> The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities
Gender related opportunities	<ul style="list-style-type: none"> Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> VMGs may have limited access to finances to acquire the required inputs VMGs have limited access to education, training and extension services Due to their social status VMGs are often excluded from decision making in development and dissemination activities There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit Employment opportunities exist for male youth in offering security, repairing the hives and harvesting the honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> Kakuzi Ltd do manage honeybee colonies for pollination of avocado orchards.
Application guidelines for users	<ul style="list-style-type: none"> adopt pollinator trade friendly hives especially the framed comb hives Practice best beekeeping practices Refer to avocado pollination brochure by KALRO
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
h Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.12.3 Mango pollination management

2.12.3 TIMP name	Mango pollination management
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Insufficient pollination of mango • Reduced fruit yield and quality (size and oil content) in mangoes.
What is it? (TIMP description)	<p>Establishing honeybee colonies for pollination of mango orchards for enhanced fruit yields and quality. This involves identification of suitable apiary siting in the mango orchard and training of the farmers on management of the bee colonies.</p> <p>The stocking density is minimum of four (4) hive colonies per one (1) hectare with the colony having about 10,000 workers and above.</p>  <p><i>Flowering mango trees.</i> Source: Joseph Mulwa</p>  <p><i>Honeybee colony adjacent to mango orchard for pollination provision.</i> Source: Joseph Mulwa</p>
Justification	Insufficient pollination of mango trees leads to depressed fruit yields and low quality. The establishment of honeybee colonies in mango orchards enhances pollination resulting in excellent fruit set. In Kenya, insufficient pollination in mango trees could lead to suppressed mango fruit yields. Mango orchards will require pollinator supplementation for enhanced performance.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, mango growers and research institutions
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days



	<ul style="list-style-type: none"> • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital platforms -website, dashboards, APPs, social media, short message service
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Appropriate bee hive density • appropriate crop husbandry practices during pollination period • Presence of alternate flowering plants when the mango trees are at off-flowering season
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- training on management of honeybee colonies • Beekeepers- avail honeybee colonies for pollination services • National Beekeeping Institute (NBI) - Supply of honeybee hives and training on management of honeybee colonies • International Centre of Insect Physiology and Ecology (ICIPE) – training on management of honeybee colonies • Mango growers - appropriate crop husbandry practices
C: Current situation and future scaling up	
Counties where already promoted if any	Kakamega, Nakuru, Laikipia, Machakos, Makueni, Kitui, Murang'a, Tharaka Nithi, Meru, Elgeyo Marakwet , Embu
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Insufficient number of mango model growers who have adopted the technology • Lack of beekeepers practicing hired pollination service • Cultural challenges which bias beekeeping as a practice for men • Women phobia for honeybee stings therefore a challenge for female mango growers • Limited knowledge on honeybee management for pollination services by the extension service providers
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • capacity building mango growers to adopt supplemental pollination service inputs • capacity build extension service providers • capacity build beekeepers for provision of pollination services
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Insufficient pollination of mango trees has resulted in suppressed mango fruit yields • Training is important for success in using honeybees for pollination services • Unfriendly farm practices to bees such as use of synthetic insecticides should be avoided
Social, environmental, policy and market conditions	<ul style="list-style-type: none"> • Enabling policy framework to support development and adoption of the technology

necessary for development and up scaling	<ul style="list-style-type: none"> • Mango farming has shown the need for provision of pollination service • Good transport network for transporting bee colonies • Available friendly hive types for pollination trade • Demand for more mango fruits and of good quality by both domestic and export markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • KES 7000 per bee hive, 4 hives per ha of mango orchard. About 28,000 per ha for the entire avocado production period • Honeybee colony management costs, based on the number of colonies demanded
Estimated returns	<ul style="list-style-type: none"> • Over 53% improvement in mango fruit production hence income enhanced by 53%. • Sales from honeybee products- Honey a kg @ KES 700
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary cultural practices • Women may suffer from bee-sting phobia • Women may have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice • The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for male youth in offering security, repairing the hives and harvesting the honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> • Kakuzi Ltd do manage honeybee colonies for pollination of mango orchards.

Application guidelines for users	<ul style="list-style-type: none"> • adopt pollinator trade-friendly hives especially the framed comb hives • Practice best beekeeping practices • Refer to mango pollination brochure by KALRO
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Joseph Mulwa, Daniel Toroitich
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

2.12.4 Cashew nut pollination management

2.7.2 TIMP name	Cashew nut pollination management
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Insufficient pollination for cashew nuts • Reduced yields of cashew nuts.
What is it? (TIMP description)	<p>Establishing honeybee colonies for pollination of cashew nuts for enhanced yields. This involves the identification of suitable apiary siting in the farm and training of the farmers on management of the bee colonies.</p> <p>The stocking density is a minimum of four (4) hive colonies per one (1) hectare with the colony having about 10,000 workers and above.</p>

	 <p>Honeybee on cashew nut flower. Source: Plantwise</p>  <p>Honeybee colonies for pollination provision. Source: J Mulwa</p>
Justification	<p>The main pollinating insects in cashew nuts are honeybees (<i>Apis mellifera</i>). Insufficient pollination of cashew nut trees leads to depressed fruit set and of low quality. Establishment of honeybee colonies in cashew nut orchards enhances pollination resulting to a 200% improvement in yields. Cashew nut orchards in Kenya will require pollinator supplementation for enhanced performance.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, cashew nut growers, extension agents and research institutions
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Appropriate bee hive density

	<ul style="list-style-type: none"> • appropriate crop husbandry practices during pollination period • Presence of alternate flowering plants during the cashew nuts trees off-flowering season
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- training on management of honeybee colonies • Beekeepers- avail honeybee colonies for pollination services • National Beekeeping Institute (NBI) - Supply of honeybee hives and training on management of honeybee colonies • International Centre of Insect Physiology and Ecology (ICIPE) – training on management of honeybee colonies • Cashew nut growers - appropriate crop husbandry practices • Extension service providers
C: Current situation and future scaling up	
Counties where already promoted if any	Kwale, Kilifi
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Nakuru, Kajiado, Migori, Siaya, Kitui, Machakos and Makueni, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of cashew nut model growers who have adopted the technology and can be used for training • Lack of beekeepers practicing hired pollination service • Culture where beekeeping is seen as a practice for men and phobia for honeybee stings by women hence a challenge for female cashew nut growers • Limited knowledge on honeybee management for pollination services by the extension services providers
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • capacity building cashew nut growers to adopt supplemental pollination service inputs • capacity build extension services • capacity build beekeepers for provision of pollination service
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Provision of pollination services in cashew nut trees has resulted to 157.8-200% improvement in yields • Training is important for success in using honeybees for pollination services • Use of synthetic insecticides in the farm is unfriendly to bees and should be avoided
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • Have socially acceptable practices management • Enabling policy framework to support development and adoption of the management practice • Have management practices that are compliant to both national and county environmental policies • Cashew nut farming has indicated the need for the provision of pollination service • Good transport network for transporting bee colonies • Available friendly hive types for pollination trade • Demand for more cashew nuts and of good quality by both domestic and export markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	

Basic costs	<ul style="list-style-type: none"> • KES 7000 per bee hive, 2 hives per hectare of cashew nut orchard. About 14,000 per ha for the entire cashew nut production period • Honeybee colony management costs, based on the number of colonies demanded
Estimated returns	<ul style="list-style-type: none"> • A 200% improvement in cashew nut production. • Sales from honeybee products
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary cultural practices • Women may suffer from bee-sting phobia • Women have less access to information and knowledge on the technology • Most women and youths have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice • The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and male youth in offering security, repairing the hives and harvesting the honey • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs may have limited access to education, training and extension services • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Hustler funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for male youth in offering security, repairing the hives and harvesting the honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	In Ghana and Benin cashew nut orchards.
Application guidelines for users	<ul style="list-style-type: none"> • Adopt pollinator trade-friendly hives especially the framed comb hives • Adopt best beekeeping practices
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Requires validation

G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	Kenya Forestry Research Institute, International Centre of Insect Physiology and Ecology, National Museum of Kenya, National Beekeeping Institute

Gaps

1. Assessment of Honeybees' exposure to agro chemicals and its implication in their population stability
2. Determination of pollination deficits for cashew nuts in Kenya
3. Establish economic value of pollination service offered by honeybees to cashew nuts

2.12.5 Coffee pollination management

2.12.5 TIMP name	Coffee pollination management
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low yields in coffee due to reduced pollination • Low bean quality due to insufficient pollination
What is it? (TIMP description)	This is a management practice in which the farmer keeps and manages bee colonies for coffee pollination. Coffee flower characteristics favor cross-pollination and this ensures dedicated pollinators visit to flowers. There is, however, the significant influence of colony size on the behavior of individual bee nectar foragers. Workers from well-managed, strong bee colonies work harder and offer a better pollination service to coffee than from weak ones, as they can cover longer distances. The recommended density is 2 beehives (colonies) per acre.
Justification	Coffee is an export crop that earns Kenya much-needed foreign exchange. Coffee yields can be low without pollination by honey bees. Though highland Arabica coffee (<i>Coffea arabica</i>) can self-pollinate, pollinators increase fruit set (when a flower transforms into a berry), berry size, and yield. Honeybees are among the abundant visitors that are recorded when coffee is in the flowering stage. They collect nectar and pollen as rewards/benefits for this ecological service.


	Management practices that result in higher yields of high-quality berries are required. These include incorporation of beekeeping for improved pollination services.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Coffee farmers, service providers (Argo-vets), trainers, agricultural extension staff, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful adoption and promotion	Raise the level of awareness of benefits of pollination of coffee by honey bees to both the coffee farmers and beekeepers
Partners/stakeholders for scaling up and their roles	Coffee farmers, beekeepers, National Beekeeping Institute, County governments to fund training of agricultural extension staff and farmers, financial institutions to develop incentive packages to support more beekeepers with initial seed capital for inputs
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	Language barriers during training, especially the explanation of technical concepts; suppliers of good-quality beekeeping equipment
Suggestions for addressing the challenges	Promote stocking of standardized, good quality equipment by local Agro-vet stores, train beekeepers in their own localities for relevance of course content
Lessons learned in up scaling if any	Honeybee can increase coffee production and the resilience of communities through the marketing of coffee and hive products
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • More appealing and user friendly to all genders and age groups • Management is in compliant and in conformity with national and county environmental regulations • Does not negatively impact the environment • Reduces loss of honey and honeybee colonies, therefore increased incomes • Promotes high and stable supply of honey for local and export markets.

D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<p>These are into two categories namely;</p> <p>1) Coffee production</p> <ul style="list-style-type: none"> – labor and materials for land preparation, fencing, planting, weeding, harvesting - farmer field school training facilitation, coffee seedlings, pesticides, fertilizer, M&E visits by agricultural extension staff <p>2) Honeybee management</p> <ul style="list-style-type: none"> – beehives, inspection and product processing accessories, farmer training, colony protection by fencing, M&E visits by trainers
Estimated returns	<p>Minimum stocking of two hives/acre gives 50kg of honey per annum which can be sold at the gate price. Income is diversified by optimum coffee yields and strong bee colonies, and other hive products supplement household income by >30%</p>
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • In some communities' cultural norms may hinder women from harvesting honey or interacting with bee colonies in the open apiary • Women and youths may suffer from bee-sting phobia • Coffee as a cash crop is an enterprise owned and controlled mostly by men • Women have less access to information and knowledge on the management practice • Women and youths have less access to land for coffee and apiculture farming • Women have less access to training and extension services on the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Business opportunities exist for agro-vets to stock high-quality hives and other accessories • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and youths in offering security, repairing the hives and harvesting the honey • Affirmative action and government funding opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services on the management practice • VMGs are often excluded from decision-making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Governmentgovernment funding opportunities exist for VMGs to acquire the required credit

	<ul style="list-style-type: none"> • Employment opportunities such as provision of security, services, repairing the hives and harvesting the honey exist for youths in offering
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Honey bees are considered the most effective pollinating insects. Cross-pollination produces heavier and fuller coffee berries.
Application guidelines for users	KALRO Apiculture ToT manual.
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for Up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,

2.12.6 Pyrethrum pollination management

2.7.2 TIMP name	Pyrethrum pollination management
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low pyrethrum yield caused by insufficient pollination
What is it? (TIMP description)	Establishing honeybee colonies for pollination of pyrethrum for enhanced yields. This involves identification of suitable apiary siting in the farm and training of the farmers on management of the bee colonies. The stocking density for the hive colonies per one hectare needs to be established.

	 <p>Honeybee on pyrethrum flower.</p> <p>Source Mykhailo</p>
Justification	Cross-pollination in pyrethrum is key in delivering higher seed set and seed with higher viability. Establishment of honeybee colonies in pyrethrum plantations could promote cross pollination since managing other pollinators such as flies and beetles is complex.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, pyrethrum growers, extension agents and research institutions, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Appropriate bee hive density • Appropriate crop management practices during pollination period • Presence of alternate flowering plants during the pyrethrum off-flowering season
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- training on management of honeybee colonies • Beekeepers- avail honeybee colonies for pollination services • National Beekeeping Institute (NBI) - Supply of honeybee hives and training on management of honeybee colonies • International Centre of Insect Physiology and Ecology (ICIPE) – training on management of honeybee colonies

	<ul style="list-style-type: none"> • Pyrethrum growers - appropriate crop husbandry practices • Extension service providers
C: Current situation and future scaling up	
Counties where already promoted if any	Nakuru, Uasin Gishu, Elgeyo Marakwet, Nandi, Baringo, Kericho, Bomet, Narok, Laikipia, Trans Nzoia, West Pokot, Kisii and Nyamira; Kiambu, Nyeri and Nyandarua, Meru, Embu and Bungoma
Counties where TIMPs will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of pyrethrum model growers who have adopted the technology and can be used for training • Lack of beekeepers practicing hired pollination service • Culture where beekeeping is seen as a practice for men and phobia for honeybee stings by women pyrethrum growers Limited knowledge on honeybee management for pollination services by the extension services providers
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Train pyrethrum growers to adopt supplemental pollination service inputs • Train extension service providers • Train beekeepers for provision of pollination service • Carry out more research and validation on pollination provision in pyrethrum farming systems
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Provision of pollination services in pyrethrum has resulted in improved yields • Training is important for success in using honeybees for pollination services • as Application of synthetic insecticides should be avoided completely
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • Have socially acceptable practices management • Have management practices that are compliant to both national and county environmental policies • Enabling policy framework to support development and adoption of the technology • Pyrethrum farming has recorded the need of provision of pollination service • Good transport network for bee colonies • Available friendly hive types for pollination trade • Demand for more good quality pyrethrum by both domestic and export markets
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Honeybee colony management costs, based on the number of colonies demanded
Estimated returns	<ul style="list-style-type: none"> • An improvement in pyrethrum production. • Sales from honeybee products
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary cultural practices • Women and youths may suffer from bee-sting phobia

	<ul style="list-style-type: none"> • Women have less access to information and knowledge on the technology • Women and youths have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology • The management practice may not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women and youths in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and youths in offering security, repairing the hives and harvesting the honey • Affirmative action and government funding opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • VMGs are often excluded from decision making in development and dissemination activities • Lack of awareness may contribute to low adoption by the VMGs
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Government funding opportunities exists for VMGs to acquire the required credit • Employment opportunities exist for youths in offering security, repairing the hives and harvesting the honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None in Kenya.
Application guidelines for users	<ul style="list-style-type: none"> • KALRO Apiculture ToT Manual • https://www.agricultureauthority.go.ke/pyrethrum/index.php/newsroom/reports?download=32:pyrethrum-growers-manual
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Requires validation
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI)

	P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, ICIPE, other,

2.13 Apiculture Agribusiness

2.13.1 Business Planning

2.13.1 TIMP name	Business Planning
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	<ul style="list-style-type: none"> • Lack of planning, hindering the ability of farmers to make informed decisions in beekeeping enterprises. • Insufficient business planning skills, resulting in challenges in setting clear objectives, efficiently allocating resources, and navigating the complexities of the dynamic apiculture market. • Inability to effectively track performance, leading to missed opportunities for improvement, failure to identify underperforming aspects, and a lack of skills to optimize overall beekeeping operations.
What is it? (TIMP description)	A business plan shows the business goals and how they will be achieved. The plan describes a business, its products and services and strategies to be used to achieve the set goals. A good business plan evolves regularly over time in response to the emerging changes.
Justification	Equipping beekeepers with business planning skills is imperative for a seamless transition from subsistence to commercial beekeeping. The development of a robust business plan is pivotal in providing a comprehensive overview of the beekeeping enterprise, encompassing key features such as production, operations, marketing, human resources, and financial management. A well-crafted business plan guides the beekeeper in achieving their objectives and serves as a crucial tool in securing financial support. With a sound business plan, beekeepers can confidently approach financial institutions to access credit, facilitating the sustainable growth and commercial viability of their apiculture ventures.
B: Assessment of dissemination and scaling up/out approaches	

Users of TIMP	Beekeepers, farmer groups, Entrepreneurs in apiculture, extension service providers, NGOs and researchers, and agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Enabling and friendly policies and regulatory frameworks that support apiculture as a business. • Inclusive value chain integration incorporating all stakeholders along the apiculture value chain • Willingness of farmers to make use of the business planning • Well-trained facilitators in business planning and possess effective training and communication skills. • Incorporate practical exercises and demonstrations to enhance farmers' understanding of business planning concepts and strategies • Partnerships with supportive organizations that support apiculture; NGOs, and extension services to strengthen the economic analysis capacities of farmers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • County Agribusiness Development Officer (CADO) –Train and backstop farmers during implementation • Extension service providers (public and private) – to train farmers on business planning • KALRO – technology development and fine-tuning, ToT, backstopping and monitoring implementation • Farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be up-scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Varying education levels of the farmers • Language barriers limit communication • Resistance among beekeepers to adopt the use of new business planning practices • The logistical challenges associated with reaching and engaging beekeepers in these dispersed areas
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Simplify business planning to make it easy to understand and apply

	<ul style="list-style-type: none"> • Train farmers on business planning for apiculture enterprises. • Customized Training: align training materials to suit farmers with varying levels of education. • Practical guidance for farmers on analysis • Incorporate success stories and case studies showcasing the positive impact of business planning in apiculture. • Use mobile training units or establish regional training hubs to reach beekeepers in dispersed areas.
Lessons learned	<ul style="list-style-type: none"> • Business planning for apiculture enterprises is beneficial for beekeeping farmers
Social, environmental, policy and market conditions necessary for the success of the TIMP	<ul style="list-style-type: none"> • Have socially acceptable training sessions on business planning practices • Gender equity in training programs. • Strong community support for apiculture farmers to share knowledge, resources, and experiences, enhancing the overall success of business plans. • Have business planning practices that are compliant to both national and county policies and regulations • Enabling policy framework to support development and adoption of the business planning practices • An existing demand for hive products and consumer preferences.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES10,000-50,000 depending on size of farm
Estimated returns	<p>A household with 20 beehives, will produce about 200 kg honey a season, each priced at KES 700. Honey can be harvested at least twice annually</p> <p>Hives lasts more than 10 years with minimal maintenance costs</p>
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • Limited access to training opportunities may lead to differences in knowledge and skills. • Gender-based differences in access to resources, such as credit, land, and technology, may negatively impact the implementation of business plans. • Unequal ownership and control of apiculture assets may affect women the implementation and scaling of business plans. • Unequal decision-making power within households may affect women and youths in adoption and scaling of business plans • Cultural norms and societal expectations may limit women and youth's participation in training sessions and business planning initiatives. • Men, women and youths may have different needs and priorities in business planning • Gender-based challenges may affect women and youth's access to markets for their apiculture products, limiting the economic benefits they can derive from business plans.

	<ul style="list-style-type: none"> Limited representation of women and youths in extension services may result in a lack of gender-sensitive support for female beekeepers.
Gender related opportunities	<ul style="list-style-type: none"> Women and youths equipped with entrepreneurial skills can offer business planning services to apiculture farmers for a fee, Commercialization of apiculture resulting from good business planning is an opportunity for increased income and financial independence among all gender groups Implementation of business planning strategies enables access to credit for women and youths in apiculture
VMG issues and concerns in development, dissemination adoption and scaling up of the TIMP	<ul style="list-style-type: none"> VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial apiculture enterprise VMGs may have limited access to training, and extension services therefore, most have no business planning knowledge and skills VMGs may have limited access to markets VMGs have less access to production resources such as land, capital, labor and credit hence they might not see the need to prepare a business plan VMGs may have high illiteracy levels which limits their abilities to develop and apply business planning Some VMGs have limited mobility and might not access training venues Training programs may lack inclusive teaching aids and materials e.g. sign language interpreters, and challenging physical facilities
VMG related opportunities	<ul style="list-style-type: none"> Youths with business skills can prepare business plans for beekeeping farmers at a fee Through business planning women and youths can acquire credit through affirmative action and available funds to finance their enterprises Commercialization can lead to VMGs economic empowerment through increased income and financial independence
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Smart Marketing Manual (USAID) https://www.scribd.com/document/354585440/Business-Plan-Sample-Small-Busines-Plan-in-Kenya
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director KALRO – Apiculture and Beneficial Insects Research Institute (ABIRI)

	P.O. Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Physiology and Ecology and others,

Gaps

There is a gap in business plan development skills for both county staff and farmers

2.13.2 Marketing of Apiculture Products

2.13.2 TIMP name	Marketing of Apiculture Products
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	<ul style="list-style-type: none"> Farmers have limited information about markets for apiculture products and necessary inputs. Disorganized markets for apiculture products leading to inefficiencies, reduced bargaining power for farmers, and unreliable market channels. Low market participation, especially for women and youths which limits farmers' ability to maximize the economic potential of their apiculture products. Limited knowledge of market dynamics hampers farmers' ability to respond effectively to market changes, optimize pricing strategies, and adapt to evolving market conditions.
What is it? (TIMP description)	This practice marketing of apiculture products is designed to equip farmers with essential information, skills, and knowledge to excel in the competitive apiculture production enterprise. Farmers will gain a deep understanding of efficient markets, market channels and dynamics, and key linkages within the apiculture value chain. The practice will also explore consumer preferences and delve into the economics of product pricing. This practice marketing of apiculture products aims to maximize apiculture production and sales, ultimately promoting a thriving and prosperous apiculture business, transitioning from subsistence to commercial venture.
Justification	Training of farmers on the marketing of apiculture products is very important in opening up the economic benefits of the beekeeping enterprises. Beekeepers often face challenges related to insufficient market information, disorganized market structures, and often changing market dynamics. Comprehensive training in marketing, farmers gain crucial insights into identifying market opportunities, establishing organized market channels, and

	strategically positioning their products in the market. Knowledge about product price determination is essential for farmers to navigate the challenges of low prices and market disruptions. Empowering farmers with marketing skills enhances their ability to secure fair prices for their apiculture products and contributes to the growth and sustainability of the apiculture industry. It enables them to actively participate in market dynamics, optimize their pricing strategies, and ultimately ensures that the economic benefits of apiculture reach their full potential, fostering a more prosperous and resilient apiculture sector.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers and stakeholders in the apiculture value chain, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Enabling regulations, legislations, and policies that support and facilitate marketing of apiculture products. • Farmers willingness to adopt commercial apiculture production practices • Inclusive value chain integration incorporating all stakeholders along the apiculture value chain • Designing aligned gender and VMG inclusive training programs to the specific needs, knowledge levels, and constraints of the target farmers, ensuring relevant and accessible content. • Well trained facilitators in apiculture marketing and possess effective training and communication skills. • Provide farmers market information, market linkages, and financial support to support their marketing efforts. • Incorporate practical exercises, demonstrations, and real-life case studies to enhance farmers' understanding of marketing concepts and strategies • Farmer producer organizations: encourage the formation of farmer producer organizations and cooperatives to collectively sell their products hence improving their bargaining power • Supportive organizations: collaborate with agricultural and apiculture production groups, NGOs, and extension services to strengthen the marketing capacities of farmers

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Extension service providers (public and private): to train farmers and give timely information on markets • County governments-link farmers with markets • KALRO: technology development and fine tuning, ToT, backstopping and monitor implementation • Farmer groups: adoption and utilization of technologies, innovations, management practices and related information.
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Varying education levels of the farmers since some may have limited formal education. Marketing is essential and the training materials should be aligned to meet diverse learning needs. • Poor accessibility of learning sites especially in the remote areas • Poor and fluctuating market prices may discourage farmers from marketing of apiculture products • Limited access to markets for apiculture products may discourage farmers from attending training programs • Lack of marketing skills among farmers can limit their ability to make informed marketing decisions. • Middlemen and other actors along the apiculture value chain influence, potentially limit farmers' independence and their returns from apiculture products. • Limited knowledge of financial concepts may hinder farmers' ability to effectively manage pricing, budgeting, and financial aspects of marketing. • Lack of up-to-date information on market trends, consumer preferences, and pricing dynamics can hinder farmers from making informed marketing decisions
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Customized training: Align training materials to suit farmers with varying levels of education. • Introduce financial literacy programs together with marketing training to enhance farmers' knowledge of financial concepts, enabling them to manage pricing, budgeting, and financial aspects effectively. • Enhanced marketing skills: provide comprehensive training to equip farmers with the marketing skills needed such as market analysis, product promotion, pricing strategies, and customer relationship management. • Establish mechanisms to provide farmers with up-to-date information on market trends, consumer preferences, and pricing dynamics, empowering them to make informed marketing decisions.

	<ul style="list-style-type: none"> • Formation of farmers groups to enhance their bargaining power in the market. • Training of value chain actors to enhance market efficiency and fairness.
Lessons learned	<ul style="list-style-type: none"> • This is a new TIMP • It is expected that: <ul style="list-style-type: none"> ○ Aligned marketing strategies are important as “one-size-fits-all” marketing strategies may not work for all farmers. ○ A comprehensive market information system is important to provide farmers with up-to-date data on prevailing demand trends, pricing fluctuations, and consumer preferences. ○ Real-time price indices enable farmers to make informed decisions about when and where to sell their apiculture products, ultimately maximizing their returns. ○ Continuous market research is crucial to know the changing consumer preferences and the market dynamics of the apiculture products. ○ Producer group model can help small-scale farmers access better markets and negotiate better prices. ○ Strong market linkages can ensure easy and timely movement of apiculture products from the farm to the market, ensuring deliveries. ○ Digital platforms can help farmers be informed about market trends, prices, connect with buyers, and manage their businesses more efficiently.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Support Community engagement induces community ownership among the beekeeping farmers on the usefulness of collaboration and support for the marketing of apiculture products • The need for a conducive policy and regulatory frameworks for competitive markets of apiculture products • Farmers’ willingness and ability to produce and market quality apiculture products. • Socio-cultural considerations may influence marketing practices of apiculture products • Ensure that farmers have access to training materials, instructors, and facilities. • Ensure gender and VMG inclusion in training programs. • Assess the availability of motorable roads and means of transportation which can impact the logistics of marketing apiculture products. • An existing market demand for apiculture products and consumer preferences.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Marketing information will be available at no cost from the identified lead farmer in their locality

Estimated returns	Farmers using this information will experience increased market access and participation resulting in sustainable and economically viable apiculture production enterprises.
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Gender differences in access to marketing information with women and youths being dis-advantaged hence limiting their ability to make informed marketing decisions. • Limited involvement of women and youths in decision-making processes related to marketing strategies. • Rationale: Inclusive decision-making ensures that the perspectives and needs of women farmers are considered in marketing initiatives. • Unequal access to resources, including financial support and training opportunities which can hinder women's capacity to engage effectively in marketing activities. • Gender-based disparities in access to training programs on marketing. • Limited ownership and control of apiculture enterprises by women and youths limiting their active participation in marketing activities. • Gender-based barriers to market access. for example restrictive social norms, that limit women's ability to access markets for their apiculture products. • Gender-based disparities in access to and use of technology for marketing such as digital marketing • Cultural norms and stereotypes affecting women's participation
Gender related opportunities	<ul style="list-style-type: none"> • Empowerment of women and youths through training in marketing and equipping them with the skills and knowledge to actively participate in marketing activities that enhancing their economic empowerment. • Enhanced involvement of women and youths in decision-making, empowering them to contribute more actively to decision-making processes related to pricing, market access, and business strategies. • Diversification of roles by breaking gender stereotypes and encouraging both men, women and youths to engage in various aspects of marketing apiculture products. • Entrepreneurial training opportunities for women and youth to improve their economic independence. • Facilitating market access for women farmers. • Remove the digital gender gap by enhancing women's and youths' ability to leverage digital tools for marketing purposes. • Shift in perceptions, recognizing and valuing the significant contributions of women and youths' in apiculture marketing.
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMG individuals may have limited access to useful resources for apiculture production and marketing.

	<ul style="list-style-type: none"> • Lower literacy rates among VMG groups can limit access and understanding of training materials and market information. • Language differences may create challenges in disseminating information and training materials • VMG individuals may be discriminated against when accessing markets for their apiculture products. • Some VMG groups may reside in remote or isolated areas, making it challenging to reach markets and access transportation infrastructure for their apiculture products. • VMGs may be more susceptible to economic shocks and disruptions, which may affect their ability to invest in and sustain commercial enterprises for their apiculture products
VMG related opportunities	<ul style="list-style-type: none"> • Business opportunities exist for educated VMGs on digital marketing • VMGs could form their marketing groups or organizations to help them with selling their apiculture products
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Training manuals https://www.kcsap.go.ke/sites/default/files/manual/APICULTURE.pdf
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director KALRO – Apiculture and Beneficial Insects Research Institute (ABIRI) P.O. Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Physiology and Ecology and others,

2.13.3 Economic Analysis of Beekeeping

2.13.3 TIMP name	Economic Analysis of Beekeeping
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	

Problem addressed	<ul style="list-style-type: none"> • Farmers encounter significant challenges in evaluating the profitability of their apiculture enterprises, primarily due to lack of information and skills • This gap hinders their ability to make informed decisions and optimize the economic sustainability of their beekeeping ventures, • Ultimately this impacts on their income potential as they miss opportunities to enhance efficiency, reduce costs, and maximize revenue.
What is it? (TIMP description)	<p>This entails providing farmers with the essential skills and knowledge to conduct a comprehensive economic analysis of their apiculture enterprise. This includes proficiency in gross margin calculation and cost-benefit analysis, with a specific focus on various hive products.</p> <p>Through the enhancement of the skills on economic analysis of beekeeping farmers gain the capacity to accurately assess all factors of production, compute returns from product sales, and determine economically viable scales of apiculture production. This skills promote the development of a thriving and prosperous apiculture business, facilitating the transition from subsistence to a commercial venture.</p>
Justification	<p>The knowledge of economic analysis of beekeeping contributes to the transitioning of farmers from subsistence to commercial apiculture farming.</p> <p>Enhanced skills in economic analysis of beekeeping serves as a tool for effective enterprise management and allows farmers to overcome the challenges in the apiculture farming. Economic Analysis of Beekeeping helps farmers track and assess all costs related to marketing of apiculture products. This becomes a safeguard against potential losses, enabling farmers to make informed decisions, optimize resource utilization, and ensure the overall financial viability of their apiculture operations.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Apiculture individual farmers, Farmer groups, entrepreneurs, Extension service providers, NGOs and researchers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services

Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Enabling regulations, legislations, and policies that support apiculture production as a business. • Inclusive value chain integration incorporating all stakeholders along the apiculture value chain • Designing gender inclusive training programs to address specific needs of the target farmers and ensuring the content is relevant and accessible. • Well trained facilitators in apiculture economic analysis and possess effective training and communication skills. • Incorporate practical exercises and demonstrations to enhance farmers' understanding of economic analysis concepts and strategies • Supportive organizations: collaborate with agricultural and beekeeping production groups, NGOs, and extension services to strengthen the economic analysis capacities of farmers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • County Agribusiness Development Officer (CADO) –Train and backstop farmers during implementation • Extension service providers (public and private) – to train farmers on economic and cost benefit analysis • KALRO – technology development and fine tuning, ToT, backstopping and monitor implementation
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Varying education levels of the farmers since some may have limited formal education making it challenging for them to grasp complex economic concepts. • Farmers may experience low motivation due to poor market prices • Lack of computational skills among farmers can impede their ability to do economic analysis • Farmers may lack comprehensive knowledge of the dynamics of apiculture production with the changing input prices. • Limited access to training resources especially for farmers in remote or economically disadvantaged areas • Language barriers due to diversity can pose a challenge, especially in regions where multiple languages are spoken. • Time constraints due to farmers busy schedules with various responsibilities, including farm work and household chores • Complexity of economic concepts and terminology which can be unfamiliar to farmers.

	<ul style="list-style-type: none"> • Cultural norms and beliefs can influence the willingness of farmers, especially women, to participate in training programs.
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Develop customized training materials that cater to varying literacy levels and educational backgrounds e.g. use visual aids, practical examples, and local languages to enhance comprehension. • Use community-driven approaches involving local leaders and community members in the planning and implementation of training programs to support ownership and encourages participation. • On-site training and addressing challenges related to accessibility. • Provide translated and localized training materials to address language barriers. Utilize local dialects and ensure that terminology is culturally relevant and easily understood. • Integrate financial literacy initiatives into training programs to enhance farmers' understanding of economic concepts. • Design training programs that are inclusive of different gender and age groups. Consider organizing separate sessions if needed to address specific needs and concerns. • Engage farmers actively through participatory learning methods, such as group discussions, case studies, and practical demonstrations. • Offer flexible training schedules that accommodate farmers' busy routines. • Strengthen extension services and establish a continuous support mechanism.
Lessons learned	<ul style="list-style-type: none"> • A comprehensive training on economic analysis is important to provide farmers with skills on how to cost their factors of production. • Simplified tools are more appealing to farmers • Real-time price indices enable farmers to make informed decisions about when and where to sell their hive products, ultimately maximizing their returns. • Digital platforms can help farmers stay informed about input prices, market trends, connect with buyers, and manage their businesses more efficiently.
Social, environmental, policy and market conditions necessary development and upscaling	<ul style="list-style-type: none"> • Strong community support and acceptance of apiculture farming • Apiculture practices that support sustainable environments • Farmers' ability to produce and market their hive products • Farmers' existing knowledge of economic analysis and their level of education. • Farmers access to training materials, instructors, and facilities. • Gender inclusive training programs.

	<ul style="list-style-type: none"> • An existing demand for hive products and consumer preferences. • Conducive policy and regulatory framework to enable farmers commercially venture into apiculture production
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	No cost
Estimated returns	It is expected that farmers using this information will estimate their costs of production, get ways on minimizing loss and venture in economically viable Apiculture production enterprises.
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • Gender disparities in access to information and training opportunities where women may have limited access to economic analysis training programs, workshops, or extension services • Unequal educational opportunities for men and women with women in certain regions having lower levels of formal education, affecting their capacity to engage with and understand economic analysis concepts. • Unequal decision-making power within households with women having limited decision-making authority in apiculture enterprises • Unequal access to resources such as land, credit, and technology hindering their ability to invest in sustainable apiculture practices. • Gender-specific roles leading to time constraints especially for women who bear multiple responsibilities, including household chores and caregiving. • Cultural norms restricting women's participation in public activities which may discourage them from attending training sessions or engaging in public forum • Gender-based disparities in market access with women facing challenges in accessing markets for their apiculture products, impacting their ability to benefit economically from the adoption of economic analysis practices.
Gender related opportunities	<ul style="list-style-type: none"> • Entrepreneurship for women and youth through empowerment with economic analysis skills • Enhanced informed and collaborative decision-making, considering a diversity of perspectives. • Economic independence fostering a more equitable distribution of economic responsibilities. • Improving women's economic literacy may enhance their ability to access resources such as credit, land, and technology, promoting greater participation in apiculture. • Women entrepreneurs, equipped with economic analysis skills, can enhance the competitiveness of their apiculture products in the market, leading to increased market share and profitability. • Training programs can contribute to a broader awareness of gender issues, potentially influencing the development of gender-inclusive policies in the apiculture sector.

	<ul style="list-style-type: none"> • Contribute to the adoption of sustainable apiculture practices, considering the long-term environmental • Youths with entrepreneur skills can carry out business analytical services as a paid undertaking
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs often have restricted access to productive skills such as land, capital, and technology, which may hinder their participation in commercial apiculture farming. • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial apiculture enterprise • VMGs may have limited access to training, and extension services leaving them with inadequate knowledge and skills for apiculture commercialization. • VMGs have high illiteracy levels leading to lack of record keeping and poor record keeping • Some VMGs may reside in remote or isolated areas, making it challenging to access training on economic analysis • Training programs not accommodating materials in accessible formats e.g. sign language interpreters, and physical facilities that are wheelchair-friendly
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and government fund opportunities exist for VMGs to acquire the required credit • VMGs with entrepreneurial skills can carry out business analytical services as a paid undertaking • Commercialization can lead to VMGs economic empowerment through increased income and financial independence
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	<ol style="list-style-type: none"> 1. https://core.ac.uk/download/pdf/234655887.pdf 2. https://www.researchgate.net/publication/40424177_Socio-Economic_Analysis_of_Beekeeping_and_the_Effects_of_Beehive_Types_on_Honey_Production 3. https://core.ac.uk/download/pdf/234655887.pdf
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director KALRO – Apiculture and Beneficial Insects Research Institute (ABIRI) P.O. Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO S. Wambua, A. Murage, J Kasina and E Nyambati

Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,
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Gaps

There is a need to do gross margin analysis for both apicultures under different production systems.

2.13.4 Beekeeping Records and Record Keeping

2.13.4 TIMP name	Beekeeping Records and Record Keeping
Category (i.e. technology, innovation or management practice)	Management practice
A: Description	
Problem to be addressed	<ul style="list-style-type: none"> • Farmers lack sufficient knowledge and skills in effective record-keeping practices leading to challenges in tracking data and making informed decisions. • Difficulties in monitoring and evaluating the performance thus hindering the ability to identify areas for improvement. • Insufficient record-keeping practices affect the overall competitiveness of apiculture products. • Poor allocative efficiency potentially affecting the overall productivity and incomes • Low productivity in apiculture due to inadequate record keeping
What is description it? (TIMP)	This is a management practice which entails equipping farmers with the essential skills to collect important data and information, enabling them to systematically track activities in apiculture production. It goes beyond mere data collection, but aiming to empower farmers to instill a culture of comprehensive record-keeping. This encompasses documenting all aspects of production and marketing, including quantities and costs of inputs incurred and resultant outputs. The gathered information serves as a valuable resource, allowing farmers to evaluate the performance of their apiculture enterprises. By encouraging a record keeping culture, farmers are equipped to make informed decisions and to analyze trends, identify areas for improvement, and optimize the overall efficiency and success of their apiculture ventures.
Justification	Training apiculture farmers in records and record-keeping is crucial for optimizing resource management and overall efficiency. This practice of record keeping empowers farmers to track hive performance, resource utilization, and financial transactions, fostering informed decision-making. The comprehensive records also enhance market access by providing reliable information on product quality and traceability. Financial

	management and planning are streamlined, ensuring economic sustainability and growth. Moreover, the continuous improvement facilitated by regularly updated records contributes to the overall resilience and success of apiculture enterprises. Compliance with regulations is streamlined, and efficient monitoring and evaluation enable farmers to assess the effectiveness of their practices and implement evidence-based improvements. In essence, this training is a strategic investment that benefits individual farmers and elevates the sustainability, profitability, and competitiveness of the entire apiculture sector.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, women, youth and VMGs, processors, traders, consumers; private multipliers; researchers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Eagerness of farmers to initiate the practice of keeping comprehensive production and marketing records. • Development of customized training materials aligned to various languages spoken in the community. • Active community engagement to support ownership and collective responsibility. • Implementation of practical demonstrations and hands-on sessions to reinforce the learning experience. • Favorable and sustained market for apiculture products to encourage farmers' commitment to record-keeping. • Ensuring the availability of funding to create and disseminate materials essential for effective training and outreach initiatives
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – Development and dissemination of the TIMPs • Private sector – to publicize and disseminate the TIMP • National, and County governments, faith-based organizations, NGOs and development partners to take up the management practice and avail it to farmers. • Agripreneurs
C: Current situation and future scaling up	
Counties where already promoted if any	None

Counties where TIMPS will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Farmers limited understanding of the benefits of record keeping making it challenging to garner interest and participation. • Limited access to technology, hindering the adoption of digital record-keeping tools and platforms. • Resistance to adopting new practices, especially among older or more traditional farmers, can impede the acceptance • Farmers with low literacy and numeracy levels may face difficulties in maintaining written or numerical records • Farmers may perceive record-keeping as time-consuming, especially when faced with demanding daily responsibilities, leading to inconsistent implementation. • Insufficient availability of trained facilitators, training materials, or resources aligned to the specific needs of apiculture farmers can hinder effective dissemination. • Limited financial resources for outreach programs, workshops, and the development of training materials may hinder the scope and effectiveness of dissemination efforts. • Language and cultural diversity can pose challenges in conveying information effectively, requiring targeted approaches and materials adapted to local contexts. • Concerns about the privacy and security of recorded information may deter farmers from fully embracing record-keeping practices, especially if they perceive potential risks.
Suggestions for addressing the challenges in upscaling if any	<ul style="list-style-type: none"> • Conduct targeted awareness campaigns to emphasize the benefits of record-keeping • Develop training programs that consider the literacy levels, language preferences, and cultural aspects • Ensure that training materials are simple, visual, and user-friendly. • Introduce simplified and accessible technology solutions for record-keeping for example mobile applications or basic digital tools that align with farmers' technological literacy levels. • Collaborate with community leaders and influential figures to endorse the importance of record-keeping. • Implement incentive programs to motivate farmers, such as recognition for outstanding record-keeping practices or access to additional training opportunities and resources. • Collaborate with local agricultural extension services, NGOs, and community-based organizations to leverage existing networks for effective dissemination and support. • Seek funding from various sources, including governmental agencies and non-profit organizations.

	<ul style="list-style-type: none"> • Design training programs that accommodate farmers' schedules, • Implement measures to address data privacy concerns,
Lessons learned in upscaling if any	<ul style="list-style-type: none"> • The TIMP is yet to be upscaled
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Encouraging community-based support systems • Integrating record-keeping within the context of sustainable apiculture practices that align with environmental conservation and biodiversity efforts. • Supportive regulatory framework that recognize and support the importance of record-keeping in apiculture, providing guidelines and incentives for its implementation. • Creating and strengthening market linkages that reward beekeepers for maintaining accurate records, User-friendly record keeping techniques, considering the diversity of technological literacy levels among beekeepers. • Financial support for the development and dissemination of training materials, workshops, and extension services that promote record-keeping. • Designing record-keeping initiatives that are culturally sensitive and align with the norms and values
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The information will be offered to farmers at no cost
Estimated returns	Although no monetary value is directly linked to the TIMP, it is expected that once farmers follow efficient record keeping, they will improve their production and especially the quality of their products and hence become more competitive, and this will result in higher incomes
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • Gender disparities in access to education may limit women's ability to engage effectively in training programs on record-keeping • Unequal access to resources, such as land and credit, may impact women's ownership of hives and their ability to invest in record-keeping tools and training. • Traditional gender roles may assign specific responsibilities to men and women, influencing their roles in apiculture and record-keeping. • Gender-based differences in technological literacy may result in women facing challenges in using digital tools for record-keeping • Lack of gender-sensitive approaches in training and extension services may result in content that does not resonate with or adequately support women farmers. • Gender-based challenges in accessing markets and value addition opportunities may limit women's ability to leverage record-keeping for improved market negotiations

	<ul style="list-style-type: none"> • Gender disparities in decision-making power within households may influence women's ability to prioritize and integrate record-keeping practices into apiculture activities. • Social networks and support systems may vary for men and women in apiculture communities, affecting their ability to share knowledge and experiences related to record-keeping.
Gender related opportunities	<ul style="list-style-type: none"> • Record-keeping training can empower women to actively participate in decision-making processes • Optimization of resource allocation for improved hive productivity. • Record-keeping allows both men and women to negotiate better prices in the market. • Bridging the gender gap in technological literacy. Women can benefit from learning to use digital applications and devices, contributing to their overall empowerment. • Training programs foster social interactions and networks. • Record-keeping skills empower women to explore entrepreneurship opportunities • Affirmative action and government funds opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs may face barriers in accessing training programs due to geographical location, limited resources, or social marginalization. • Cultural norms and practices may differ among VMGs, • VMGs often face economic challenges, limiting their ability to invest in record-keeping tools or participate in training • VMGs may have varying literacy levels. • VMGs, especially women and minority groups, may have limited ownership or control over land and resources essential for apiculture. • VMGs may have limited access to digital technology, potentially excluding them from the benefits of digital record-keeping tools. • VMGs may face discrimination or stigma within their communities, affecting their participation in training programs and hindering the adoption of new practices. • VMGs may be underrepresented in decision-making processes related to apiculture and record-keeping initiatives.
VMG related opportunities	<ul style="list-style-type: none"> • Empowerment and skill development leading to increased confidence and self-efficacy. • VMGs can leverage record-keeping skills to enhance the economic aspects • Well-maintained records can enhance VMGs' credibility in the market leading to increased market access and better bargaining power, contributing to improved income and financial independence.

	<ul style="list-style-type: none"> • VMGs can explore entrepreneurial opportunities within apiculture. • Affirmative action and government funds opportunities exist for women and youths to acquire the required credit • Employment opportunities exist for learned VMGs especially the youths in carrying conducting business analytical services
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Training manuals https://beekeeperstraining.com/file2/source/books/57.pdf
F: Status of TIMPS readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further Research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director KALRO – Apiculture and Beneficial Insects Research Institute (ABIRI) P.O. Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,

Gaps

1. Development of dissemination and publicity materials for farmers.
2. Need to carry out a survey to find out why farmers don't keep records

2.13.5 Certification in Apiculture Value chain

2.13.5 TIMP name	Certification in Apiculture Value chain
Category (i.e. technology, innovation or management practice)	Management Practices
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low honey quality due to premature harvesting, or mishandling during process and/or intentional adulteration.
What is it? (TIMP description)	Certification of honey is a process by which honey producers ensure that their honey meets specific quality standards.

	<p>Certification provides consumers with confidence in the authenticity and quality of the honey they are purchasing. Different countries and regions may have their own certification standards, however, there are certifications and standards recognized internationally.</p>
Justification	<p>Certification of honey serves several important purposes, providing benefits to both producers and consumers. Certification of honey serves the following;</p> <p>Quality Assurance: Certification ensures that honey meets specific quality standards. This includes factors such as purity, absence of contaminants, and adherence to specific production practices. Consumers can have confidence that certified honey is of a certain quality.</p> <p>Consumer Confidence: In an era where consumers are increasingly concerned about the safety and authenticity of the products they purchase, certification provides a clear signal of trust. Certifying bodies conduct thorough assessments to verify that the honey meets defined standards, instilling confidence in consumers.</p> <p>Market Access: Certification opens up markets for honey producers. Many retailers, both local and international, prefer to stock certified products as they carry a reputation for meeting certain quality and safety standards. This can enhance market access for honey producers, helping them reach a wider consumer base.</p> <p>Environmental and Ethical Standards: Certifications, such as organic or fair trade, ensure that honey is produced in an environmentally sustainable and socially responsible manner. This addresses concerns related to the impact of agricultural practices on ecosystems and ensures fair compensation for producers.</p> <p>Differentiation: Certification allows honey producers to differentiate their products in the market. For example, a certification indicating a specific geographical origin or a unique production method can make a product stand out among competitors, attracting consumers who appreciate these specific qualities.</p> <p>Food Safety: Certifications like Hazard Analysis and Critical Control Points (HACCP) contribute to food safety by identifying and controlling potential hazards in the honey production process. This is crucial for preventing contamination and ensuring that the honey is safe for consumption.</p> <p>Credibility and Transparency: Certification by independent third-party organizations adds credibility to the claims made by honey producers. It demonstrates a commitment to transparency and a willingness to adhere to established standards that go beyond self-declarations.</p> <p>Support for Sustainable Practices: Certifications that promote sustainable and environmentally friendly practices encourage honey producers to adopt methods that have a reduced impact on</p>

	ecosystems. This aligns with the growing consumer demand for products that are produced with sustainability in mind.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, Honey Processors, Honey marketers, KEBS, Agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications-posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Certification cost • Sustainable honey quantities • Reliable honey markets
Partners/stakeholders for scaling up and their roles.	<ul style="list-style-type: none"> • KALRO – train beekeepers on the importance of honey certification • KEBS- Testing of honey samples • Supermarkets - buy and sell certified honey to final consumers. • Agri-preneurs
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Baringo
Counties where TIMP will be up-scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited funds for testing honey samples • Lack of knowledge by beekeepers about the importance of honey certification
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Train beekeepers on the importance of certification. • Capacity build beekeepers on the honey qualities • Link beekeepers to service providers eg KEBS
Lessons learned in upscaling if any	<ul style="list-style-type: none"> • Most beekeepers sell uncertified honey at the farm gate.
Social, environmental, policy and market conditions necessary for development and up scaling	<ul style="list-style-type: none"> • Certification to be made easy and less tedious to all genders and age groups • Certification process be in compliant and in conformity with national and county regulations • Promotes high and stable supply of honey for local and export markets • Certification allows selling, labeling, and represent products as organic.

D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Honey sample testing KES 1000 / test, • KEBS annual fee
Estimated returns	<ul style="list-style-type: none"> • KES 850-1000 per Kg of certified organic honey
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to agricultural information, technology and knowledge on honey certification • High illiteracy level among women makes them unable to read the dissemination documents and other materials
Gender related opportunities	<ul style="list-style-type: none"> • Proper application of the management practice will lead to improved health of men, women and youth due to consumption of organic honey that are free from hazards. • Opportunities for increased sales leading to high profit margins due to quality assurance and consumer confidence resulting from certification
VMG issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Requires some movement on the farm to maintain records and process verification which may be untenable by some VMGs who are elderly and disabled. • VMGs have less access to agricultural information, technology and knowledge on the management practice • High illiteracy level of the VMGs makes them unable to read the dissemination documents and other materials.
VMG related opportunities	<ul style="list-style-type: none"> • Proper application of the management practice will led to improved health of VMGs due to consumption of clean health cashews that are free from hazards.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers who practice certification of honey maintain their honey on the market throughout the seasons. The beekeeping groups in Kitui, Machakos, and Baringo are such group that sells a Kg of honey at KES 700 minimum. This has transformed communities livelihood for better.
Application guidelines for users	<ol style="list-style-type: none"> 1. https://kilimo.go.ke/wp-content/uploads/2023/05/15.05.2023-BEE-INDUSTRY-DRAFT-REGULATIONS-2023.pdf 2. https://www.au-ibar.org/sites/default/files/2020-11/doc_20150723_certification_honey_1_en.pdf 3. https://issuu.com/beesfd/docs/123_bfdj_july2017/s/12874797 4. https://www.tharakahoney.com/quality-policy-certifications/
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO: Muo Kasina, Richard Kimitei, Dan Toroitich, Caroline Kimani,

Partner organizations	Common Interest Groups, Community Based Organizations, , Extension service providers, Kenya Bureau of Standards, Agri- preneurs
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2.13.6 Geographic branding of honey

2.13.6 TIMP name	Geographic branding of honey
Category (i.e. technology, innovation or management practice)	Management practice
A: Description	
Problem to be addressed	Lower incomes arising from poor market uptake and prices due to lack of awareness and familiarity with modern branding concepts among apiculture farmers, leading to reduced market share.
What is description it? (TIMP)	Geographic branding is the associating of a product's, service's, or brand,s unique attributes with its geographic location of origin. This practice enhances the perceived value and appeal of the product by capitalizing on the reputation of the specific area.
Justification	Knowledge on geographic branding by apiculture farmers of their products is crucial for several reasons. Firstly, it empowers farmers to differentiate their bee products in the market by associating them with a specific geographic location. This distinction enhances the perceived value of the products, allowing farmers to command premium prices and gain a competitive edge. Secondly, geographic branding provides an avenue for farmers to showcase the unique characteristics and qualities of their honey or other bee products that are influenced by the local environment. This establishes authenticity and creates a compelling story for consumers, fostering a connection that goes beyond the product itself. Thirdly, by understanding and implementing geographic branding, farmers can tap into consumer preferences for locally sourced and authentic products, potentially expanding market reach. Ultimately, this knowledge contributes to the economic success of individual farmers and strengthens the overall resilience and sustainability of the apiculture industry.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, processors, traders, consumers; researchers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension Models • Mass media – Electronic and Print

	<ul style="list-style-type: none"> • Publications-Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Enthusiasm among farmers to embrace the practice of geographic branding of their products • A growing market that reward geographically branded products • Creation of personalized training materials catering for language diversity within the community. • Engagement with the community to cultivate a sense of ownership and collective responsibility. • Use of practical demonstrations and hands-on sessions to enhance the learning process. • Supportive policies and regulations that enhance geographically branded products • Securing funding resources to produce and distribute essential materials for impactful training and outreach programs.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – Development and dissemination of the TIMPs • Private sector – to publicize and disseminate the TIMP • National, and County governments, faith-based organizations, NGOs and development partners to take up the management practice and avail it to farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPS will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Limited awareness of geographic branding may hinder interest and participation, especially among farmers accustomed to traditional marketing methods. • Resource constraints, particularly in remote areas, such as limited access to technology, may impede effective engagement in training programs. • Language diversity poses challenges in delivering training materials and conducting effective communication. • Varying education levels among farmers can affect the effectiveness of the training. • Market fluctuations for apiculture products may affect farmers' perceptions of the relevance and importance of geographic branding. • Time constraints due to busy schedules may limit farmers' availability and commitment to training. • Insufficient availability of trained facilitators, aligned training materials, or resources specific to apiculture may hinder effective dissemination. • Limited financial resources for outreach programs, workshops, and the development of training materials may

	constrain the scope and effectiveness of dissemination efforts.
Suggestions for addressing the challenges in upscaling if any	<ul style="list-style-type: none"> • Conduct targeted awareness campaigns to educate farmers about the benefits of geographic branding. • Collaborate with local organizations or government initiatives to improve technology infrastructure in remote areas. • Customized training programs in local languages and adapt content to suit the diverse educational levels of farmers. • Use practical demonstrations and hands-on sessions to enhance understanding. • Implement strategies to stabilize the market for apiculture products, e.g cooperatives • Flexible training schedules that accommodate farmers' busy routines. • Invest in building the capacity of facilitators and trainers on the concept of geographic branding. • Lobby for financial support from governmental or non-governmental organizations to fund outreach programs, • Develop culturally sensitive materials and approaches that resonate with the local context. Engage with community leaders and influencers
Lessons learned in upscaling if any	None
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • A well-informed and educated community that understands the value of geographic branding. • Strong social networks and support within the community to encourage collective participation in geographic branding practices. • A cultural context that embraces modern marketing concepts and values the uniqueness of local products. • A rich and diverse natural environment that contributes to the unique characteristics of bee products. • Adoption of sustainable apiculture practices to ensure the long-term availability of high-quality products. • A healthy ecosystem that supports the thriving of bee colonies and contributes to the distinctiveness of the honey produced. • Enabling regulatory frameworks that facilitate and encourage geographic branding of bee products. • Policy measures to motivate farmers to engage in geographic branding. • Clear quality standards and certifications that ensure the authenticity and quality of branded products. • A market with a growing demand for locally produced and branded bee products. • Adequate market access and distribution channels for farmers to reach consumers with their branded products.

	<ul style="list-style-type: none"> • Implementation of fair trade practices that benefit both farmers and consumers in the value chain.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	None attached
Estimated returns	Farmers who are able to geographically brand their bee products can reap premium prices in the market and hence improve their income
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • High illiteracy levels among women leading to lack of geographical branding of their products. • Women have limited access to education, training and extension services • Women have less access to market for branded apiculture products • In some farming communities' women have limited decision-making power as men dominate decisions at the household and community levels • Women have less access to inputs such as finances and other inputs required for geographical branding of their products
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youths, women and men in performing the task of geographical branding • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances.
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men • VMGs are often excluded from decision making in development and dissemination activities • VMGs have limited access to education, training and extension services on o geographical branding • VMGs have less access to market for their branded apiculture product • Women have less access to inputs such as finances and other inputs required for to geographical branding of their products • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial apiculture enterprises
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youths, in performing the task of geographical branding • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances.
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	<ol style="list-style-type: none"> 1. Training manuals 2. https://onlinelibrary.wiley.com/doi/10.1155/2019/2932509 3. https://www.frontiersin.org/articles/10.3389/ffgc.2020.00102

	4. https://www.researchgate.net/figure/Geographical-distribution-of-honey-samples-collected-for-analysis_tbl1_259784629 5. https://saspublishers.com/article/14583/download/
F: Status of TIMPS readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further Research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, KALRO-Apiculture and Beneficial Insects Research Institute (ABIRI), P.O. Box 32, MARIGAT Email; director.abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, A. Murage and E Nyambati
Partner organizations and their roles	KALRO, Producer organizations, County Governments

Gaps

1. Development of dissemination and publicity materials for farmers.
2. Understand the unique characteristics of the region that the product come from and which needs to be branded
3. Profiling of the chemistry and biochemistry of honey and correlating these with specific unique environmental parameters, for branding (Assembling accompanying branding information)

2.14 Apiculture Policy and Regulations

2.14.1 Beekeeping Policy options and regulations

2.14.1 TIMP name	Beekeeping Policy options and regulations
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low productivity and incomes within the apiculture sector due to a substantial knowledge gap concerning policies and regulations. Absence of policies and regulations that address the bee industry.
What is it? (TIMP description)	Knowledge of apiculture policy options and regulations offers beekeepers a structured framework for operating within legal parameters, enhancing hives' product quality, gaining market access, adopting sustainable apiculture practices, and advocating for their specific needs. Through strict adherence to apiculture regulations and being well-informed about policies, beekeepers can significantly improve their economic prospects and contribute

	towards the overall sustainability and success of the apicultural sector.
Justification	Training apiculture farmers on policies and regulations within the apiculture sub-sector is crucial as it addresses a significant knowledge gap, enabling farmers to comprehend and adhere to critical legal requirements essential for the long-term sustainability of apiculture production practices. Lack of awareness can result in unintended violations, penalties, and legal challenges, ensuring that beekeepers are compliant with stringent standards for apiculture products' quality, hygiene, and safety to safeguard consumers' health and enhance the industry's reputation. Access to both local and international markets is often contingent on strict adherence to specific regulations. Without proper knowledge, apiculture farmers may miss out on lucrative market opportunities, limiting their income potential. Knowledge of policies empowers apiculture farmers to actively participate in shaping agricultural policies that benefit their sector, contributing to economic empowerment and the overall success of the apiculture industry.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Apiculture farmers, input providers, and extension officers, agri-preneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Relevance of the training program – Designing training programs that specifically address the unique needs and challenges faced by apiculture practitioners. • Accessibility – Ensuring that training materials and sessions are easily accessible to apiculture farmers, including those residing in rural or remote areas. • Simplicity – Presenting training content in a clear and understandable manner, avoiding unnecessary technical or legal jargon to facilitate easy comprehension by beekeepers. • Participatory learning – Actively engaging apiculture farmers through participatory learning methods, such as group discussions, case studies, and practical demonstrations, to ensure better knowledge retention and practical application in their beekeeping practices.

	<ul style="list-style-type: none"> • Inclusivity – Taking into account the diverse needs of apiculture, including women and youth, and developing training programs that are inclusive and equitable to promote widespread participation and benefit.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Extension service providers (County, NGOs, Farmer-based organizations, faith-based organizations) – To train farmers on the TIMP • NGOs, ICIPE – To be part of the facilitators • Farmer groups – To take up the training and provide training to other farmers • Agripreneurs
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Baringo, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega and all beekeeping regions in Kenya
Challenges in dissemination	<ul style="list-style-type: none"> • Complexity of legal language: Policies and regulations are often written in complex legal language that can be difficult for farmers to understand, leading to confusion and misinterpretation. • Diversity of the audiences: Beekeepers come from diverse backgrounds, and one-size-fits-all training may not address the specific needs of different groups • Apiculture farmers may be located in rural remote areas which are less accessible • Apiculture farmers are mainly subsistence and may not be keen on policy and regulation issues • Cultural and language diversity affecting communication • Inadequate extension agents familiar with local dialects of target areas
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Simplify legal language into clear, farmer-friendly terms. Utilize local languages whenever possible to enhance accessibility and understanding. • Customize training programs to the specific needs, literacy levels, and gender considerations of diverse apiculture farmer groups. Pay special attention to addressing the unique requirements of women, youth, and marginalized communities, ensuring inclusivity and effectiveness. • Practical illustrations to enhance comprehension of policy concepts: use practical, real-world examples that resonate with apiculture farmers. Demonstrate the tangible impact of compliance on their daily beekeeping practices, reinforcing the relevance of understanding and adhering to policies. • Incentive mechanisms: Introduce incentives for farmers who adhere to policy guidelines, emphasizing the positive outcomes of compliance, such as improved productivity, market access, and sustainability in apiculture practices.

	<ul style="list-style-type: none"> • Mobile outreach strategies: Overcome the accessibility challenges posed by the remote locations of apiculture farmers through mobile outreach initiatives, including on-site visits and training sessions. • Culturally sensitive trainers: Ensure that trainers are culturally sensitive and, preferably, possess an understanding of the local language.
Lessons learned	<ul style="list-style-type: none"> • This is a new TIMP • Comprehensive training on policies and regulations equips beekeepers with the knowledge and tools necessary to comply with legal requirements. • This empowerment enables them to make informed decisions that uphold the integrity of their beekeeping practices and contribute to the long-term success and economic well-being of their apiculture enterprises.
Social, environmental, policy and market conditions necessary development and upscaling	<ul style="list-style-type: none"> • Culturally sensitive training program with active engagement in the local community to cultivate trust and cooperation among apiculture practitioners. • Community involvement by engaging community leaders, elders, and influential figures to ensure a collaborative approach to apiculture farming practices. • Policies that encourage but actively support sustainable and environmentally friendly apiculture practices. • Active participation of apiculture farmers in the development and review of policies directly related to their industry. • Ensure that beekeepers have access to a foundational level of education and relevant resources that empower them in their apiculture enterprises. • Policies that are clear, accessible, and aligned to the specific needs of beekeepers, promoting a farmer-friendly approach. • Rewarding market initiatives that incentivize compliance, creating opportunities for apiculture farmers to benefit from their commitment to adhering to regulations.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The information will be offered to farmers at no cost
Estimated returns	<ul style="list-style-type: none"> • Although no monetary value is directly linked to the TIMP, it is expected that once farmers follow the set rules and regulation, they will improve their production and especially the quality of their products and hence become more competitive, and this will result in higher incomes
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to education and therefore cannot read and fully understand/comprehend the existing apiculture policies • Women and youth have Inadequate representation in policy formulation and validation dialogues • Women and youth have less access to policy training/sensitization forums/workshops

	<ul style="list-style-type: none"> • Men dominate discussions in policy formulation and validation processes as women sometimes remain muted • Women have limited access to extension services therefore are not aware of the existing policies • Cultural norms and beliefs may discourage women from participating in public activities or interacting with unfamiliar individuals, including trainers
Gender related opportunities	<ul style="list-style-type: none"> • Opportunities exist for adequate representation of women and youths in the policy formulation and validation processes since the constitution supports their participation
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs have less access to education therefore cannot read and fully understand/comprehend the existing apiculture policies • VMGs have Inadequate representation in the policy formulation and validation dialogues • VMGs have less access to policy training/sensitization forums/workshops than men • Men dominate discussions in policy formulation and validation processes as VMGs sometimes remain muted • VMGs have limited access to education and extension services therefore cannot articulate the existing policies well • Cultural norms and beliefs may discourage women from participating in public activities or interacting with unfamiliar individuals, including trainers
VMG related opportunities	<ul style="list-style-type: none"> • Opportunities exist for adequate representation of women and youths in the policy formulation and validation processes since the constitution supports their participation
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	<ol style="list-style-type: none"> 1. Technical bulletins 2. https://barakaagricollege.ac.ke/index.php/beekeeping-development/ 3. KALRO Apiculture ToT Manual
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director KALRO – Apiculture and Beneficial Insects Research Institute (ABIRI) P.O. Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO
	J Kasina, S. Wambua, A. Murage, and E Nyambati

Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,
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Gaps

Analysis of impact of policies on apiculture value chain

3.1 Stingless bees

3.1.1 *Ferrugenea* Stingless bees

3.1.1TIMP name	Ferrugenea Stingless bees
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
The problem to be addressed	<ul style="list-style-type: none"> • Low productivity in hive products- • Low adoption of stingless beekeeping • Lack of knowledge on stingless bee species suitable for keeping for the production of honey and other products and for pollination services.
What is it? (TIMP description)	<p>Ferrugenea Stingless bee (<i>Meliponula ferruginea</i>) is a medium-sized bee (5.1-5.9mm long), reddish brown bee widely distributed in Kenya and well known for its characteristic honey.</p> <p>Nesting site: In cavities in indigenous trees in the forest and in cavities in mudwalls in homesteads and underground in farms and forests.</p> <p>Morphologically- The abdomen and hind leg of <i>M. ferruginea</i> are reddish brown.</p> <p>Nest architecture- The nest propolis, honey pots are reddish brown. The nest entrance is circular.</p> <p>Distribution- The species is widely distributed in Kenya, hence the species adapts to wide weather conditions allowing its domestication in most parts of the country. So far the species have been observed to adapt well in Coast regions, Kakamega, Central Kenya, Nairobi county.</p> <p>Honey production: The honey production of <i>Meliponula ferruginea</i>, like that of other stingless bee species, is generally much lower compared to honey bee species like <i>Apis mellifera</i>. The colonies of <i>Meliponula ferruginea</i> are smaller, and the individual workers are typically smaller as well. As a result, the</p>

	<p>amount of honey produced by a colony of <i>Meliponula ferruginea</i> is limited.</p> <p>Honey characteristics: Chemical characterization of its honey show Hydroxymethylfurfural (HMF): 10.6 mg/kg it has the lowest HMF levels compared to other species.</p> <p>Sugars: 73.9 Brix. The sugar levels were higher than in all species studied</p> <p>Water activity (aw): 0.70 Moisture (%): 26.1 Ph: 4.9 Free acidity (meq/kg): 38 Electrical conductivity (mS/cm): 1 Proline (mg/kg): 443 Invertase activity (IN): 3.7 HMF (mg/kg): 10.6 Sugars (% Brix): 73.9</p>  <p><i>Meliponula ferruginea</i> Source: Dr. N. Ndungu</p>
Justification	<p>Stingless bee species are non-stinging bees found naturally in the conducive environment. Currently more than 12 species of stingless bees have been identified in Kenya.</p> <p>However, more species are expected to be identified thorough field collections are carried out.</p> <p>The main genus found in Kenya include; <i>Meliponula</i>, <i>Hypotrigona</i>, <i>Liotrigona</i>, <i>Plebeina</i>, <i>Dactyllurina</i> and <i>Cleptotrigona</i> (Parasitic stingless bee that steal hive products from other stingless bees). All the five genera have been</p>

	<p>domesticated except <i>D. schimidi</i> which build their nests on the outer part of tree branches making it difficult to domesticate it. Stingless bees are usually identified using morphological features, nesting sites, and nest architecture.</p> <p>Correct identification of stingless bees in Kenya and sound knowledge of their nesting sites, nest architecture is paramount to enhance the stingless bee domestication which would then lead to high honey and other hive products. Thus, increase in income generation for the farmers. <i>Meliponula ferruginea</i> is an important species, widely distributed and thus can have wide area for domestication.</p> <p>Species with economic importance: <i>Meliponula togoensis</i>, <i>M. ferruginea</i>, <i>M. lendlana</i>, <i>M. bocandei</i>, <i>Liotrigona</i> sp. and <i>Plebeina armata</i></p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, researchers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of the species in a locality • Acceptance by policymakers and local communities • Financing regulations that encourage investment • Honey from these species may be of higher quality • Market opportunities are highly likely to contribute to incomes
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • ICIPE-To guide in identification of stingless bee species • KALRO-For farmers linkages and trainings • County governments extension workers for farmer linkages and training) • Farmers-To allow access to their farms during search of colonies • KEFRI-To allow access to the Kenyan forests where some stingless bees live • Stingless bee traditional hunters—who assist in identification of stingless bee colonies in the wild
C: Current situation and future scaling up	

Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of Knowledge and awareness of <i>Meliponula ferruginea</i> • High absconding rates caused by diseases and pests
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased training to change the practices • Increased awareness through social media and on-farm demonstrations
Lessons learned in upscaling if any	Increased honey production
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Acceptance by policymakers and local communities • Financing regulations that encourage investment • Honey from these species may be of higher quality • Market opportunities are highly likely to contribute to incomes
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Not known
Estimated returns	<ul style="list-style-type: none"> • Not identified
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Men and the youths mostly perform the task of hunting <i>M. ferruginea</i> in the forest • Men mostly perform the task of hunting <i>M. ferruginea</i> in the forest • Women and youths have less access to information and knowledge on the management practice • Women and youths have less access to production resources such as land, capital and labour • Women and youths have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youths in hunting <i>M. ferruginea</i> in the forest • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs are often excluded from decision making in development and dissemination of technologies • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for some VMGs in cleaning the hives • Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	


Success stories from previous similar projects	<i>Meliponula ferruginea</i> has been domesticated in Kakamega, and in Arabuko Sokoke in coast region
Application guidelines for users	<ol style="list-style-type: none"> 1. Youtube video for stingless beekeeping 2. https://www.youtube.com/watch?v=5qZs14mcMQc 3. https://www.youtube.com/watch?v=zCKmbN9rAkM 4. Kiatoko Nkoba 2014 thesis 5. Ndungu Nelly, Kiatoko Nkoba¹, Ciosi Marc, Salifu Daisy, Nyansera Damaris, Masiga Daniel and Raina Suresh K (2017) Identification of stingless bees (Hymenoptera: Apidae) in Kenya using Morphometrics and DNA barcoding), (<i>Journal of Apicultural Research</i>, https://doi.org/10.1080/00218839.2017.1327939). 6. Mokaya, H.O., Nkoba, K., Ndunda, R.M. and Vereecken, N.J., 2022. Characterization of honeys produced by sympatric species of Afrotropical stingless bees (Hymenoptera, Meliponini). <i>Food chemistry</i>, 366, p.130597.
F: Status of TIMP readiness (1- ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	<p>KALRO Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa,</p> <p>ICIPE Kiatoko Nkoba and Nelly Ndungu</p>
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

Gaps

Identification of more species of stingless bees

3.1.2 Bocandei Stingless bee

3.1.2 TIMP name	Bocandei Stingless bee
Category (i.e. technology, innovation or management practice)	Technology

A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low productivity in hive products- • Low adoption of stingless beekeeping • Lack of knowledge on stingless bee species suitable for keeping for the production of honey and other products and for pollination services.
What is it? (TIMP description)	<p>Bocandei Stingless bee (<i>Meliponula bocandei</i>) is a large sized bee (7.0 mm long), the legs are orange yellowish.</p> <p>Nesting site: In cavities in indigenous trees in the forest</p> <p>Morphologically- The abdomen and hind leg of <i>M. bocandei</i> are reddish brown. Has 9 hamuli in the hind wing.</p> <p>Nest architecture- The brood are organized in clusters. The nest entrance is.</p> <p>Distribution- In Kenya, the species is widely distributed, therefore, the species adopts to wide weather conditions allowing its domestication in most parts of the country. The species have been observed to adopt well in Coast regions, Kakamega, Central Kenya, Nairobi county</p> <p>Honey production:</p> <p>Honey characteristics:</p> <p>Water activity (aw): 0.70</p> <p>Moisture (%): 27.6</p> <p>Ph: 4.4</p> <p>Free acidity (meq/kg): 48</p> <p>Electrical conductivity (mS/cm):0.6</p> <p>Proline (mg/kg): 457</p> <p>Invertase activity (IN): 2.8</p> <p>HMF (mg/kg): 11.2</p> <p>Sugars (% Brix): 72.4.9</p> <hr/> <div>  </div> <p><i>Meliponula bocandei</i> Photo: Nelly Ndungu</p>
Justification	<p>Stingless bee species are non stinging bees found naturally in the conducive environment. Currently more than 12 species of stingless bees have been identified in Kenya.</p> <p>However, more species are expected to be identified thorough field collections are carried out.</p>


	<p>The main genus found in Kenya include; <i>Meliponula</i>, <i>Hypotrigona</i>, <i>Liotrigona</i>, <i>Plebeina</i>, <i>Dactyllurina</i> and <i>Cleptotrigona</i> (Parasitic stingless bee that steal hive products from other stingless bees). All the five genera have been domesticated except <i>D. schimidti</i> which build their nests on the outer part of tree branches making it difficult to domesticate it. Species with economic importance: <i>Meliponula togoensis</i>, <i>M. ferruginea</i>, <i>M. lendliana</i>, <i>M. bocandei</i>, <i>Liotrigona sp.</i> and <i>Plebeina armata</i></p> <p>Stingless bees are usually identified using morphological features, nesting sites, and nest architecture.</p> <p>Correct identification of stingless bees in Kenya and sound knowledge of their nesting sites, nest architecture is important to enhance the stingless bee domestication which would then lead to high honey and other hive products. Thus, increase in income generation for the farmers. <i>Meliponula bocandei</i> is an important species, widely distributed and thus can have wide area for domestication.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, researchers,agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of the species in a locality • Community acceptance
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • ICIPE-To guide in identification of stingless bee species • KALRO-For farmers linkages and trainings • County governments extension workers for farmer linkages and training) • Farmers-To allow access to their farms during search of colonies • KEFRI-To allow access to the Kenyan forests where some stingless bees live • Stingless bee traditional hunters—who assist in identification of stingless bee colonies in the wild
C: Current situation and future scaling up	

Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of Knowledge and awareness of <i>Meliponula ferruginea</i> • High absconding rates caused by diseases and pests
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased trainings to change the practices • Increased awareness through social media and on farm demonstrations
Lessons learned in up scaling if any	Increased honey production
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • Financing regulations that encourage investment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 1000/= per hive
Estimated returns	<ul style="list-style-type: none"> • One hive can produce 200g of honey per harvest each costing Ksh600 • About 4 harvests are possible in a year, giving a farmer about 2,400 annually • A farmer keeping 50 hives will make annually about KES 120,000/- • Hives can last more than 10 years
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Men mostly perform the task of hunting <i>Meliponula bocandei</i> in the forest • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and youths in hunting <i>Meliponula bocandei</i> in the forest • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs are often excluded from decision making in development and dissemination of technologies • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for some VMGs in cleaning the hives

	<ul style="list-style-type: none"> Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<i>Meliponula bocandei</i> has been domesticated in Kakamega, and in Arabuko Sokoke in coast region
Application guidelines for users	<p>Youtube video for stingless beekeeping Kiatoko Nkoba 2014 thesis</p> <p>1 Ndungu Nelly, Kiatoko Nkoba¹, Ciosi Marc, Salifu Daisy, Nyansera Damaris, Masiga Daniel and Raina Suresh K (2017) Identification of stingless bees (Hymenoptera: Apidae) in Kenya using Morphometrics and DNA barcoding), (<i>Journal of Apicultural Research</i>, https://doi.org/10.1080/00218839.2017.1327939).</p> <p>2 Mokaya, H.O., Nkoba, K., Ndunda, R.M. and Vereecken, N.J., 2022. Characterization of honeys produced by sympatric species of Afrotropical stingless bees (Hymenoptera, Meliponini). <i>Food chemistry</i>, 366, p.130597.</p>
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	<p>1. Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org</p>
Lead organization and scientists	<p>KALRO Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa,</p>
	<p>ICIPE Kiatoko Nkoba and Nelly Ndungu</p>
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,

3.1.3 Plebeina Stingless bee species

3.1.3 TIMP name	Plebeina Stingless bee species
Category (i.e. technology, innovation or management practice)	Innovation

A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low productivity in hive products • Low adoption of stingless beekeeping • Lack of knowledge on stingless bee species suitable for keeping for the production of honey and other products and for pollination services.
What is it? (TIMP description)	<p>Plebeina Stingless bee species (<i>Plebeina armata</i>), the mopane bee or mopane fly, is a very small gnat-like stingless bee species native to Africa, and the only member of its genus.</p> <p>Nesting site: <i>P. armata</i> is an underground cavity nester and its nests are only found in termite mounds.</p> <p>Nest architecture- <i>P. armata</i> organize their brood in horizontal combs.</p> <p>Distribution – In Kenya, the species is widely distributed, hence the species adapts to wide weather conditions allowing its domestication in most parts of the country. The species have been observed to adapt well in Kakamega county</p> <p>Honey production:</p> <p>Honey characteristics:</p> <p>Water activity (aw): 0.71</p> <p>Moisture (%): 27.2</p> <p>Ph: 4</p> <p>Free acidity (meq/kg): 141</p> <p>Electrical conductivity (mS/cm):0.6</p> <p>Proline (mg/kg): 415</p> <p>Invertase activity (IN): 4.6</p> <p>HMF (mg/kg): 55.2</p> <p>Sugars (% Brix): 72.9</p> <div>  </div> <p><i>Plebeina armata</i> Photo: Nelly Ndungu</p>
Justification	<p>Stingless bee species are non-stinging bees found naturally in a conducive environment. Currently, more than 12 species of stingless bees have been identified in Kenya.</p> <p>However, more species are expected to be identified thorough field collections are carried out.</p> <p>The main genus found in Kenya include; <i>Meliponula</i>, <i>Hypotrigona</i>, <i>Liotrigona</i>, <i>Plebeina</i>, <i>Dactyllurina</i> and <i>Cleptotrigona</i> (Parasitic stingless bee that steal hive products from other stingless bees). All the five genera have been domesticated except <i>D. schimidti</i> which build their nests on the outer part of tree branches making it difficult to domesticate it. Species with economic importance: <i>Meliponula</i></p>

	<p><i>togoensis</i>, <i>M. ferruginea</i>, <i>M. lendliana</i>, <i>M. bocandei</i>, <i>Liotrigona</i> sp. and <i>Plebeina armata</i></p> <p>Stingless bees are usually identified using morphological features, nesting sites, and nest architecture.</p> <p>Correct identification of stingless bees in Kenya and sound knowledge of their nesting sites, nest architecture are paramount to enhance the stingless bee domestication which would then lead to high honey and other hive products. Thus increase in income generation for the farmers. <i>Plebeina armata</i> is an important species, widely distributed and thus can have wide area for domestication.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, researchers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Availability of the species in a locality Community acceptance
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> ICIPE-To guide in identification of stingless bee species KALRO-For farmers linkages and trainings County governments extension workers for farmer linkages and training) Farmers-To allow access to their farms during search of colonies KEFRI-To allow access to the Kenyan forests where some stingless bees live Stingless bee traditional hunters—who assist in identification of stingless bee colonies in the wild
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Lack of Knowledge and awareness of <i>Plebeina armata</i> High absconding rates caused by diseases and pests
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Increased training to change the practices Increased awareness through social media and on-farm demonstrations

Lessons learned in upscaling if any	<ul style="list-style-type: none"> Increased honey production
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> Community acceptance Acceptance by policymakers and local communities Financing regulations that encourage investment Honey from these species may be of higher quality Market opportunities are highly likely to contribute to incomes Financing regulations that encourage investment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> 1000/= per hive
Estimated returns	<ul style="list-style-type: none"> One hive can produce 200g of honey per harvest each costing Ksh600 About 4 harvests are possible in a year, giving a farmer about 2,400 annually A farmer keeping 50 hives will make annually about KES 120,000/- Hives can last more than 10 years
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> Men mostly perform the task of hunting <i>Plebeina armata</i> in the forest Women and youths have less access to information and knowledge on the management practice Women and youths have less access to production resources such as land, capital and labour Women and youths have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> Employment opportunities exist for men and youths in hunting <i>Plebeina armata</i> in the forest Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> VMGs are often excluded from decision making in development and dissemination of technologies VMGs have less access to information and knowledge on the management practice VMGs have less access to production resources such as land, capital and labour VMGs have less access to training and extension services
VMG related opportunities	<ul style="list-style-type: none"> Employment opportunities exist for some VMGs in cleaning the hives Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<i>Plebeina armata</i> has been domesticated in Kakamega, and in Arabuko Sokoke in coast region
Application guidelines for users	<ol style="list-style-type: none"> YouTube video for stingless beekeeping Kiatoko Nkoba 2014 thesis

	<p>3. Ndungu Nelly, Kiatoko Nkoba¹, Ciosi Marc, Salifu Daisy, Nyansera Damaris, Masiga Daniel and Raina Suresh K (2017) Identification of stingless bees (Hymenoptera: Apidae) in Kenya using Morphometrics and DNA barcoding), (<i>Journal of Apicultural Research</i>, https://doi.org/10.1080/00218839.2017.1327939).</p> <p>4. Mokaya, H.O., Nkoba, K., Ndunda, R.M. and Vereecken, N.J., 2022. Characterization of honeys produced by sympatric species of Afrotropical stingless bees (Hymenoptera, Meliponini). <i>Food chemistry</i>, 366, p.130597.</p> <p>5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10537491/</p>
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa, ICIPE Kiatoko Nkoba and Nelly Ndungu
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,

3.1.4 Stingless bees Domestication

3.1.4 TIMP name	Stingless bees Domestication
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Modernizing stingless bee beekeeping • Expanding beekeeper opportunities • Providing protection and safety

	<ul style="list-style-type: none"> Difficulties in management of colonies in the wild
What is it? (TIMP description)	Domestication of stingless bees involves harvesting wild colonies and placing them in modern hives. Which are then placed in a meliponary (apiaries).
Justification	<p>Stingless bees keeping (<i>meliponiculture</i>) involves harvesting colonies mostly in the wild, in the forest, underground or on the house walls and placing the colony in a stingless bee hive.</p> <p>Most of the honey hunters discard the brood after harvesting the honey in the forest. The introduction of hives to domesticate stingless bees will preserve the brood and act as a source of honey for the farmers.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<ul style="list-style-type: none"> Stingless beekeepers, extension service, researchers, input suppliers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Availability of wild colonies Management and conservation of floral resources Access to funds Availability of locally available materials such as wood for hives and meliponary construction.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> ICIPE-Provides design and train on construction of hives for domestication ICIPE- Training of the farmers- capacity building County governments extension workers for farmer linkages and training) KALRO-Technical backstopping and training of beekeeping farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> Lack of Knowledge and awareness Practices—Discarding colonies after harvesting High absconding rates Species specific climate requirements...each species has requirements in terms of area to be domesticated

Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased trainings to change the practices • Increased awareness through social media and on farm demonstrations • Credit facilities • Government various funding opportunities e.g. government funds, youth enterprise fund etc
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Increased stingless bee honey production • Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policymakers and local communities • Financing regulations that encourage investment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Meliponary structure, hosting 50 beehives (grass, rafters, posts, KES 50,000 • Each hive costs KES 1,000
Estimated returns	<ul style="list-style-type: none"> • One hive can produce 200g of honey per harvest each costing Ksh600 • About 4 harvests are possible in a year, giving a farmer about 2,400 annually • A farmer keeping 50 hives will make annually about KES 120,000/- • Hives can last more than 10 years
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Men mostly perform the task of harvesting wild colonies and placing them in modern hives • Social and cultural norms may hinder women from performing this task • Women may suffer from bee-sting phobia • Women have less access to information and knowledge on the technology • Women have less access to production resources such as land for apiculture farming • Women have less access to training and extension services, which can lead to a knowledge gap in the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary • Employment opportunities exist for men and youths in offering security, repairing the hives and harvesting the honey • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services on the technology • VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness

VMG related opportunities	<ul style="list-style-type: none"> Affirmative action and Government funds opportunities exist for VMGs to acquire the required credit Employment opportunities exist for youths in offering security, repairing the hives and harvesting the honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> Beekeepers have adopted this management practice in Kakamega and Kitui counties and have harvested honey from the domesticated
Application guidelines for users	You tube video for stingless beekeeping (provide links)
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO Muo Kasina, Richard Kimitei, Daniel Toroitich, Caroline Kimani and Joseph Mulwa,
	ICIPE Kiatoko Nkoba and Nelly Ndungu
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,


Gaps

Work that may need to done to improve TIMP

3.2 Stingless bee Hives

3.2.1 *Bocandei* stingless bee Hives

3.2.1 TIMP name	Bocandei stingless bee Hives
Category (i. e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Each stingless bee species builds their nest in a specific manner, for example the <i>M. bocandei</i> builds its nest in clusters manner.
What is it? (TIMP description)	A stingless bee hive, is the house/home for the domesticated stingless bees' colonies. The design of stingless bee hives is species

	<p>specific; and various designs are available for various species. The design is dictated by the species brood cell construction behavior, some build horizontally while some build vertically.</p>  <p>ICIPE4M</p> <p>Source: Kiatoko Nkoba design</p>
Justification	<p>Transfer of colonies from wild to stingless bee hives also known as domestication technology, requires specific hive designs.</p> <p>There are two kinds of stingless bees, in terms of body size, large, medium and small stingless bees. <i>Meliponula bocandei</i> being a large bee occupy large spaces and thus larger hives are required.</p> <p>Further, wooden stingless bee hives are designed for tree nesting species e.g <i>M. bocandei</i>, <i>Meliponula ferruginea</i>, <i>Meliponula togoensis</i> and <i>H. gribodoi</i>.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of locally available materials such as wood for hives and hive stands construction. • Access to funds
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • ICIPE-Provides design and train on construction of hives for domestication • ICIPE- Training of the farmers- capacity building • KALRO – ARI

	<ul style="list-style-type: none"> Local carpenters-
C: Current situation and future scaling up	
Counties where already promoted if any	Kakamega, Kiambu, Vihiga
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> <i>Meliponula bocandei</i> is mainly found in Kakamega forest and therefore requires regions with similar climatic conditions.
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Carpenters should be trained on the specifications of <i>M. bocandei</i> hives Landscape characterization of the target counties should be carried out.
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Increased honey production Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> General acceptance by policy makers and local communities Financing regulations that encourage investment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> 1 Hive of large bees KES1000
Estimated returns	<ul style="list-style-type: none"> One hive can produce 200g of honey per harvest each costing KES600 About 4 harvests are possible in a year, giving a farmer about 2,400 annually A farmer keeping 50 hives will make annually about KES 120,000/- Hives can last more than 10 years
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> Men mostly perform the task of Hive construction Women have bee sting phobia Women and youths have less access to information and knowledge on the management practice Women and youths have less access to production resources such as land, capital and labour Women and youths have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> There will be creation of job opportunities for men and youths in the hive construction Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Hive construction is labour intensive for VMGs who may not be very healthy VMGs are often excluded from decision making in development and dissemination of technologies VMGs face the barrier of accessing the Single Hive Stand due to inadequate of resources


	<ul style="list-style-type: none"> • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youths in hive construction • Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers have adopted the <i>M. bocandei</i> hives in Kakamega and carpenters have been trained on the same. More carpenters can be trained at ICIPE on <i>M. bocandei</i> hives construction.
Application guidelines for users	<ol style="list-style-type: none"> 1. You tube video for stingless beekeeping 2. Nkoba Kiatoko thesis 2014
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology Nelly Ndung'u
	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, International Centre of Insect Physiology and Ecology and others.,

Gaps

1. Further research work needs to be done on the efficiency of *Bocandei* stingless beehive
2. Further research on compatibility of *M. bocandei* in different regions should be done.
More carpenters need to be recruited and trained on the stingless bee construction.

3.2.2 Ferruginea stingless bee hive

3.2.2 TIMP name	Ferruginea stingless bee hive
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Category (i. e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Each stingless bee species builds their nest in a specific manner, <i>M. ferruginea</i> builds its nest in layers.
What is it? (TIMP description)	<p>A stingless bee hive, is the house/home for the domesticated stingless bees' colonies. The design of stingless bee hives is species specific; and various designs are available for various species. The design is dictated by the species brood cell construction behavior, some build horizontally while some build vertically.</p>  <p>ICIPE</p> <p>Source: Nelly Ndung'u</p>
Justification	<p>Transfer of colonies from wild to stingless bee hives also known as domestication technology, requires specific hive designs.</p> <p>There are two kinds of stingless bees, in terms of body size, large, medium and small stingless bees. <i>Meliponula ferruginea</i> being a medium sized bee occupy large spaces and thus larger hives are required.</p> <p>Further, wooden stingless bee hives are designed for tree nesting species e.g <i>M. bocandei</i>, <i>Meliponula ferruginea</i>, <i>Meliponula togoensis</i> and <i>H. gribodoi</i>.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Availability of locally available materials such as wood for hives and hive stands construction. Access to funds

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • ICIPE-Provides design and train on construction of hives for domestication • ICIPE- Training of the farmers- capacity building • KALRO – ARI • Local carpenters-
C: Current situation and future scaling up	
Counties where already promoted if any	Kakamega, Kiambu, Vihiga
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega and all other counties
Challenges in dissemination	<i>Meliponula ferruginea</i> is widely found in different regions of Kenya.
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Selected carpenters should be trained on the specifications of <i>M. ferruginea</i> hives • Landscape characterization of the target counties should be carried out to determine their suitability of domesticating <i>M. ferruginea</i>.
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Increased honey production of the stingless bees and more farmers are interested in stingless bees • Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • <i>M. ferruginea</i> is currently widely acceptable in different weather conditions. It is one of the species we encourage farmers to introduce in their farms in Kiambu county and many other counties in Kenya.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	1 Hive of large bees Ksh500
Estimated returns	<ul style="list-style-type: none"> • One hive can produce 200g of honey per harvest each costing Ksh600 • About 4 harvests are possible in a year, giving a farmer about 2,400 annually • A farmer keeping 50 hives will make annually about KES 120,000/- • Hives can last more than 10 years
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Men mostly perform the task of Hive construction • Women have bee sting phobia • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youths in the hive construction • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances

VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Hive construction is labour intensive for VMGs who may not be very healthy • VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the Single Hive Stand due to inadequate of resources • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youths in hive construction • Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> • Beekeepers have adopted the <i>M. ferruginea</i> hives in Kakamega and carpenters have been trained on the same. More carpenters can be trained at ICIPE on <i>M. ferruginea</i> hives construction.
Application guidelines for users	<ol style="list-style-type: none"> 1. You tube video for stingless beekeeping 2. Nkoba Kiatoko thesis 2014
F: Status of TIMP readiness (1-ready for up scaling; 2- requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology
	Nelly Ndung'u
	KALRO
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

Gaps

1. Further research work to improve efficiency of *Ferruginea* **stingless bee hive**
2. Further research on compatibility of *M. ferruginea* in different regions should be done
3. More carpenters need to be recruited and trained on the stingless bee construction.

3.2.3 *Pleibeina* Stingless Bee Hives


3.2.3 TIMP name	<i>Pleibeina</i> Stingless Bee Hives
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Unsustainability of productivity of stingless bee products due to lack of domestication and/or appropriate housing.
What is it? (TIMP description)	<p>These are clay manmade pots used as hives specifically for stingless bees, including <i>Plebeia</i> species. This provides the colony with a permanent shelter and beekeepers with an accessible hive from which honey can easily be harvested periodically and thus sustainably.</p> <div> </div> <div> </div>
Justification	<p>Transfer of colonies from wild to stingless bee hives also known as domestication technology, requires specific hive designs.</p> <p>There are two kinds of stingless bees, in terms of body size, large, medium, and small stingless bees. <i>Pleibeina</i> construct nests in the underground cavities and isolate them using a series of membranes of bitumen which is made of resin, mud, and wax.</p> <p>Further, clay pots are designed and are suitable for underground nesting hives such as <i>Plebeina armata</i> and <i>Meliponula lendiliana</i>. These hives ensure ease of repeated honey harvesting and thus product sustainability.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models

	<ul style="list-style-type: none"> • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of locally available materials such as mud and clay for hives construction. • Access to funds
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • ICIPE-Provides design and train on construction of hives for domestication, Training of the farmers- capacity building • KALRO - Training of stakeholders • Local carpenters-fabrication of hives • County government - extension services, mobilisation of farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of Knowledge and awareness • Lack of enough funds for awareness creation
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased training to carpenters involved in hive construction • Credit facilities government various funding opportunities e.g., Government fund, youth enterprise fund etc.
Lessons learned in upscaling if any	<ul style="list-style-type: none"> • Increased honey production when bees are domesticated in hives • Habitat conservation and associated ecosystem services
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance of hives by local communities and policymakers • Financing regulations that encourage investment • Market willing and able to uptake the increased honey production
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • 1 Hive of large bees Ksh 1000, and 700 for smaller
Estimated returns	<ul style="list-style-type: none"> • One hive can produce 200g of honey per harvest each costing Ksh600 • About 4 harvests are possible in a year, giving a farmer about 2,400 annually • A farmer keeping 50 hives will make annually about KES 120,000/- • Hives can last more than 10 years
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Men mostly perform the task of hive construction. • Women have bee sting phobia • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour

	<ul style="list-style-type: none"> Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> There will be the creation of job opportunities for men and youths in the hive construction Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Hive construction is labour intensive for VMGs who may not be very healthy VMGs are often excluded from decision-making in the development and dissemination of technologies VMGs face the barrier of accessing the Single Hive Stand due to inadequate of resources VMGs have less access to information and knowledge on the management practice VMGs have less access to production resources such as land, capital and labour VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> Employment opportunities exist for youths in hive construction Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> Beekeepers have adopted the hives in Kakamega and Kitui counties and have harvested honey from the hives
Application guidelines for users	<ol style="list-style-type: none"> YouTube video for stingless beekeeping https://www.youtube.com/watch?v=5qZs14mcMQc https://www.youtube.com/watch?v=zCKmbN9rAkM
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology
	Nelly Ndung'u
	KALRO
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute

	Community Based Organizations, Farmer groups and common interest groups, other
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3.2.4 Hypotrigona stingless bee hive

3.2.4 TIMP name	Hypotrigona stingless bee hive
Category (i. e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Each stingless bee species builds their nest in a specific manner, <i>Hypotrigona spp</i> builds its nest in clusters and their broods are smallest in size. The <i>Hypotrigona species</i> therefore requires smaller spaces to build their nest and to maintain optimum temperature conditions.
What is it? (TIMP description)	<p>A stingless bee hive, is the house/home for the domesticated stingless bees' colonies. The design of stingless bee hives is species specific; and various designs are available for various species. The design is dictated by the species brood cell construction behavior, some build horizontally while some build vertically.</p> <p><i>Hypotrigona gribodoi</i> build its nest in cluster format and the brood is in smaller size. Therefore, the hive smallest among all stingless bee species</p>  <p>ICIPE</p> <p>Source: Kiatoko Nkoba design</p>
Justification	<p>Transfer of colonies from wild to stingless bee hives also known as domestication technology, requires specific hive designs.</p> <p>There are two kinds of stingless bees, in terms of body size, large, medium and small stingless bees. <i>Hypotrigonoa gribodi</i> being a the smallest bee occupy smallest hive space, thus smaller hives are required.</p>

	Further, wooden stingless bee hives are designed for tree nesting species e.g <i>M. bocandei</i> , <i>Meliponula ferruginea</i> , <i>Meliponula togoensis</i> and <i>H. gribodoi</i> .
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Availability of locally available materials such as wood for hives and hive stands construction. Access to funds
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> ICIPE-Provides design and train on construction of hives for domestication ICIPE- Training of the farmers- capacity building KALRO – ARI Local carpenters- Agripreneurs-to support the business sector
C: Current situation and future scaling up	
Counties where already promoted if any	Kakamega, Kiambu, Vihiga
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, and Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> <i>Hypotrigona species</i> is widely found in different regions of Kenya.
Suggestions for addressing the challenges	<ul style="list-style-type: none"> Selected carpenters should be trained on the specifications of <i>Hypotrigona species</i> hives
Lessons learned in up scaling if any	<ul style="list-style-type: none"> Habitat conservation and associated ecosystem services especially pollination is encouraged and thus increased in production and fruits quality.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> General acceptance by policy makers and local communities <i>Hypotrigona species</i> is currently widely adaptable in different weather conditions. It one of the species we encourage farmers to introduce in their farms especially for pollination.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	1 Hive /Ksh500

Estimated returns	<ul style="list-style-type: none"> • One hive can produce 200g of honey per harvest each costing Ksh600 • About 4 harvests are possible in a year, giving a farmer about 2,400 annually • A farmer keeping 50 hives will make annually about KES 120,000/- • Hives can last more than 10 years
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Men mostly perform the task of Hive construction • Women have bee sting phobia • Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • There will be creation of job opportunities for men and youths in the hive construction • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Hive construction is labour intensive for VMGs who may not be very healthy • VMGs are often excluded from decision making in development and dissemination of technologies • VMGs face the barrier of accessing the Single Hive Stand due to inadequate of resources • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the technology
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youths in hive construction • Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers have adopted the <i>Hypotrigona</i> hives in Kakamega and carpenters have been trained on the same. More carpenters can be trained at ICIPE on <i>Hypotrigona</i> hives construction.
Application guidelines for users	<ol style="list-style-type: none"> 1. You tube video for stingless beekeeping 2. Nkoba Kiatoko thesis 2014
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	


Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology
	Nelly Ndung'u
	KALRO
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

Gaps

1. Work that may need to be done to improve TIMP
2. *Hypotrigona* species need through research in terms of field collection and identification to different species.

3.3 Stingless bee Apiary

3.3.1 Stingless bee apiary

3.3.1 TIMP name	Stingless bee apiary
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Hunting for stingless bee honey • Destruction of stingless bee colonies • Poor quality of stingless bee honey
What is it? (TIMP description)	<p>Involves the installation of stingless beehives in an apiary (Meliponary). The domestication of stingless bees from the wild are placed in bee hives to produce honey of high-quality levels.</p> <div>  </div> <p>Simple stingless bee apiary (Meliponary) Source: Nelly Ndung'u and Beatrice Nganso, respectively</p>
Justification	Putting the stingless bee hives in an apiary helps to conserve the colonies during harvesting as compared with colonies on the wild.

	The hives inside the meliponary are organized and can be managed easily which result to high quality honey.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless Beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of natural habitats including woodlands and forests and hedgerows. • Management and conservation of floral resources • Access to credit facilities and grants
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO- provide designs and train on the construction of the open apiary by the value chain leaders and all other value chain players. • SEKU & UoN- capacity building • County governments (Livestock)-extension workers for farmer linkages and training
C: Current situation and future scaling up	
Counties where already promoted if any	Kajiado, Makueni and Kitui, Baringo,
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega and other NAVCDP Counties
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of awareness • Poor extension services • Poor partnership and linkages • Lack of financial resources • Cultural affiliations
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Increased awareness through social media and on farm demonstrations • Credit facilities through cooperatives, NGOs • Government various funding opportunities e.g., government fund, inua jamii, youth enterprise fund • Targeted communication to change undesirable cultural attitudes
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Reduced bees absconding • Easier management of pests and diseases • Increased honey production • Habitat conservation and associated ecosystem services

Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • Improved bee pastures e.g., managed integrated bee flora • Financing regulations that encourage investment • Market availability spurs increased technology uptake
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Cost of 100 hives • Labour for hive installation KES 2000/=
Estimated returns	<ul style="list-style-type: none"> • One hive can produce half kg of honey per harvest each costing KES 1500/kg • Minimum of 2 harvests per year, hence 1kg/hive • Total harvests 100 kg per year • Income: KES 150,000/year • The hives are expected to last more than 5 years while the structure can last more than 10 years with minimal repairs
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Women can easily do the routine management of the apiary in terms of cleaning and maintenance, and water provision. • Open apiary can be established near the homestead, hence accessible and has no gender bias with modest husbandry exposure.
Gender related opportunities	<ul style="list-style-type: none"> • Saved water encourages home gardening, attractive to women and youth
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • Vulnerable and marginalized communities can adopt Housing of bee colonies because it is easy to establish and manage • Readily available local materials • It is generally an acceptable Management Practice in the society
VMG related opportunities	<ul style="list-style-type: none"> • Income generation from enhanced hive products and creation of jobs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Guidelines to be included in Apiculture Training Manual
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO

Partner organization	Muo Kasina, Richard Kimitei, Joseph Mulwa, Daniel Toroitich, Caroline Kimani
	ICIPE Kiatoko Nkoba and Nelly Ndung'u
	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

3.4. Stingless bees

3.4.1 Stingless bee Husbandry

3.4.1 TIMP name	Stingless bee Husbandry
Category (i.e. technology, innovation or management practice)	Management practices
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Limited understanding of stingless bee care and production.
What is it? (TIMP description)	Stingless bee husbandry refers to all the management practices for stingless bees. It includes all procedures and activities that help to support stingless bee colonies to maintain honey production.
Justification	Poor growth of Stingless bee farming is due to poor beekeeping tools and husbandry, and lack of knowledge on best colony management practices among others. Employing the best management practices are in all levels of stingless beekeeping, during harvesting of stingless bee honey, ensures the colony is handled with care, in the hive in an upright position. The stingless bee apiary should always be kept clean, during harvesting and supplemented with food in dry seasons. In applying good stingless bees husbandry mixing of pollen and honey should be avoided in order to minimize fermentation of the honey.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, input suppliers, researchers, input suppliers, artisans, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services

Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> ● Acceptance of stingless bee keeping by target communities ● Availability of the stingless bees ● Favourable weather conditions
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> ● ICIPE- Research and training of the farmers- capacity building ● KALRO ABIRI - Research and training of the farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> ● Lack of Knowledge and awareness ● Communication barrier
Suggestions for addressing the challenges	Training of individual farmers and farmer associations (50% female) in hiving, colony multiplication and management.
Lessons learned in upscaling if any	<ul style="list-style-type: none"> ● Increased stingless bee honey production
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> ● Socially, there is general acceptance by policymakers and local communities ● Financing regulations that encourage investment ● Market exists for quality stingless bee honey ● Good Stingless bee husbandry is environmentally friendly
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> ● Labour for inspection once a season KES 500 ● Cost of repairs and replace KES 1000 in a season
Estimated returns	<ul style="list-style-type: none"> ● One hive can produce 200g of honey per harvest each costing KES 600 ● About 4 harvests are possible in a year, giving a farmer about 2,400 annually ● A farmer keeping 50 hives will make annually about KES 30,000/- ● Hives can last more than 10 years
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> ● Social and cultural constraints may hinder women from performing apiary cultural practices ● Women have less access to information and knowledge on the technology ● Women have less access to production resources such as land, capital and labour ● Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through the technology
Gender related opportunities	<ul style="list-style-type: none"> ● Employment opportunities exist for women in cleaning the apiary, watering bees and transporting of hives to the apiary ● Employment opportunities exist for men and youths in offering security, repairing the hives and harvesting the honey

	<ul style="list-style-type: none"> • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services than men • VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and Government funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the management practice
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • The management of stingless bees is easy since they do not sting, women and children can involved in the maintenance, the trainings on the Best management practices and scaling up of the trainings is important.
Gender related opportunities	The management of colonies is an opportunity for youth, women and children to be involved in stingless bee farming.
VMG issues and concerns in development, dissemination adoption and scaling up	Vulnerable and marginalized communities can adopt domestication of stingless bees as it is culturally acceptable.
VMG related opportunities	Income generation from enhanced stingless bee hive products and creation of jobs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers have adopted the stingless hives in Kakamega and Kitui counties and have harvested honey from the hives
Application guidelines for users	<ol style="list-style-type: none"> 1. Youtube video for stingless beekeeping 2. https://www.youtube.com/watch?v=5qZs14mcMQc 3. https://www.youtube.com/watch?v=zCKmbN9rAkM
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Lead organization and scientists	ICIPE
	Nelly Ndungu
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute

	Community Based Organizations, Farmer groups and common interest groups, other
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3.4.2 Management of stingless bee pests

3.4.2 TIMP name	Management of stingless bee pests
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low honey production due to pests' infestation • Absconding of the colonies due to pest challenges
What is it? (TIMP description)	Stingless bee pests are those insects and parasites that attack stingless bees, their colonies and hives. The management of stingless bee pest involves prevention/protection of stingless bee hives from pests/intruders that could attack the colony for food and/or occupation leading to reduced stingless bee honey yields and absconding. This can be through application of grease, oil on the hive stand, basins filled with soapy water and metallic guards to prevent rats, lizards and snakes.
Justification	Stingless bee pests may lead to absconding of established stingless bee colonies. Therefore, management of the intruders/pests through preventing their access to the stingless bee is paramount and will lead to enhanced honey yield hence improved family income and nutrition.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service providers, researchers, and trainers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Capacity on pest identification and elimination (awareness creation) • Availability of funds
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Research Institutions - Kenya Agricultural and Livestock Research Organization (KALRO) and International Centre for

	<p>Insect Physiology and Ecology (ICIPE) - Training beekeepers and extension service providers on stingless bee diseases and their management</p> <ul style="list-style-type: none"> ● Extension: National Beekeeping Institution - Extension services provision ● County governments extension workers for farmer linkages and training) ● Non-Governmental Organizations (NGOs) - funding and mobilizing the practices ● Beekeepers used as models in using the practice and mobilizing fellow beekeepers ● Agripreneurs – to support the management of pests through advise
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> ● Beekeepers holding onto their traditional practices ● Inadequate funding for capacity building ● Limited access to credit facilities ● Gender bias toward facilitators
Suggestions for addressing the challenges	<ul style="list-style-type: none"> ● Increased trainings to change traditions limiting dissemination and gender bias ● Increased awareness through social media and on farm demonstrations ● Engage the community leaders ● Mobilize for access and acquisition of funds
Lessons learned in up scaling if any	<ul style="list-style-type: none"> ● It is possible to capacity build beekeepers ● Improved honey production leading to promotion in family income and nutrition. ● There is diversity in job creation hence increased income generation
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> ● General acceptance by policy makers and local communities is required for technology adoption ● Policies that support the consumption of the stingless honey ● Management of pests using eco-friendly methods There is market for stingless bee honey since it is believed to be medicinal
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> ● 4 basins @ KES 200 ● 1 litre liquid soap @ KES 200 ● Grease @ KES 250 ● Old iron sheets for guards @ KES 100
Estimated returns	<ul style="list-style-type: none"> ● Up to 100% Improvement in stingless bee honey yields leading into higher family incomes.

Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Social and cultural constraints may hinder women from performing apiary GBPs • Traditionally, the apiculture is considered a man's enterprise • Women and youths have less access to information and knowledge on the management practice • Women and youths have less access to production resources such as land, capital and labour • Women and youths have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women, men and youth in implementing the management practice • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances.
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men. • VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for youths in implementing the management practice • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers have been able to manage pests in Kakamega, Kitui and Coast. Their meliponaires (stingless bee hives) are well kept and thus no predators have affected the colonies negatively.
Application guidelines for users	<ol style="list-style-type: none"> 1. You tube video for stingless beekeeping 2. https://www.youtube.com/watch?v=NQKwttaack 3. https://www.youtube.com/watch?v=ucvtGL-E4fM 4. https://www.youtube.com/watch?v=QWeJfCWEbPQ
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3- requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology
	Nelly Ndung'u
	KALRO
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa

Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other
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3.4.3 Stingless bee husbandry

3.4.3 TIMP name	Management of stingless bee diseases
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> Reduced honey production due to ineffectiveness of worker bees to collect nectar and use it to make honey. Poor health in hives due to diseases that lower colony productivity and quality of hive products.
What is it? (TIMP description)	<p>These are activities carried out in the stingless bee colonies and could include scouting for diseases, transfer of contaminated colonies to clean hives and removing the contaminated hive products & replacement of the queen to prevent further spread of the disease. Stingless bee disease is any condition affecting the health of stingless bees and hence the productivity of a colony. The diseases may be fungal, bacterial or viral. Some of the diseases affecting stingless bees include:</p> <p>Diseases: Nosema and Black Queen Cell Virus (BQCV) have been detected in stingless bee colonies in Kenya.</p>
Justification	The management of the diseases of the stingless bees is important Diseases are a major threat to the stingless bees since they may lead to the absconding of established stingless bee colonies.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, , researchers, artisans, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> Capacity of the beekeepers to identify and manage the diseases Availability of funds

	<ul style="list-style-type: none"> ● Community acceptance ● Supportive policies
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> ● Research Institutions - Kenya Agricultural and Livestock Research Organization (KALRO) and International Centre for Insect Physiology and Ecology (ICIPE) - Training beekeepers and extension service providers on stingless bee diseases and their management ● Extension: National Beekeeping Institution - Extension services provision ● County governments extension workers for farmer linkages and training) ● Non Governmental Organizations - funding and promotion of the practices ● Beekeepers used as models in using the practice and mobilizing fellow beekeepers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> ● Low knowledge ● Low awareness levels ● Limited engagement with community ● Inadequate resources
Suggestions for addressing the challenges	<ul style="list-style-type: none"> ● Increased trainings to change the practices ● Increased awareness through social media and on farm demonstrations ● Engage the community leaders ● Mobilize for access and acquisition of funds
Lessons learned in up scaling if any	<ul style="list-style-type: none"> ● When hives are well managed and diseases diagnosed early, then management of the diseases are easier. ● Management of stingless bee diseases optimized honey yields ● Management of stingless bee diseases reduced bee absconding
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> ● General acceptance by policy makers and local communities is required for technology adoption ● There is market for stingless bee honey since it is believed to be medicinal
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> ● Stingless bee inspection costs are generally low ● Cost of a new hive (replacement) is KES 500
Estimated returns	<ul style="list-style-type: none"> ● Up to 100% Improvement in stingless bee honey yields leading into higher family incomes.
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> ● Social and cultural constraints may hinder women and youths from performing apiary good beekeeping practices ● Traditionally, the apiculture is considered a man's enterprise

	<ul style="list-style-type: none"> • Women and youths tend to have less access to information and knowledge on the management practice • Women and youths have less access to production resources such as land, capital and labour • Women and youths have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women, men and youth in implementing the management practice • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs have limited access to education, training and extension services than men • VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for both youths and women in implementing the management practice • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Kakamega and Arabuko-sokoke farmers are able to manage diseases early and the production of the stingless bees is not affected
Application guidelines for users	<ol style="list-style-type: none"> 1. You tube video for stingless beekeeping 2. https://repository.seku.ac.ke/bitstream/handle/123456789/1080/Muli_Stingless%20Bees....pdf?sequence=1&isAllowed=y 3. http://www.icipe.org/research/environmental-health/beneficial-and-commercial-insects/projects/integrating-stingless-bees 4. https://www.researchgate.net/publication/235721963_Stingless_Bees_Importance_Management_and_Utilisation_ATraining_Manual_for_Stingless_Bee_Keeping 5. https://www.researchgate.net/publication/257361291_Stingless_bees_in_Kenya 6. https://kilimo.go.ke/wp-content/uploads/2023/03/Beekeeping-making-money-from-bees.pdf
F: Status of TIMP readiness (1-ready for up scaling; 2 -requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org

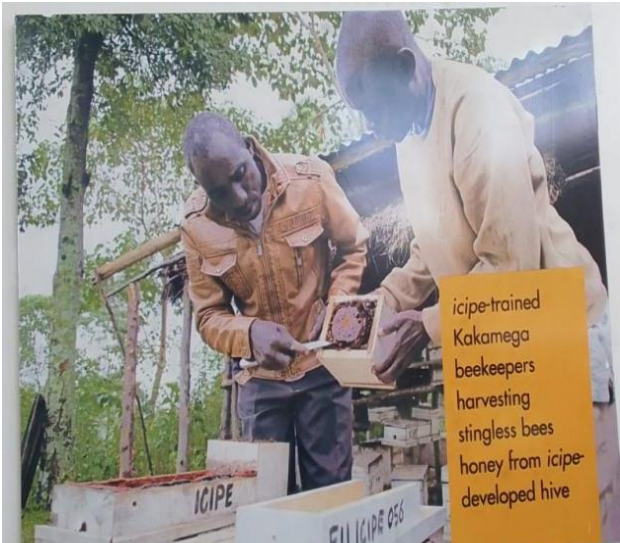
Lead organization and scientists	International Centre for Insect Physiology and Ecology Nelly Ndung'u
	KALRO Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich, Joseph Mulwa
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

Gaps

Develop methods of removing honey from the honeypots without contamination with pollen.

3.5 Stingless bee harvest and post-harvest

3.5.1 Stingless bee honey Harvesting

3.5.1 TIMP name	Stingless bee honey Harvesting
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Low quality stingless bee honey • Threat to stingless bee colonies and establishment • Unfriendly activities to the environment
What is it? (TIMP description)	<p>Harvesting is the art of removing stingless bee honey from the hives, and consequently from the honey pots.</p> <p>Stingless bee honey harvesting involves removing honey pots very carefully using a knife, placing the pots in the bowl, and then closure of the hive. The pots are then squeezed or pricked using a sharp object to remove the honey. The honey is then put in a clean container for further processing.</p> 

	<i>Source: Courtesy of ICIPE</i>
Justification	Stingless bee honey harvesting processes are essential for the sales of quality product to the consumers. Previously, stingless bee honey harvesting was primarily through wild harvesting, and very rudimentary technology compromising both the honey's quality and the well-being of the bees while also causing environmental degradation. However, the introduction of best practices in harvesting resulted in improved shelf-life of the stingless bee honey from 1 month to 2 years thereby further enhancing incomes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, input suppliers, researchers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of harvesting materials • Capacity for technology use
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • International Centre for Insect Physiology and Ecology - Training of the farmers- capacity building • Kenya Agricultural and Livestock Research Organization – Apiculture and Beneficial Insects Research Institute for capacity building • Farmer COOPERATIVES - for mobilizing beekeepers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Machakos, Siaya, Meru, Baringo, Kajiado, West Pokot, Kisii
Challenges in dissemination	<ul style="list-style-type: none"> • Lack of Knowledge and awareness • Inadequate funding
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Training of individual farmers and farmer associations (50% female) in harvesting practices. • Mobilize for funds

Lessons learned in upscaling if any	Increased honey sales
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policymakers and local communities • Stingless bee harvesting techniques has no environmental effect • Financing regulations that encourage investment • Stingless bee honey when properly harvested has high demand
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Training costs
Estimated returns	One hive can produce 1 kg of honey per harvest each costing KES 1000/kg
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Harvesting of stingless bee is a task mostly performed by men • Women and youths have limited access to land for apiculture farming • Women may have bee sting phobia • Women and youth have limited finances to purchase the required inputs • Women have less access to information and knowledge on the technology
Gender related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for men and male youths in Harvesting of stingless bee • Employment for women and youth in the sale of the of honey • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> • VMGs may have limited access to finances to acquire the required inputs • VMGs have limited access to education, training and extension services on the technology • VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and government funds opportunities exist for VMGs to acquire the required credit • Employment for women and youth in the sale of the of honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers have adopted the harvesting methods in Kakamega and Kitui counties and have harvested honey from the hives
Application guidelines for users	You tube video for stingless beekeeping
F: Status of TIMP readiness (1-ready for up scaling; 2requires validation; 3- requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI)


	P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology Nelly Ndung'u
	KALRO Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich and Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

Gaps

Develop methods of removing honey from the honeypots without contamination with pollen.

3.5.2 Stingless bee honey processing, packaging and storage

3.5.2 TIMP name	Stingless bee honey processing, packaging and storage
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
The problem to be addressed	<ul style="list-style-type: none"> • Limited knowledge in stingless bee honey processing, • Inadequate packaging and poor storage facilities
What is it? (TIMP description)	This refers to the set of procedures for processing, packaging and storage followed in preparing stingless bee honey for the market. They include procedures for removing pollen and any other foreign bodies in stingless bee honey before putting it into clean food-grade containers ready for storage on its way to the market.
Justification	Stingless bee honey processing, packaging, and storage are important aspects of generating income from sales of the packaged and high-quality honey. Inadequate stingless bee honey processing, poor packaging and storage done using rudimentary methods compromises the honey's quality and its shelf life. However, the introduction of best practices in stingless bee honey processing, packaging and storage has resulted in improved shelf-life of the stingless bee honey from 1 month to 2 years thereby further enhancing incomes.

	 <p>Stingless bee honey processing kit Source: N Kiatoko</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, input suppliers, researchers, researchers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> ● Farmer Field and Business School (FFBS) ● Agricultural Innovation Platforms (AIP) ● Demonstrations - On-farm and on station ● Agricultural Shows/Exhibitions/Field days ● Trainings - Workshops/Seminars/Meetings ● Public and Private Extension Agents ● Farmer to Farmer Extension models ● Mass media – Electronic and print ● Publications -Posters/Brochures/Leaflets, Manuals ● Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> ● Availability of processing and packaging materials ● Adequate knowledge ● Availability of equipment and materials ● Market to absorb the resultant quality stingless bee honey
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> ● International Centre for Insect Physiology and Ecology - Research and training of the farmers- capacity building ● Kenya Agricultural and Livestock Research Organization ABIRI - Research and training of the farmers ● Farmer Cooperatives – fund farmers’ activities ● Community Interest Groups and Non Governmental Organizations to mobilize farmers ● Agri-preneurs to support farmers’ activities
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui and Kakamega, Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega and other NAVCDP Counties
Challenges in dissemination	<ul style="list-style-type: none"> ● Poor processing and storage equipment

	<ul style="list-style-type: none"> ● Inadequate funding for processing, packaging and storage of stingless bee honey ● Insufficient knowledge on processing, packaging and storage of stingless bee honey
Suggestions for addressing the challenges	<ul style="list-style-type: none"> ● Expose farmers and farmer groups to new processing, packaging and storage equipment ● Fund farmer groups to acquire necessary equipment ● Training of individual farmers and farmer associations (50% female) in processing, packaging and storage of stingless bee honey practices.
Lessons learned in up scaling if any	<ul style="list-style-type: none"> ● Increased stingless bee honey sales and increased income. ● Cleaner stingless bee honey, without pollen contamination ● Low spoilage levels
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> ● General acceptance by policy makers and local communities ● Financing regulations that encourage investment ● Use of eco-friendly methods in the disease management ● Reduced spoilage hence better use of stingless bee honey in the market ● Increased availability of the honey because of its increased longevity after processing ● The medicinal value attached to honey produced by these bees
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> ● Labour for processing and packaging once a season KES 2000 ● Cost of packaging containers KES 1000
Estimated returns	<ul style="list-style-type: none"> ● 1 hive will give 200g @ KES 600/ season ● 50 hives will give =KES 30,000/season
Gender issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> ● Women perform most of the honey processing activities ● Women and youths may suffer from bee-sting phobia ● Women have less access to information and knowledge on the technology ● Women and youths have less access to training and extension services, which can lead to a knowledge gap in the technology ● The technology not be adopted if it increases the work burden for women who often juggle multiple responsibilities such as domestic chores and care taking in addition to honey production
Gender related opportunities	<ul style="list-style-type: none"> ● Employment opportunities exist for women in honey processing, packaging and storage ● Employment opportunities exist for men and youths in offering security, repairing the hives and harvesting the honey
VMG issues and concerns in dissemination, adoption and scaling up	<ul style="list-style-type: none"> ● VMGs may have limited access to finances to acquire the required inputs ● VMGs have limited access to education, training and extension services than men


	<ul style="list-style-type: none"> • VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Employment opportunities exist for women in honey processing, packaging and storage • Affirmative action and government funds opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in offering security, repairing the hives and harvesting the honey
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Beekeepers have adopted the Processing, packaging and storage methods in Kakamega and Kitui counties and have harvested honey from the hives
Application guidelines for users	<ol style="list-style-type: none"> 1. Youtube video for stingless beekeeping 2. https://www.youtube.com/watch?v=5qZs14mcMQc 3. https://www.youtube.com/watch?v=zCKmbN9rAkM
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	ICIPE
	Nelly Ndungu
	KALRO
	Muo Kasina, Richard Kimitei, Caroline Kimani, Daniel Toroitich and Joseph Mulwa
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

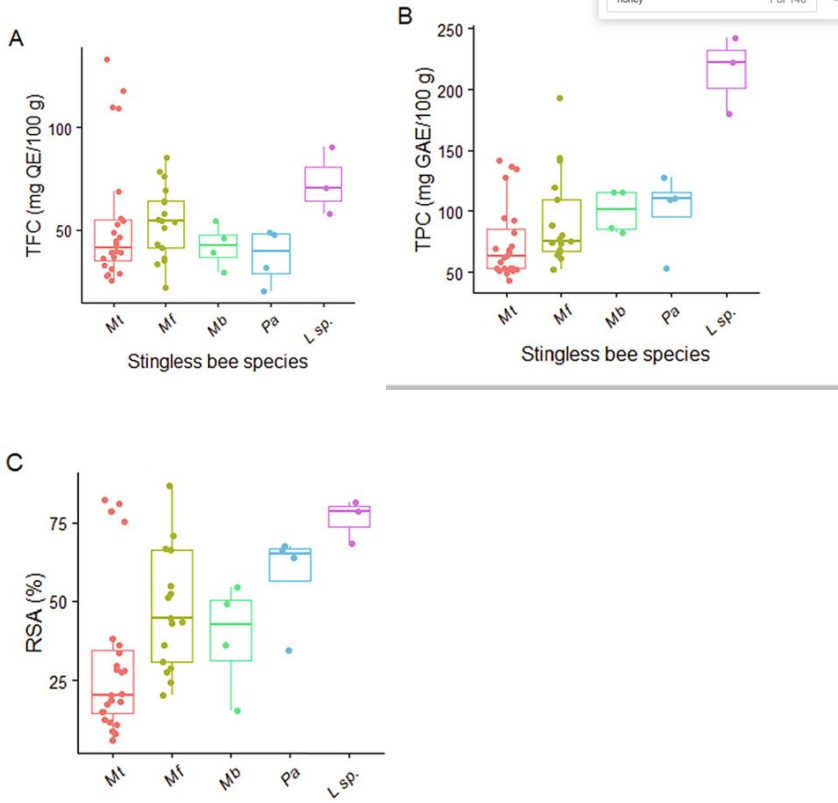
Gaps

How to harvest honey from the stingless bee honey pots without contamination with pollen.

3.6 Stingless bee honey value addition

3.6.1 Stingless bee honey

3.6.1 TIMP name	Stingless bee honey
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Most farmers have limited information about the honey from the stingless bees. Stingless bee honey has high moisture compared to the <i>Apis mellifera</i> honey. Therefore, these honey is more liquid and tends to ferment due to the presence of pollen and also high moisture.
What is it? (TIMP description)	<p>These are the stingless bee honey value addition processes needed for reduce spoilage of stingless bee honey. It could also include characterization of different stingless bee honey for proper identification and customized usage.</p> <p>Honey is a complex mixture of mainly sugars and other substances made by honey bees and some related insects from nectar or honeydew.</p> <p>The honeys that are available currently are from the listed stingless bee species such as <i>Meliponula bocandei</i>, <i>M. ferruginea</i>, <i>M. togoensis</i>, <i>Hypotrigona araujoi</i>, <i>M. beccarii</i> and <i>Plebeina armata</i></p>  <p>Stingless bee honey colours Source: Kiatoko Nkoba, icipe</p> <p>Phytochemical contents</p>

	 <p>Box plots explaining variation in phytochemical contents (A and B), and antiradical activity (C). L_sp = <i>Liotrigona</i> sp., Pa = <i>Plebeina armata</i>, Mb = <i>Meliponula bocandei</i>, Mf = <i>Meliponula ferriginea</i>, and Mt = <i>Meliponula togoensis</i>. <i>M. lendliana</i> was not included, because it had a single data point (one sample). Significant variations across species were observed for TPC (Chi-squared = 15.3, df = 5, $p \leq 0.05$), and RSA (Chi-squared = 16.0, df = 5, $p \leq 0.05$), but not for TFC (Chi-squared = 9.21, df = 5, $p > 0.05$). H.O. Mokaya et al. 2022.</p> <p>Graphics courtesy of Mokaya et al 2022</p>
Justification	<p>Stingless bee honey (SBH) is steadily gaining acceptance among consumers due to its contrasting and appealing flavor and aroma, a more fluid texture and slow crystallization, all contributing to its high commercial potential. The honey is resistant to form hydroxymethylfurfural (HMF) which when subjected to high temperatures, is an added value for its use in pharmaceutical and food industries where the negative effects associated with excess HMF should be avoided. A more recent study revealed that SBH is the only natural product known to be enriched with a biologically active sugar (trehalulose), which has both antidiabetic and acariogenic properties.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, , researchers, agri-preneurs

Approaches to be used in dissemination	<ul style="list-style-type: none"> ● Farmer Field and Business School (FFBS) ● Agricultural Innovation Platforms (AIP) ● Demonstrations - On-farm and on station ● Agricultural Shows/Exhibitions/Field days ● Trainings - Workshops/Seminars/Meetings ● Public and Private Extension Agents ● Farmer to Farmer Extension models ● Mass media – Electronic and print ● Publications -Posters/Brochures/Leaflets, Manuals ● Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> ● Availability of stingless bee colonies and an active colony which can produce honey, ready for harvesting ● Support by policy makers and the local community
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> ● International Centre for Insect Physiology and Ecology - Research and training of the farmers- capacity building ● Kenya Agricultural and Livestock Research Organization ABIRI - Research and training of the farmers ● Farmer Cooperatives – fund farmers’ activities ● Community Interest Groups and NonGovernmental Organizations to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Kakamega and Kilifi
Counties where TIMP will be up scaled	Machakos, Kitui, Siaya, Meru, Baringo, Kajiado, West Pokot, Kisii, Makueni, Baringo, Migori, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> ● Insufficient knowledge on characterization of stingless bee honey ● Inadequate funding for capacity building, research and provision of extension services
Suggestions for addressing the challenges	<ul style="list-style-type: none"> ● More trainings needed and workshops to train farmers researcher and policy makers on the stingless bee honey ● Mobilize funding for promoting the technology
Lessons learned in up scaling if any	<ul style="list-style-type: none"> ● Enhanced stingless bee honey sales and increased income.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> ● General acceptance by policy makers and local communities ● Application of eco-friendly methods in disease management that are compliant with the policies, laws and regulations ● Promotion of the technology is friendly to the environment ● Availability of markets for well characterized stingless bee honey ● Sale of organic honey from the stingless bees will create market opportunities
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> ● The cost of installing new colony KES 500- 1000
Estimated returns	<ul style="list-style-type: none"> ● 1 hive will give 200g @ KES 600/ season


Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • In some communities, taboos prevent women from harvesting honey or interacting with bee colonies in the apiary • Women have less access to information and knowledge on the Stingless bee honey • Women have less access to production resources such as land, capital and labour • Women have less access to training and extension services, which can lead to a knowledge gap in the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and government funds opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs are often excluded from decision making in development and dissemination of the technology • VMGs have less access to information and knowledge on the management practice • VMGs have less access to production resources such as land, capital and labour • VMGs have less access to training and extension services, which can lead to a knowledge gap in the management practice
VMG related opportunities	Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Stingless bee honey are different some farmers can differentiate them and sell them individually, in this case selling three times that of honey bees.
Application guidelines for users	<ol style="list-style-type: none"> 1. https://www.researchgate.net/publication/235721963_Stingless_Bees_Importance_Management_and_Utilisation 2. A Training Manual for Stingless Bee Keeping 3. https://apiconsult.com/wp-content/files/beginners_beekeeping_guide.pdf
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	KALRO
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
	International Centre for Insect Physiology and Ecology
	Nelly Ndung'u

Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other
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Gaps

1. Evaluation of more parameters for characterizing stingless bee honey
2. More research needed to be done on stingless bee honeys.

3.6.2 Stingless bee honey recipes and fusions

3.6.2 TIMP name	Stingless bee honey recipes and fusions
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Fermentation of stingless bee honey leading to spoilage • There is insufficient information regarding stingless bee honey recipe and fusions
What is it? (TIMP description)	<p>Stingless bee honey recipes and fusions are value added products that can be generated from the honey after harvesting and processing. Recipes include; Baking cakes, soap, face oils, soap, sweetener in black tea and coffee, and medicine. Stingless bee honey can be fused with; Cinnamon honey, Ginger honey also known as dawa</p>  <p>Stingless bee honey colours Honeys: Kiatoko Nkoba, icipe</p>
Justification	<p>Stingless bee honey is gaining popularity among consumers due to appealing flavor and aroma, being more fluid, and doesn't crystalize, all the factors contribute to its potential in commercialization. In addition, stingless bee honey when subjected to high temperature doesn't form hydroxymethylfurfural (HMF), make it suitable in pharmaceutical and food industries. The stingless bee honey can therefore be applied in the;</p> <ul style="list-style-type: none"> • Cosmetics • Beauty products • Medical industries • Baking

	<ul style="list-style-type: none"> • Used as sweetener for hot drinks without milk • Energy drink • Food industries as a preservative <p>The honey can be used as fusion where various components can be added for value addition including; Cinnamon, Mukombero and others</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, Private sectors involved in stingless bee sales, researchers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of stingless bee colonies and an active colony which can produce honey, ready for harvesting • Support by policy makers and the local communities
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • International Centre for Insect Physiology and Ecology - Research and training of the farmers- capacity building • Kenya Agricultural and Livestock Research Organization ABIRI - Research and training of the farmers • Farmer Cooperatives – fund farmers’ activities • Community Interest Groups and Non Governmental Organizations to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Kilifi, Kitui and Kakamega
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Insufficient knowledge on of stingless bee honey recipes and fusions • Although farmers are using the stingless bee honey as food, medicinal purposes, sweetener, they have not explored it in the cosmetics industries and for beauty products.
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • More trainings needed and workshops to train farmers researcher and policy makers on the stingless bee honey recipes and stingless bee honey infusions
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Increased stingless bee honey sales and increased income.
Social, environmental, policy and market conditions	<ul style="list-style-type: none"> • General acceptance by policy makers and local communities • There is market for stingless bee honey

necessary for development and upscaling	<ul style="list-style-type: none"> Stingless beekeeping promotes environmental conservation
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> The cost of installing new colony KES 500- KES 1000
Estimated returns	<ul style="list-style-type: none"> For each 300 ml the honey is sold at KES 600
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> Processing, packaging and storage of stingless bee honey is easily manageable and can be done by women, youth or men. Making fusions is mainly termed as women activity and thus most men keep off. The production of beauty and cosmetics products require skills in chemistry which most of the farmers do not have.
Gender related opportunities	<ul style="list-style-type: none"> Men can participate in making soaps and honey fusions
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> VMGs are often excluded from decision making in development and dissemination of the technology VMGs have less access to information and knowledge on the management practice VMGs have less access to production resources such as land, capital and labour VMGs have less access to training and extension services, which can lead to a knowledge gap in the management practice
VMG related opportunities	<ul style="list-style-type: none"> VMG can be involved in making honey fusions and also recipe such as baking cakes which are very health and thus promotes income generation. Affirmative action and government funds opportunities exist for VMGs to acquire the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<ul style="list-style-type: none"> Stingless bee honey is highly medicinal due to its antibacterial and antioxidants values. Thus, mostly used as medicine for coughs and sore throat, and stomach aches. Therefore, the honey is on high demand in Kakamega, Kitui and Coast region. If the baking, cosmetics and `beauty products can be encouraged in this and other regions, then this will increase the value of honey and thus increase income generation in the rural poor households.
Application guidelines for users	You tube video for stingless beekeeping
F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
	International Centre for Insect Physiology and Ecology

Lead organization and scientists	Nelly Ndung'u
	KALRO
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

Gaps

- More research needed to be done on stingless bee honeys recipes and stingless bees honey fusions.

3.6.3 Food safety in stingless beekeeping value chain

3.6.3 TIMP name	Food safety in stingless beekeeping value chain
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	<ul style="list-style-type: none"> • Presence of physical contaminants in stingless bee honey • Detection of chemical contaminants in stingless bee honey • Poor hygiene practices along the value chain • Detection of microbial contaminants in stingless bee honey • Allergies experienced after consumption of stingless bee honey
What is it? (TIMP description)	These are the activities involved throughout the harvesting practices and includes keen adherence to personal hygiene and avoidance of chemical and microbial contaminants. Storage of stingless bee honey should be in clean, airtight containers at room temperature or in a cool, dark place to prevent spoilage
Justification	<p>Food safety for stingless bee honey is grounded in several factors that contribute to the quality and safety of this unique honey product:</p> <p>While these factors support the food safety of stingless bee honey, it's crucial to note that proper beekeeping practices, adherence to local regulations, and maintaining hygiene during harvesting and processing are essential for ensuring the safety and quality of the final product. As with any food item, consumers and producers should stay informed about best practices and local regulations to support the continued production of safe and high-quality stingless bee honey.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless beekeepers, extension service, researchers, agripreneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station

	<ul style="list-style-type: none"> • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful adoption and promotion	<ul style="list-style-type: none"> • Availability of stingless bee colonies and an active colony that can produce honey, ready for harvesting • Support by policy makers and local community leaders
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • International Centre for Insect Physiology and Ecology - Research and training of the farmers- capacity building • Kenya Agricultural and Livestock Research Organization ABIRI - Research and training of the farmers • Farmer Cooperatives – fund farmers’ activities • Community Interest Groups and Non Governmental Organizations to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Kakamega and Kilifi
Counties where TIMP will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Insufficient knowledge on stingless bee honey safety measures • Availability of funds
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • More training and workshops to train farmers, researchers and policymakers on the food safety of stingless bee honey. • Mobilize for more funding
Lessons learned in up scaling if any	<ul style="list-style-type: none"> • Increased safe stingless bee honey consumption/use and increased income.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • General acceptance by policymakers and local communities • There is market for stingless bee honey • Stingless beekeeping promotes environmental conservation
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Not identified
Estimated returns	<ul style="list-style-type: none"> • Not identified
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Women have less access to agricultural information, technology and knowledge on Stingless bee honey Food safety • High illiteracy level of women makes them unable to read the dissemination documents and other materials on Stingless bee honey Food safety • Women may have less access to extension services on the management practice
Gender related opportunities	<ul style="list-style-type: none"> • Proper application of the management practice will lead to improved health of men, women and youths due to consumption of clean health honey that are free from hazards.

VMG issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • MGs have less access to agricultural information, technology and knowledge on Stingless bee honey Food safety • High illiteracy level of the VMGs makes them unable to read the dissemination documents and other materials on Stingless bee honey Food safety • VMGs are often excluded from decision making in development and dissemination activities
VMG related opportunities	<ul style="list-style-type: none"> • Proper application of the management practice will lead to improved health of men, women and youths due to consumption of clean health honey that are free from hazards
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	<ol style="list-style-type: none"> 1. Brochures on the food safety of stingless bee honey. 2. https://apiconsult.com/wp-content/files/beginners_beekeeping_guide.pdf
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G. Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI) P.O Box 32-30403 Marigat Director.Abiri@kalro.org
Lead organization and scientists	International Centre for Insect Physiology and Ecology
	Nelly Ndung'u
	KALRO
	Muo Kasina, Richard Kimitei, Joseph Mulwa, Dan Toroitich, Caroline Kimani
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, other

3.7 Stingless bee business

3.7.1 Stingless beekeeping business plan

3.7.1 TIMP name	Stingless beekeeping Business Plan
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	<ul style="list-style-type: none"> • Lack of planning, hindering the ability of farmers to make informed decisions in beekeeping enterprises.

	<ul style="list-style-type: none"> • Insufficient business planning skills, resulting in challenges in setting clear objectives, efficiently allocating resources, and navigating the complexities of the dynamic apiculture market. • Inability to effectively track performance, leading to missed opportunities for improvement, failure to identify underperforming aspects, and a lack of skills to optimize overall stingless beekeeping operations.
What is it? (TIMP description)	A business plan shows the business goals and how they will be achieved. The plan describes a business, its products and services and strategies to be used to achieve the set goals. A good business plan evolves regularly over time in response to the emerging changes to ensure the success of their stingless beekeeping operations.
Justification	The knowledge of economic analysis of stingless beekeeping contributes to the transitioning of farmers from subsistence to commercial apiculture farming. Enhanced skills in economic analysis of beekeeping serves as a tool for effective enterprise management and allows farmers to overcome the challenges in the apiculture farming. Economic analysis of stingless beekeeping helps farmers track and assess all costs related to marketing of apiculture products. This becomes a safeguard against potential losses, enabling farmers to make informed decisions, optimize resource utilization, and ensure the overall financial viability of their apiculture operations.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Beekeepers, farmer groups, Entrepreneurs in honey products, extension service providers, NGOs and researchers, Agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Establishing a supportive and beekeeping-friendly policy and regulatory framework that encourages stingless beekeeping as a business. • Implementing an inclusive value chain integration that involves all stakeholders along the stingless beekeeping value chain.

	<ul style="list-style-type: none"> • Engaging willing and receptive beekeepers to foster a positive environment for stingless beekeeping activities. • Providing comprehensive training led by skilled facilitators well-versed in business planning, equipped with effective training and communication skills. • Using practical exercises and demonstrations to enhance beekeepers' comprehension of business planning concepts and strategies specific to stingless beekeeping. • Forming partnerships with supportive organizations, including NGOs and extension services, to reinforce the economic analysis capacities of stingless beekeepers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • County Agribusiness Development Officer (CADO) –Train and backstop farmers during implementation • Extension service providers (public and private) – to train farmers on business planning • KALRO – technology development and fine tuning, ToT, backstopping and monitoring implementation • Farmer groups to mobilize farmers • ICIPE - through innovative and applied research, alongside deep exploratory study, impact assessment, evaluation and sustainable capacity building. • Ministry of agriculture and livestock development (MoALD)-beekeeping station
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be up-scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Farmers willingness to adopt the new enterprise of stingless bee keeping • Diverse education levels among beekeepers, with some having limited formal education. • Language barriers that may impede effective communication and understanding in stingless beekeeping training. • Resistance to change, particularly from beekeepers accustomed to traditional or informal business planning methods. • Logistical challenges in reaching and engaging beekeepers, especially in dispersed areas where access may be difficult.
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Simplify business planning to enhance its ease of understanding and application in the context of stingless beekeeping. • Capacity building of beekeepers, with a specific emphasis on business planning aligned for stingless beekeeping enterprises.

	<ul style="list-style-type: none"> • Customized Training: Adapt training materials to meet the educational diversity of beekeepers, ensuring relevance for various levels of education. • Practical sessions with beekeepers, enabling them to undertake business analysis with guidance, emphasizing hands-on learning. • Incorporate success stories and case studies highlighting the positive impact of business planning in the unique context of stingless beekeeping. • Utilize mobile training units or establish regional training hubs to effectively reach and train beekeepers in dispersed areas.
Lessons learned	<ul style="list-style-type: none"> • None • Expected mind set change
Social, environmental, policy and market conditions necessary for the success of the TIMP	<ul style="list-style-type: none"> • Strong community support for stingless beekeepers to share knowledge, resources, and experiences, fostering the success of business plans in the context of stingless beekeeping. • Socially acceptable training programs aligned for the unique requirements of stingless beekeeping. • Favorable policies and regulatory frameworks supporting stingless beekeeping, ensuring a conducive environment for its growth and sustainability. • Environmentally friendly practices aligned for the success of stingless beekeeping enterprises. • Gender equity in training programs, ensuring inclusivity and equal opportunities for both male and female stingless beekeepers. • An existing demand for stingless be hive products and alignment with consumer preferences. •
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	<ul style="list-style-type: none"> • Labour for processing and packaging once a season KES 2000 • Cost of packaging containers KES 1000
Estimated returns	<ul style="list-style-type: none"> • 1 hive will give 200g @ KES 600/season • 50 hives will give =KES 30,000/season
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • Women and youths may face limited access to business planning training programs, workshops, or extension services, contributing to gender disparities in knowledge and skills. • Women and youths in some regions may have lower levels of formal education compared to men, affecting their capacity to engage with and understand business planning concepts for stingless beekeeping. • Women and youths may have limited decision-making authority within households, impacting their involvement in decision-making processes related to stingless beekeeping enterprises.

	<ul style="list-style-type: none"> • Unequal access to resources such as land, credit, and technology may hinder women and youths ability to invest in sustainable stingless beekeeping practices. • Women triple roles may lead to time constraints due to multiple responsibilities, including household chores and caregiving. • Men, women and youths have different needs and priorities in business planning, and a one-size-fits-all approach may not address these differences. • Cultural norms restricting women's participation in public activities may discourage them from attending training sessions or engaging in public forums for economic analysis in stingless beekeeping. • Women and youths may face challenges in accessing markets for their stingless beekeeping products, resulting in gender-based disparities in economic benefits from the adoption of economic analysis practices.
Gender related opportunities	<ul style="list-style-type: none"> • Youths with entrepreneur skills can carry prepare business plans for farmers at a fee • Commercialization can lead to economic empowerment of women through increased income and financial independence • Through business planning women and youths will acquire credit through the affirmative action and government funds to finance their enterprises
VMG issues and concerns in development, dissemination adoption and scaling up of the TIMP	<ul style="list-style-type: none"> • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial apiculture enterprise • VMGs may have limited access to training, and extension services leaving them with inadequate business planning knowledge and skills • VMGs may have limited access to markets • VMGs have less access to production resources such as land, capital, labor and credit hence they might not see the need to prepare a business plan • VMGs have high illiteracy levels which can interfere with understanding the process of preparing a business plan • Some VMGs have limited mobility and might not access training venues • Training programs lack inclusive teaching aids and materials e.g. sign language interpreters and physical facilities that are wheelchair-friendly
VMG related opportunities	<ul style="list-style-type: none"> • Youths with business skills can prepare business plans for farmers at a fee • Through business planning women and youths will acquire credit through the affirmative action and government funds to finance their enterprises

	<ul style="list-style-type: none"> Commercialization can lead to VMGs economic empowerment through increased income and financial independence
E: Case studies/profiles of success stories	
Success stories	TIMP yet to be rolled out
Application guidelines for users	<ol style="list-style-type: none"> 1. Smart Marketing Manual (USAID) 2. https://core.ac.uk/download/pdf/234655887.pdf 3. https://www.researchgate.net/publication/40424177_Socio-Economic_Analysis_of_Beekeeping_and_the_Effects_of_Beehive_Types_on_Honey_Production 4. https://core.ac.uk/download/pdf/234655887.pdf
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, ICIPE, other,

Gaps

There is a gap in business plan development skills for both county staff and farmers

3.7.2 Stingless beekeeping economic analysis

3.7.2 TIMP name	Stingless beekeeping economic Analysis
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	<ul style="list-style-type: none"> Stingless beekeeping is an emerging value chain with limited information on economic analysis. Farmers' inability to assess the profitability of their stingless bee enterprises due to insufficient information and skills. This impediment hampers their capacity to make informed decisions, affecting the economic sustainability of their beekeeping ventures.

	<ul style="list-style-type: none"> Consequently, farmers miss opportunities to enhance efficiency, reduce costs, and maximize revenue, impacting their income potential
What is it? (TIMP description)	<p>The TIMP involves equipping farmers with vital skills and knowledge to perform a thorough economic analysis of their stingless beekeeping enterprise. This encompasses expertise in gross margin calculation and cost-benefit analysis, specifically emphasizing various stingless bee products. Through refining these skills, farmers can evaluate all production factors, calculate returns from product sales, and ascertain economically feasible scales for stingless beekeeping. This proficiency is instrumental in cultivating a flourishing and prosperous stingless beekeeping business, facilitating the shift from subsistence to a commercial venture.</p>
Justification	<p>Stingless bee keeping is still a new venture, and economic analysis has not been ascertained. The enhanced skill on economic analysis becomes a pivotal tool for proficient enterprise management, enabling farmers to navigate the complexities of their stingless beekeeping ventures. For farmers to effectively embrace commercial stingless beekeeping, acquiring robust agribusiness skills, especially in economic analysis, is crucial. Proficiency in economic analysis empowers farmers to smoothly monitor and evaluate all costs incurred and sales realized in their beekeeping enterprises. This serves as a protective measure against potential losses, allowing farmers to make informed decisions, optimize resource utilization, and ensure the overall financial viability of their stingless beekeeping operations.</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	<p>Stingless beekeeping farmers, Farmer groups, agripreneurs, Extension service providers, NGOs and researchers, agripreneurs</p>
Approaches used in dissemination	<ul style="list-style-type: none"> Farmer Field and Business School (FFBS) Agricultural Innovation Platforms (AIP) Demonstrations - On-farm and on station Agricultural Shows/Exhibitions/Field days Trainings - Workshops/Seminars/Meetings Public and Private Extension Agents Farmer to Farmer Extension models Mass media – Electronic and print Publications -Posters/Brochures/Leaflets, Manuals Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> Establishing an enabling regulatory framework with supportive regulations, legislation, and policies for stingless beekeeping as a viable business. Inclusive Value Chain: Integrating all stakeholders along the stingless beekeeping value chain to promote collaboration and inclusivity.

	<ul style="list-style-type: none"> • Tailor-Made Training: Designing customized, gender-inclusive training programs that address the specific needs of stingless beekeepers, ensuring relevant and accessible content. • Expert Facilitators: Using well-trained facilitators with expertise in economic analysis for stingless beekeeping and effective training and communication skills. • Practical Training: Incorporating practical exercises and demonstrations to enhance farmers' understanding of economic analysis concepts and strategies in the context of stingless beekeeping. • Supportive Partnerships: Collaborating with agricultural and beekeeping production groups, NGOs, and extension services to enhance the economic analysis capacities of stingless beekeepers.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • County Agribusiness Development Officer (CADO) –Train and backstop farmers during implementation • Extension service providers (public and private) – to train farmers on economic and cost benefit analysis • KALRO – technology development and fine tuning, ToT, backstopping and monitor implementation
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Diverse education levels making it challenging to understand complex economic concepts. • Low motivation may be experienced in the face of poor market prices for stingless bee products. • Lack of computational skills among farmers can impede their ability to conduct effective economic analysis for stingless beekeeping ventures. • Knowledge Gaps: Farmers may lack comprehensive knowledge of the dynamics of stingless beekeeping, including changing input prices and market trends. • Limited access to training resources, particularly for farmers in remote or economically disadvantaged areas, poses a challenge. • Diversity in languages spoken in different regions can be a barrier to understanding economic concepts, especially where multiple languages are prevalent. • Farmers face time constraints due to busy schedules with various responsibilities, including farm work and household chores. • The complexity of economic concepts and terminology may be unfamiliar to stingless beekeepers, posing a learning challenge.

	<ul style="list-style-type: none"> • Cultural norms and beliefs can influence the willingness of farmers, especially women, to participate in training programs for stingless beekeeping.
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Develop customized training materials that cater to varying literacy levels and educational backgrounds e.g. use visual aids, practical examples, and local languages to enhance comprehension. • Use community-driven approaches involving local leaders and community members in the planning and implementation of training programs to support ownership and encourages participation. • On-site training and addressing challenges related to accessibility. • Provide translated and localized training materials to address language barriers. Use local dialects and ensure that terminology is culturally relevant and easily understood. • Integrate financial literacy initiatives into training programs to enhance farmers' understanding of economic concepts. • Design training programs that are inclusive of different gender and age groups. Consider organizing separate sessions if needed to address specific needs and concerns. • Engage farmers actively through participatory learning methods, such as group discussions, case studies, and practical demonstrations. • Offer flexible training schedules that accommodate farmers' busy routines. • Strengthen extension services and establish a continuous support mechanism.
Lessons learned	<ul style="list-style-type: none"> • A comprehensive training on economic analysis is important to provide farmers with skills on how to cost their factors of production. • Simplified tools are more appealing to farmers • Real-time price indices enable farmers to make informed decisions about when and where to sell their hive products, ultimately maximizing their returns. • Digital platforms can help farmers stay informed about input prices, market trends, connect with buyers, and manage their businesses more efficiently.
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Strong community support and acceptance of stingless bee keeping • Stingless bee keeping practices that support sustainable environments • Farmers' ability to produce and market stingless bee products • Farmers' existing knowledge of economic analysis and their level of education. • Farmers access to training materials, instructors, and facilities. • Gender inclusive training programs.

	<ul style="list-style-type: none"> • An existing demand for stingless bee products and consumer preferences. • Conducive policy and regulatory framework to enable farmers commercially venture into stingless bee production
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The information will be offered to farmers at no cost
Estimated returns	It is expected that farmers using this information will estimate their costs of production and venture in economically viable stingless bee production enterprises.
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • Women and youths may face limited access to economic analysis training programs, workshops, or extension services, contributing to gender disparities in knowledge and skills. • Women and youths in certain regions may have lower levels of formal education compared to men, affecting their capacity to engage with and understand economic analysis concepts for stingless beekeeping. • Women and youths may have limited decision-making authority within households, impacting their involvement in decision-making processes related to stingless beekeeping enterprises. • Unequal access to resources such as land, credit, and technology may hinder women and youths ability to invest in sustainable stingless beekeeping practices. • Gender-specific roles, especially for women and youths engaged in stingless beekeeping, may lead to time constraints due to multiple responsibilities, including household chores and caregiving. • Cultural norms restricting women's participation in public activities may discourage them from attending training sessions or engaging in public forums for economic analysis in stingless beekeeping. • Women and youths may face challenges in accessing markets for their stingless beekeeping products, resulting in gender-based disparities in economic benefits from the adoption of economic analysis practices.
Gender related opportunities	<ul style="list-style-type: none"> • Youths with entrepreneur skills can carry out business analytical services as a paid undertaking • Commercialization can lead to women economic empowerment through increased income and financial independence • Affirmative action and government fund opportunities exist for women and youths to acquire the required credit • Apiculture commercialization offers women the opportunity to become entrepreneurs thereby contributing to economic growth. • Enhanced informed and collaborative decision-making, considering a diversity of perspectives

	<ul style="list-style-type: none"> • Economic independence fostering a more equitable distribution of economic responsibilities • Women entrepreneurs, equipped with economic analysis skills, can enhance the competitiveness of their stingless bee products in the market, leading to increased market share and profitability • Training programs can contribute to a broader awareness of gender issues, potentially influencing the development of gender-inclusive policies in the stingless bee keeping sub-sector. • Contribute to the adoption of sustainable stingless beekeeping practices, considering the long-term environmental
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs often have restricted access to productive skills such as land, capital, and technology, which may hinder their participation in commercial stingless beekeeping farming. • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial stingless beekeeping enterprise • VMGs may have limited access to training, and extension services leaving them with inadequate knowledge and skills for stingless beekeeping commercialization. • VMGs have high illiteracy levels leading to lack of record keeping and poor record keeping • Some VMGs may reside in remote or isolated areas, making it challenging to access training on economic analysis • Training programs not accommodating materials in accessible formats e.g. sign language interpreters, and physical facilities that are wheelchair-friendly
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and government fund opportunities exist for women and youths to acquire the required credit • Youths with entrepreneur skills can carry out business analytical services as a paid undertaking • Commercialization can lead to VMGs economic empowerment through increased income and financial independence
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	<ol style="list-style-type: none"> 1. https://atpsnet.org/wp-content/uploads/2017/05/agri_innovations_v1.pdf#page=99 2. KALRO Apiculture ToT Manual
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling

G: Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, ICIPE, other,

Gaps

There is need to do gross margin analysis for both stingless beekeeping under different production systems

3.7.3 Stingless bee business

3.7.3 TIMP name		Stingless beekeeping Records and Record Keeping
Category (i.e. technology, innovation or management practice)		Management practice
A: Description		
Problem to be addressed		<ul style="list-style-type: none"> • Farmers lack sufficient knowledge and skills in effective record-keeping practices leading to challenges in tracking data and making informed decisions. • Difficulties in monitoring and evaluating enterprise performance thus hindering the ability to identify areas for improvement. • Insufficient record-keeping practices affect the overall competitiveness of stingless bee products. • Poor allocative efficiency potentially affecting the overall productivity and incomes • Low productivity in stingless bee farming due to inadequate record-keeping
What is description it? (TIMP)		This is a management practice which entails equipping farmers with the essential skills to collect important data and information, enabling them to systematically track activities in stingless bee farming. It goes beyond mere data collection, but aims to empower farmers to instill a culture of comprehensive record-keeping. This encompasses documenting all aspects of production and marketing, including quantities and costs of inputs incurred and resultant outputs. The gathered information serves as a valuable resource, allowing farmers to evaluate the performance of their stingless bee enterprises. By fostering record keeping culture, farmers are equipped to make informed decisions and to analyze

	trends, identify areas for improvement, and optimize the overall efficiency and success of their stingless bee ventures.
Justification	Training farmers in records and record-keeping is crucial for optimizing resource management and overall efficiency of the stingless bee enterprise. Records and record-keeping empowers farmers to systematically track hive performance, resource utilization, and financial transactions, fostering informed decision-making. The comprehensive records also enhance market access by providing reliable information on product quality and traceability. Financial management and planning are streamlined, ensuring economic sustainability and growth. Moreover, the continuous improvement in records and record-keeping is facilitated by regularly updated records contributes to the overall resilience and success of stingless bee enterprises. Compliance with regulations is streamlined, and efficient monitoring and evaluation enable farmers to assess the effectiveness of their practices and implement evidence-based improvements. In essence, this training is a strategic investment that benefits individual farmers and elevates the sustainability, profitability, and competitiveness of the entire stingless bee sector.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, women, youth and VMGs, processors, traders, consumers; private multipliers; researchers, agri-preneurs
Approaches to be used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Eagerness of farmers to initiate the practice of keeping comprehensive production and marketing records. • Development of customized training materials aligned to various languages spoken in the community. • Active community engagement to support ownership and collective responsibility. • Implementation of practical demonstrations and hands-on sessions to reinforce the learning experience. • Favorable and sustained market for stingless bee products to encourage farmers' commitment to record-keeping. • Ensuring the availability of funding to create and disseminate materials essential for effective training and outreach initiatives

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO – Development and dissemination of the TIMPs • Private sector – to publicize and disseminate the TIMP • National, and County governments, faith-based organizations, NGOs and development partners to take up the management practice and avail it to farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPS will be up scaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Farmers limited understanding of the benefits of record keeping making it challenging to garner interest and participation. • Limited access to technology, hindering the adoption of digital record-keeping tools and platforms. • Resistance to adopting new practices, especially among older or more traditional farmers, can impede the acceptance • Farmers with low literacy and numeracy levels may face difficulties in maintaining written or numerical records • Farmers may perceive record-keeping as time-consuming, especially when faced with demanding daily responsibilities, leading to inconsistent implementation. • Insufficient availability of trained facilitators, training materials, or resources aligned to the specific needs of stingless bee farmers can hinder effective dissemination. • Limited financial resources for outreach programs, workshops, and the development of training materials may hinder the scope and effectiveness of dissemination efforts. • Language and cultural diversity can pose challenges in conveying information effectively, requiring targeted approaches and materials adapted to local contexts. • Concerns about the privacy and security of recorded information may deter farmers from fully embracing record-keeping practices, especially if they perceive potential risks.
Suggestions for addressing the challenges in upscaling if any	<ul style="list-style-type: none"> • Conduct targeted awareness campaigns to emphasize the benefits of record-keeping • Develop aligned training programs that consider the literacy levels, language preferences, and cultural aspects • Ensure that training materials are simple, visual, and user-friendly. • Introduce simplified and accessible technology solutions for record-keeping e.g. mobile applications or basic digital tools that align with farmers' technological literacy levels. • Collaborate with community leaders and influential figures to endorse the importance of record-keeping. • Implement incentive programs to motivate farmers, such as recognition for outstanding record-keeping practices or access to additional training opportunities and resources.

	<ul style="list-style-type: none"> • Collaborate with local agricultural extension services, NGOs, and community-based organizations to leverage existing networks for effective dissemination and support. • Seek funding from various sources, including governmental agencies and non-profit organizations. • Design training programs that accommodate farmers' schedules, • Implement measures to address data privacy concerns,
Lessons learned in upscaling if any	<ul style="list-style-type: none"> • The TIMP is yet to be upscaled
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Encouraging community-based support systems • Integrating record-keeping within the context of sustainable stingless bee farming practices that align with environmental conservation and biodiversity efforts. • Supportive regulatory framework that recognize and support the importance of record-keeping in stingless bee farming, providing guidelines and incentives for its implementation. • Creating and strengthening market linkages that reward beekeepers for maintaining accurate records, • User-friendly record keeping techniques, considering the diversity of technological literacy levels among beekeepers. • Financial support for the development and dissemination of training materials, workshops, and extension services that promote record-keeping. • Designing record-keeping initiatives that are culturally sensitive and align with the norms and values
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The information will be offered to farmers at no cost
Estimated returns	Although no monetary value is directly linked to the TIMP, it is expected that once farmers follow efficient record keeping, they will improve their production and especially the quality of their products and hence become more competitive, and this will result in higher incomes.
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • Women and youths have limited access to markets and value-addition opportunities which may limit their ability to leverage record-keeping for improved market negotiations • Women have high illiteracy levels which may result in challenges of using digital tools for record-keeping, lack of record keeping and poor records. • Women have limited access to training and extension services • In some farming communities' women and youths have limited decision-making power as men dominate decisions at the household and community levels • Women and youths have less access to production resources such as land, capital, extension services and credit • Social networks and support systems may vary for men, women and youths in stingless bee farming communities,

	affecting their ability to share knowledge and experiences related to record-keeping
Gender related opportunities	<ul style="list-style-type: none"> • Affirmative action and government funds opportunities exist for women and youths to acquire the required credit • Employment opportunities exist for the educated youths in keeping records for the farmers • Apiculture commercialization may lead to women and youths empowerment due to increased income and financial independence
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs may face barriers in accessing training programs due to geographical location, limited resources, or social marginalization • VMGs often face economic challenges, limiting their ability to invest in record-keeping tools • VMGs have less access to education. • VMGs, especially women and minority groups, may have limited ownership or control over land and resources essential for stingless bee farming. • VMGs may have limited access to digital technology, potentially excluding them from the benefits of digital record-keeping tools. • VMGs may face discrimination or stigma within their communities, affecting their participation in training programs and hindering the adoption of new practices. • VMGs are often excluded from decision making in development and dissemination activities • VMGs have limited access to markets since they may not travel to distant markets due to disability or a lack of exposure • VMG adoption is low possibly due to a lack of awareness
VMG related opportunities	<ul style="list-style-type: none"> • Affirmative action and government funds opportunities exist for women and youths to acquire the required credit • Empowerment opportunities exist for women through increased income as a result of good record keeping leading to increased confidence and self-efficacy • Opportunities exist for VMGs' enhanced credibility in the market leading to increased market access and better bargaining power, leading to improved income and financial independence. • Employment opportunities exist for learned VMGs especially the youths in conducting the task of record keeping
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	<ol style="list-style-type: none"> 1. Training manuals 2. https://naturekenya.org/2022/08/04/honey-from-stingless-bees-medicinal-gold/ 3. http://www.icipe.org/research/environmental-health/beneficial-and-commercial-insects/projects/integrating-stingless-bees

	4. https://www.researchgate.net/publication/257361291_Stingless_bees_in_Kenya 5. https://www.youtube.com/watch?v=ucvtGL-E4fM 6. https://www.researchgate.net/figure/Production-of-stingless-bee-honey-per-hive-per-year_fig2_272792968
F: Status of TIMPS readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further Research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations and their roles	Ministry of Agriculture Livestock and Fisheries, National Beekeeping Institute, ICIPE

Gaps

1. Development of dissemination and publicity materials for farmers.
2. Need to carry out a survey to find out why farmers don't keep records

3.7.4 Marketing of Stingless Bee Products

3.7. 4 TIMP name	Marketing of Stingless Bee Products
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	<ul style="list-style-type: none"> • Farmers have limited information about markets for stingless bee products and necessary inputs. • There are unorganized markets for stingless bee products leading to inefficiencies, reduced bargaining power for farmers, and challenges in establishing reliable market channels. • Low market participation, especially for women which impedes farmers' ability to maximize the economic potential of stingless bee products. • Limited understanding of market dynamics hampers farmers' ability to respond effectively to market changes, optimize pricing strategies, and adapt to evolving market conditions.
What is it? (TIMP description)	This management practice is designed to equip farmers with essential information, skills, and knowledge to excel in the competitive production of stingless bee enterprise. Farmers will gain a deep understanding of efficient markets, market channels

	and dynamics, and key linkages within the stingless bee value chain. The practice will also explore consumer preferences and delve into the economics of product pricing. By perfecting the skills needed to connect farmers with various market opportunities, this practice aims to maximize stingless bee production and sales, ultimately promoting a thriving and prosperous stingless bee business, transitioning from subsistence to commercial venture.
Justification	The primary justification for training farmers on the marketing of stingless bee products lies in the pivotal role marketing plays in unlocking the economic potential of the enterprises. Beekeepers often face challenges related to insufficient market information, unorganized market structures, and a lack of understanding of market dynamics. Comprehensive training in marketing, farmers gain crucial insights into identifying market opportunities, establishing organized market channels, and strategically positioning their products in the market. The knowledge of product price determination is essential for farmers to navigate the challenges of low prices and market disruptions. Empowering farmers with marketing skills enhances their ability to secure fair prices for their stingless bee products and contributes to the overall growth and sustainability of the industry. It enables them to actively participate in market dynamics, optimize their pricing strategies, and ultimately ensures that the economic benefits of stingless bee reach their full potential, fostering a more prosperous and resilient sector.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers and stakeholders in the stingless bee value chain, agripreneurs
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Enabling regulations, legislation, and policies that support and facilitate marketing of stingless bee products. • Farmers willingness to adopt commercial stingless bee production practices • Inclusive value chain integration incorporating all stakeholders along the stingless bee value chain • Designing aligned, gender and VMG inclusive training programs to the specific needs, knowledge levels, and

	<p>constraints of the target farmers, ensuring the content is relevant and accessible.</p> <ul style="list-style-type: none"> • Well trained facilitators in stingless bee marketing and possess effective training and communication skills. • Provide farmers with access to essential resources, including market information, market linkages, and financial support to kick start their marketing efforts. • Incorporate practical exercises, demonstrations, and real-life case studies to enhance farmers' understanding of marketing concepts and strategies • Farmer producer organizations: Encourage the formation of farmer producer organizations and cooperatives to collectively sell their products hence improving their bargaining power • Supportive Organizations: Collaborate with agricultural and beekeeping groups, NGOs, and extension services to strengthen the marketing capacities of farmers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Extension service providers (public and private): to train farmers and give timely information on markets • County governments- link farmers with markets • KALRO: technology development and fine tuning, ToT, backstopping and monitor implementation • Farmer groups: Adoption and utilization of Technologies, Innovations, management practices and related information.
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Varying education levels of the farmers since some may have limited formal education. Marketing is essential and the training materials should be aligned to meet diverse learning needs. • Poor accessibility of learning sites especially in the remote area • Poor and fluctuating market prices may discourage farmers. • Limited access to markets for stingless bee products may demotivate farmers from attending training programs • Lack of marketing skills among farmers can impede their ability to make informed marketing decisions. • Middlemen and other actors along the value chain can exert significant influence, potentially limiting farmers' independence and returns. • Limited understanding of financial concepts may hinder farmers' ability to effectively manage pricing, budgeting, and financial aspects of marketing.

	<ul style="list-style-type: none"> • Lack of up-to-date information on market trends, consumer preferences, and pricing dynamics can hinder farmers from making informed marketing decisions
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Customized Training: Tailor training materials to suit farmers with varying levels of education. • Introduce financial literacy programs alongside marketing training to enhance farmers' understanding of financial concepts, enabling them to manage pricing, budgeting, and financial aspects effectively. • Enhanced Marketing Skills: Provide comprehensive training to equip farmers with the marketing skills needed such as market analysis, product promotion, pricing strategies, and customer relationship management. • Establish mechanisms to provide farmers with up-to-date information on market trends, consumer preferences, and pricing dynamics, empowering them to make informed marketing decisions. • Formation of Farmers Groups to enhance their bargaining power in the market. • Capacity Building of Chain Actors to enhance market efficiency and fairness.
Lessons learned	<ul style="list-style-type: none"> • This is a new TIMP • It is expected that: <ul style="list-style-type: none"> ○ Aligned marketing strategies are important as “one-size-fits-all” marketing strategies may not work for all farmers. ○ A comprehensive market information system is important to provide farmers with up-to-date data on prevailing market conditions, including demand trends, pricing fluctuations, and consumer preferences. ○ Real-time price indices enable farmers to make informed decisions about when and where to sell their stingless bee products, ultimately maximizing their returns. ○ Continuous market research is crucial to understand the evolving preferences of consumers and the dynamics of the stingless bee market. ○ Producer group model can help small-scale farmers access better markets and negotiate better prices. ○ Strong market linkages can ensure a smooth flow of products from the farm to the market, ensuring timely deliveries. ○ Digital platforms can help farmers stay informed about market trends, connect with buyers, and manage their businesses more efficiently.
Social, environmental, policy and market conditions necessary for development and upscaling	<ul style="list-style-type: none"> • Community engagement to support ownership among beekeepers, encouraging collaboration and mutual support in marketing endeavors. • Conducive policy and regulatory framework for competitive markets of stingless bee products

	<ul style="list-style-type: none"> • Farmers' willingness and ability to produce and market quality stingless bee products. • Consider cultural norms and social structures that may influence marketing practices for hive products • Ensure that farmers have access to training materials, instructors, and facilities. • Ensure gender and VMG inclusion in training programs. • Assess the availability of roads and means of transportation which can impact the logistics of marketing stingless bee products. • An existing market demand for stingless bee products and consumer preferences.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Marketing information will be available at no cost from the identified lead farmer in their locality
Estimated returns	It is expected that farmers using this information will experience increased market access and participation resulting in sustainable and economically viable stingless bee production enterprises.
Gender issues and concerns in development, dissemination, adoption and scaling	<ul style="list-style-type: none"> • Women and youths may face limited access to business planning training programs, workshops, or extension services, contributing to gender disparities in knowledge and skills. • Women and youths in certain regions may have lower levels of formal education compared to men, affecting their capacity to engage with and understand business planning concepts for stingless beekeeping. • Women may have limited decision-making authority within households, impacting their involvement in decision-making processes related to stingless beekeeping enterprises. • Unequal access to resources such as land, credit, and technology may hinder women and youths ability to invest in sustainable stingless beekeeping practices. • Women's triple roles may lead to time constraints due to multiple responsibilities, including household chores and caregiving. • Men, women and youths may have different needs and priorities in business planning, and a one-size-fits-all approach may not address these differences. • Cultural norms restricting women's participation in public activities may discourage them from attending training sessions or engaging in public forums for economic analysis in stingless beekeeping. • Women may face challenges in accessing markets for their stingless beekeeping products, resulting in gender-based disparities in economic benefits from the adoption of economic analysis practices.

Gender related opportunities	<ul style="list-style-type: none"> • Youths with entrepreneurial skills can prepare business plans for farmers at a cost • Commercialization can lead to women's economic empowerment through increased income and financial independence • Through business planning women and youths will acquire credit through affirmative action and government funds to finance their enterprises
VMG issues and concerns in development, dissemination adoption and scaling up of the TIMP	<ul style="list-style-type: none"> • VMGs may have limited access to resources that are fundamental for stingless bee production and marketing. • Lower literacy rates among VMGs can pose challenges in accessing and understanding training materials and market information. • Language disparities may create difficulties in disseminating information and training materials • VMGs may face discrimination when attempting to access markets or negotiate prices for their stingless bee products. • Some VMGs may reside in remote or isolated areas, making it challenging to reach markets and access transportation infrastructure. • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial enterprises • Training programs lack inclusive teaching aids and materials e.g. sign language interpreters and physical facilities that are wheelchair-friendly • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial apiculture enterprise • Some VMGs have limited mobility and might not access training venues • Training programs lack inclusive teaching aids and materials e.g. sign language interpreters and physical facilities that are wheelchair-friendly
VMG related opportunities	<ul style="list-style-type: none"> • Youths with business skills can prepare business plans for other farmers at a fee • Business opportunities exist for learned VMGs on digital marketing • VMGs could form their marketing group or organization to help them with selling their products • Through business planning women and youths will acquire credit through affirmative action and government funds to finance their enterprises • Commercialization can lead to VMGs economic empowerment through increased income and financial independence
E: Case studies/profiles of success stories	
Success stories	None

Application guidelines for users	<ol style="list-style-type: none"> 1. Training manuals 2. https://www.researchgate.net/publication/341789695_Business_Process_Analysis_For_Marketing_Honey_Bee_Products 3. https://kilimo.go.ke/wp-content/uploads/2023/03/Beekeeping-making-money-from-bees.pdf 4. https://www.researchgate.net/profile/Caleb-Barasa/publication/348171931_Bee_populations_genetic_diversity_conservation_marketing_and_contribution_to_rural_households_in_Kenya_a_review/links/658d374c2468df72d3dd7710/Bee-populations-genetic-diversity-conservation-marketing-and-contribution-to-rural-households-in-Kenya-a-review.pdf
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, ICIPE, other,

3.7.5 Stingless beekeeping policy options and regulation

3.7.5 TIMP name	Stingless beekeeping Policy options and regulation
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	<ul style="list-style-type: none"> • There exists inadequate knowledge gap concerning policies and regulations in stingless bee farming on issues such as land use, pesticide regulations, disease management, quality, safety, environmental sustainability, and market access. • The consequences of this knowledge deficit result to decline in overall productivity within the stingless bee farming sector, consequently leading to reduced incomes for households engaged in beekeeping activities

What is it? (TIMP description)	<ul style="list-style-type: none"> • An essential farm management tool, offering beekeepers a structured framework for operating within legal parameters, enhancing hives' product quality, gaining market access, adopting sustainable stingless bee farming practices, and advocating for their specific needs • Through strict adherence to stingless bee farming regulations and staying well-informed about pertinent policies, beekeepers can significantly improve their economic prospects and contribute towards the overall sustainability and success of the apicultural sector
Justification	<p>Training stingless bee farmers on policies and regulations sub-sector is crucial as it addresses a significant knowledge gap, enabling farmers to comprehend and adhere to critical legal requirements essential for the long-term sustainability of production practices. Lack of awareness can result in unintended violations, penalties, and legal challenges. Thus ensuring that beekeepers are compliant with stringent standards for stingless bee products' quality, hygiene, and safety is imperative to safeguard consumers' health and enhance the industry's reputation. Access to both local and international markets is often contingent on strict adherence to specific regulations. Without proper knowledge, stingless bee farmers may miss out on lucrative market opportunities, limiting their income potential. Training can also help farmers access available government opportunities, reduce production costs, and increase profitability. Knowledge of policies empowers stingless bee farmers to actively participate in shaping agricultural policies that benefit their sector, contributing to economic empowerment and the overall success of the industry</p>
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Stingless bee keepers, input providers, agri-preneurs and extension officers
Approaches used in dissemination	<ul style="list-style-type: none"> • Farmer Field and Business School (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - On-farm and on station • Agricultural Shows/Exhibitions/Field days • Trainings - Workshops/Seminars/Meetings • Public and Private Extension Agents • Farmer to Farmer Extension models • Mass media – Electronic and print • Publications -Posters/Brochures/Leaflets, Manuals • Digital Platforms– Website, Dashboards, Apps, Social Media short message services
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Relevance of the training program – Designing training programs that specifically address the unique needs and challenges faced by stingless bee practitioners. • Accessibility – Ensuring that training materials and sessions are easily accessible to stingless bee farmers, including those residing in rural or remote areas.

	<ul style="list-style-type: none"> • Simplicity – Presenting training content in a clear and understandable manner, avoiding unnecessary technical or legal jargon to facilitate easy comprehension by beekeepers. • Participatory Learning – Actively engaging farmers through participatory learning methods, such as group discussions, case studies, and practical demonstrations, to ensure better knowledge retention and practical application in their beekeeping practices. • Inclusivity – Taking into account the diverse needs of farmers, including women and youth, and developing training programs that are inclusive and equitable to promote widespread participation and benefit.
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • Extension service providers (County, NGOs, Farmer Based Organizations, Faith-based organizations) – To train farmers on the TIMP • NGOs, ICIPE – To be part of the facilitators • Farmer groups – To take up the training and provide training to other farmers
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be upscaled	Kilifi, Tana River, Kwale, Kitui, Machakos, Makueni, Nakuru, Kajiado, Migori, Siaya, Kakamega
Challenges in dissemination	<ul style="list-style-type: none"> • Complexity of legal language: Policies and regulations are often written in complex legal language that can be difficult for farmers to understand, leading to confusion and misinterpretation. • Diversity of the audiences: Beekeepers come from diverse backgrounds, and one-size-fits-all training may not address the specific needs of different groups • Stingless bee farmers may be located in rural remote areas which are less accessible • Stingless bee farmers are mainly subsistence and may not be keen on policy and regulation issues • Cultural and language diversity affecting communication • Inadequate extension agents familiar with local dialects of target areas
Recommendations for addressing the challenges	<ul style="list-style-type: none"> • Simplify legal language into clear, farmer-friendly terms. Utilize local languages whenever possible to enhance accessibility and understanding of policy documents within the stingless bee farming context. • Customize training programs to the specific needs, literacy levels, and gender considerations of diverse stingless bee farmer groups. Pay special attention to addressing the unique requirements of women, youth, and marginalized communities, ensuring inclusivity and effectiveness. • Practical illustrations to enhance comprehension of policy concepts: use practical, real-world examples that resonate

	<p>with stingless bee farmers. Demonstrate the tangible impact of compliance on their daily beekeeping practices, reinforcing the relevance of understanding and adhering to policies.</p> <ul style="list-style-type: none"> • Incentive mechanisms: Introduce incentives for farmers who adhere to policy guidelines, emphasizing the positive outcomes of compliance, such as improved productivity, market access, and sustainability in stingless bee practices. • Mobile outreach strategies: Overcome the accessibility challenges posed by the remote locations of farmers through mobile outreach initiatives, including on-site visits and training sessions. • Culturally sensitive trainers: Ensure that trainers are culturally sensitive and, preferably, possess an understanding of the local language.
Lessons learned	<ul style="list-style-type: none"> • This is a new TIMP • Nevertheless, it is crucial to acknowledge that comprehensive training on policies and regulations equips beekeepers with the knowledge and tools necessary to comply with legal requirements. This empowerment enables them to make informed decisions that uphold the integrity of their beekeeping practices and contribute to the long-term success and economic well-being of their stingless bee enterprises.
Social, environmental, policy and market conditions necessary	<ul style="list-style-type: none"> • Culturally-sensitive training program with active engagement in the local community to cultivate trust and cooperation among stingless bee practitioners. • Community involvement by engaging community leaders, elders, and influential figures to ensure a collaborative approach to stingless bee farming practices. • Policies that encourage but actively support sustainable and environmentally friendly stingless bee farming practices. • Active participation of stingless bee farming farmers in the development and review of policies directly related to their industry. • Ensure that beekeepers have access to a foundational level of education and relevant resources that empower them in their stingless bee enterprises. • Policies that are clear, accessible, and aligned to the specific needs of beekeepers, promoting a farmer-friendly approach. • Rewarding market initiatives that incentivize compliance, creating opportunities for stingless bee farmers to benefit from their commitment to adhering to regulations.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The information will be offered to farmers at no cost
Estimated returns	Although no monetary value is directly linked to the TIMP, it is expected that once farmers follow the set rules and regulations, they will improve their production and especially the quality of

	their products and hence become more competitive, and this will result in higher incomes
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Most women have less access to education therefore cannot read and fully understand/comprehend the existing apiculture policies • Most women and youth have Inadequate representation in policy formulation and validation dialogues • Most women and youth have less access to policy training/sensitization forums/workshops • Men dominate discussions in policy formulation and validation processes as women sometimes remain muted • Women and youths have limited access to extension services therefore are not aware of the existing policies • Cultural norms and beliefs may discourage women from participating in public activities or interacting with unfamiliar individuals, including trainers
Gender related opportunities	<ul style="list-style-type: none"> • Opportunities exist for adequate representation of women and youths in the policy formulation and validation processes since the constitution supports their participation • Empowerment and active participation in decision-making • Enhanced income-generating activities leading to financial independence and reduced vulnerability • Increased understanding of policies and standards can lead to increased access to the markets and negotiate fair prices • Increased inclusion and recognition within the community and family structures
VMG issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> • VMGs have less access to education therefore cannot read and fully understand/comprehend the existing apiculture policies • VMGs have Inadequate representation in the policy formulation and validation dialogues • VMGs have less access to policy training/sensitization forums/workshops than men • Men dominate discussions in policy formulation and validation processes as VMGs sometimes remain muted • VMGs have limited access to education and extension services therefore cannot articulate the existing policies well • Cultural norms and beliefs may discourage women from participating in public activities or interacting with unfamiliar individuals, including trainers
VMG related opportunities	<ul style="list-style-type: none"> • Opportunities exist for adequate representation of women and youths in the policy formulation and validation processes since the constitution supports their participation • Empowerment and active participation in decision-making • Enhanced income-generating activities leading to financial independence and reduced vulnerability
E: Case studies/profiles of success stories	
Success stories	New TIMP

Application guidelines for users	<ol style="list-style-type: none"> 1. Technical bulletins 2. https://kilimo.go.ke/wp-content/uploads/2023/05/15.05.2023-BEE-INDUSTRY-DRAFT-REGULATIONS-2023.pdf
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, KALRO Apiculture and Beneficial Insects Research Institute (ABIRI), Marigat P.O Box 32-30403 Email; director.abiri@kalro.org
Lead organization and scientists	KALRO J Kasina, S. Wambua, A. Murage, and E Nyambati
Partner organizations	National Museums of Kenya, Kenya Forest Research Institute, Directorate of Veterinary Sciences, National Beekeeping Institute Community Based Organizations, Farmer groups and common interest groups, Ministry of Agriculture Livestock and Fisheries, ICIPE, other,

Gaps

Analysis of impact of policies on stingless bee value chain



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