



DRAFT

**INVENTORY OF CLIMATE SMART AGRICULTURE CAMEL
TECHNOLOGIES, INNOVATIONS & MANAGEMENT PRACTICES**



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KENYA CLIMATE SMART AGRICULTURE PROJECT (KCSAP)

October 2019

Version 1

1.0 INTRODUCTION

1.1 Background Information

The Kenya Climate Smart Agriculture Project (KCSAP) is a Government of Kenya/World Bank supported project under the State Department for Crops Development in the Ministry of Agriculture, Livestock Fisheries and Irrigation (MoALF&I). The Project Development Objective (PDO) is "to increase agricultural productivity and build resilience to climate change risks in targeted smallholder farming and pastoral communities in Kenya, and in the event of an Eligible Crisis or Emergency, to provide immediate and effective response". This objective will be achieved through utilization of climate-smart agriculture (CSA) technologies, innovations and management practices (TIMPs). A camel is one of the best innovations for adaptation in agriculture to achieve food security under a changing climate while delivering co-benefits for environmental sustainability, nutrition and livelihoods.

The KCSAP aims to inventorize all CSA TIMPs in the Camel Value Chain. The overall goal is three pronged: (1) Improve efficiency in the use of range resources to produce camel food; (2) Maintain the resilience of pastoral systems; and (3) Gain an understanding on how to reduce the vulnerability of communities negatively impacted by climate change in Kenya.

1.2 Definition of Terms for Technologies, Innovations and Management Practices

1.2.1 Technology: This is defined as an output of a research process that is beneficial to the target clientele (mainly farmers, pastoralists, agro-pastoralists and fisher folk for KCSAP'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.

1.2.2 Management Practice: This is defined as recommendation(s) on practice(s) that is/are considered necessary for a technology to achieve its optimum output. These include, for instance, different agronomic and 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.

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

1.2 Summary of Inventory of TIMPS in Camel Milk Value Chain

The inventory process resulted in a total of **14 TIMPs** including 8 technologies, 2 innovations, 4 pieces of information, distributed among the 5 sub-themes, as indicated in Table 1.

Table 1. Number of TIMPs identified by NARS in camel Value Chain

Commodity/ VC	Sub-Theme	Technologies	Innovations	Information
Camels	Breeds and Breeding	2	0	0
Camels	Feeds and Feeding	3	0	0
Camels	Health management	2	0	2
Camels	Post-harvest and Value Addition	1	2	0
Camels	Market Linkages and Distribution	0	0	2
Overall Total		8	2	4

1.3 Summary of Status of TIMPs in Camel Value Chain

The inventory process resulted in a total of **10 TIMPs ready for upscaling**, **2 require validation** and **2 require further research** in the sub-themes, 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
Camels	Breeds and Breeding	2	0	0
Camels	Feeds and Feeding	2	1	0
Camels	Health Management	2	0	2
Camels	Post-harvest and Value Addition	3	1	0
Camels	Market Linkages and Distribution	2	0	0
Overall Total		10	2	2

*Requires further research/validation

Table 3: Inventory of Camel TIMPs, Categories, Status and Outputs for KCSAP

TIMPs Sub Theme	TIMP Title	TIMP Category	Status
1 Breeds and breeding	1.1 Kenya camel breeds	Technology	Ready for upscaling
	1.2 Camel breeding guidelines	Technology	Ready for upscaling
2 Feeds and Feeding	2.1 Home based feed formulation for lactating camels	Technology	Requires validation
	2.2.Modified Chumvi Kuria	Technology	Ready for upscaling
	2.3 Formula for estimating the live weight of camel calves	Technology	Ready for upscaling
3 Health Management	3.1 Oral rehydration in camels	Technology	Ready for upscaling
	3.2 Integrated control of camel surra	Management practice	Ready for upscaling
	3.3. pH-based mastitis kit	Technology	Requires further research
	3.3 Mastitis Control	Management practice	Requires further research
4 Post-harvest and value addition	4.1 The donkey milk carrier	Innovation	Ready for upscaling
	4.2 Improved hemp cooling technology for milk marketing	Innovation	Ready for upscaling
	2.4.3 Solar milk cooler	Technology	Requires validation
	4.4. Camel Ghee	Innovation	Ready for upscaling
5 Camel Milk business	5.1 Strengthen Co-Management Model (CMM) in Livestock Markets Governance	Management practice	Ready for upscaling

1.0 CAMEL MILK VALUE CHAIN TIMPs

1 Breeds and breeding

1.1 Kenya Camel Breeds

TIMP Name	Kenya camel breeds
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Lack of awareness of existence of different breeds.
What is it? (TIMP description)	<ul style="list-style-type: none"> - Turkana: live weight 250-350 kg milk yield 1.5 l/d, lowest feeder, predominantly grayish in coat color and - Rendille/Gabbara: live weight, 300-450 kg, milk yield 3 l/d, moderate feeder brown cream in coat color moderate hardiness - Somali: live weight 450-700 kg, milk yield 5 l/d heavy feeder, brown-cream coat color less hardy - Pakistan: live weight 400-600kg, milk yield 10 l/d, heavy feeder predominantly grayish coat color droopy lips wider chest and least hardy
Justification	Information on the breeds can be used to improve camel productivity through targeted breeding
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Camel pastoralists researchers and development agents
Approaches to be used in dissemination	Training of Trainers (ToTs) and extension publications (leaflets, booklets, posters), Pastoral Field Schools, Field days, demonstrations, local FM radios.
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> - Trained trainers, - Availability of resources, - Capacity building, - County government, - Demographic factors, - Seasonality
Partners/stakeholders for scaling up and their roles	<ol style="list-style-type: none"> i. KALRO (lead role and information documentation) ii. County Governments (policy, resources), iii. Universities (research and training), iv. local NGO in livestock VCs (community mobilization and training), v. Kenya Livestock Marketing Council (policy implementation and advocacy)
C: Current situation and future scaling up	
Counties where already promoted, if any	Isiolo and Marsabit
Counties where TIMPs will be upscaled	Garissa, Wajir, and Mandera, Isiolo, West Pokot
Challenges in dissemination	- Human resource capacity,

	<ul style="list-style-type: none"> - Socio-cultural beliefs and illiteracy, - Insecurity. Challenges in accessing quality breeds
Suggestions for addressing the challenges	<ul style="list-style-type: none"> - Training more trainers, - Linking with more partners, - Awareness creation of/among camel pastoralists
Lessons learned in up scaling, if any	There was inadequate breed diversity for selection
Social, environmental, policy and market conditions necessary for development and up-scaling	<ul style="list-style-type: none"> - Camel breeds are socially accepted among pastoralist groups, - Camel does not compete with other (true) ruminants as it browses hence environmentally friendly, - County governments to make enabling policies
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	A good breeding camel would cost between KES. 30,000 to 60,000 (USD 333 – 666)
Estimated returns	With one year of lactation and at an average daily sale of 4 litres of milk valued KES 60 or USD 0.7 gross return =KES 87600 6 calvings = gross of KES. 525000 (USD 5840)
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> - Men and youth have major roles in breed selection. - Women are involved in camel products - Among some camel keeping communities' women are not allowed to handle camels
Gender related opportunities	The male gender have a bigger responsibility over camels than women and are therefore likely to financially benefit more than women
VMG issues and concerns in development, dissemination adoption and scaling up	Milk is important for health and there is need to target VMGs for dissemination. Target VMGs for camel breeds upscaling activities and ensure their animals are included in scaling up of technologies
VMG related opportunities	Improved livelihoods for pastoralists from selling high volumes of milk, hence improved nutrition, increased income, increased involvement of VMGs in milk marketing, need to train them on value addition and agri-business
E: Case studies/profiles of success stories	
Success stories	Demand for Somali bulls increased in both Rendille and Gabra communities
Application guidelines for users	Pamphlet, leaflets, manuals, flyers, describing breed characteristics and environment have been developed by KALRO Marsabit and can be produced as demand arises
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-SGCRI P.O. Box 147-60500 Marsabit director.sgir@kalro.org www.kalro.org

Lead organization and scientists	KALRO SGCRI Sagala J., K. Changwony
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

1.2 Camel Breeding Guidelines

TIMP Name	Camel Breeding Guidelines
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Inappropriate breeding practices lowering milk production
What is it? (TIMP description)	<ul style="list-style-type: none"> - Breed young females and males by ensuring that age of breeding male does not exceed 13 years while a female should not exceed 6 parities/calving. - Control inbreeding by ensuring that the bull does not mate closely related females and through timely replacement of breeding bulls. - Propagate desired traits in a camel herd through a breeding bull and not females
Justification	Use of the guidelines to manage camel breeding can improve herd productivity and increase milk yield
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Camel pastoralists
Approaches used in dissemination	Field days, demonstrations, agricultural shows, training of trainers
Critical/essential factors for successful promotion	Need to train more trainers, avail adequate training materials (manuals brochures etc.)
Partners/stakeholders for scaling up and their roles.	KALRO (Research and information generation) County Governments (policy, resources), Egerton University (research and training), local NGO in livestock VCs (community mobilization and training), Kenya Livestock Marketing Council (policy implementation and advocacy)
C: Current situation and future scaling up	
Counties where already promoted, if any	Isiolo and Marsabit
Counties where TIMPs will be upscaled	Garissa, Wajir and Mandera
Challenges in development and dissemination	Inadequate financial, human resource capacity, Socio-cultural beliefs and illiteracy, insecurity
Suggestions for addressing the challenges	Training more trainers, linking with more partners, awareness creation of/among camel pastoralists
Lessons learned in up scaling, if any	Communal/family ownership of camels was a hindrance to adoption of the guidelines especially the one on not breeding old

	females. Promoting private ownership of camels is key to enhanced adoption
Social, environmental, policy and market conditions necessary for development and up-scaling	Identify partners for dissemination and the governments to facilitate cross-border activities.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The direct cost would be that of buying the manual for reference and brochures (at most KES 500 or USD 5.5)
Estimated returns	It is hard to estimate returns from the guidelines in isolation
Gender issues and concerns in development, dissemination adoption and scaling up	-Men warriors and women were all involved in the survey through which information on traditional breeding strategies was gathered -Among some camel keeping communities women are not allowed to handle camels
Gender related opportunities	Men have a bigger responsibility over camels than women and are therefore likely to benefit more than women
VMG issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Camel breeding guidelines is important for camel herd management, therefore VMGs must be targeted and included in the trainings • Milk is important for health and there is need to target VMGs for dissemination • Target VMGs for breeding upscaling activities and ensure their animals are included
VMG related opportunities	Improved livelihoods from Increased milk production hence improved nutrition, increased income, increased involvement of VMGs in milk marketing, need to train them on value addition and agri-business.
E: Case studies/profiles of success stories	
Success stories	No case study has been conducted
Application guidelines for users	Offspring born of young parents are stronger and have high chances of survival Inbreeding results in malformations, increased mortality and reduced productivity of the offspring Use of a bull is a faster way of propagating good productive traits in a herd compared to females
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires validation; 3. Requires further research)	Demand for the high producing breeds on the rise. Genetic phenotypic and production characterization done and report available.
G: Contacts	
Contacts	Institute Director, KALRO-SGCRI P.O. Box 147-60500 Marsabit director.sgir@kalro.org

Lead organization and scientists	KALRO SGCRI (Sagala J., K. Changwony)
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

2. Camel Feeds and Feeding

2.1 Home based feed formulation for lactating camels

TIMP name	Home based feed formulation for lactating camels
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Poor quality feeds in the peri-urban pastoral systems
What is it? (TIMP description)	The technology consists of training herders in feed formulation for camels of different ages and lactation stages using locally available materials: <i>Euphorbia tirucalli</i> , <i>Acacia spp pods</i> , <i>Prosopis Juliflora pods</i> and hay (frequently provided from high producing areas). The technique will consist of mixing rations of <i>Euphorbia tirucalli</i> with <i>Acacia spp pods</i> , <i>Prosopis Juliflora pods</i> . Hay could be used as basal diet and will then be enriched with urea and yeast cultures for higher digestibility and milk production. Urea will be included at 4% of hay.
Justification	The camel is the main milk producing animal in the pastoral areas. There is increasing demand for camel milk due to awareness of its health benefits hence consumption in many areas. However, increasing negative effects of climate change have significantly reduced availability of natural forages in the ASALs. This renders livestock keeping in the ASALs unsustainable, yet it is the major source of livelihoods for populations of these areas. Recently a shift in pastoralism is observed with a more sedentary households who keep camels (and shoats) in the periphery of town centres. They feed camels on <i>Euphorbia</i> and supplement with hay, minerals and sometimes concentrates. The technology is aimed at sustaining this group of pastoralists.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Camels keepers and business communities
Approaches to be used in dissemination	Training of Trainers (ToTs) and extension publications (leaflets, booklets, posters etc.), Pastoral Field Schools, Farmer group trainings
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> • Pastoral field school with different feed formulations for camel classes. • Consistent follow up until technology is adopted by end users

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO/ Egerton University (on farm validation, capacity building, data collecting and monitoring) • County CEC members for Agriculture (entry to the communities, extension services, monitoring and evaluation) • Kenya Camel Association policy (advocacy and promotions) NGOs and CBOs working in the area (provide entry, promotion and provision of extension services provision)
C: Current situation and future scaling up	
Counties where already promoted if any	Isiolo and Garissa
Counties where TIMP will be upscaled	Garissa, Mandera and Wajir, West Pokot and Isiolo
Challenges in dissemination	Cultural beliefs on feeding certain types of feeds to camels, traditional camel keeping practices
Suggestions for addressing the challenges	<ul style="list-style-type: none"> • Capacity build on the potential of alternative feed resources in sustainability of camel production systems. • Set up Pastoral field school for continuous learning
Lessons learned in upscaling if any	Improving feeding is critical to achieving sustainability of pastoral production systems
Social, environmental, policy and market conditions necessary for development and upscaling	Agreement from the targeted communities to participate in the training sessions. Access to milk marketing network for the extra milk produced to be marketed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Note determined
Estimated returns	Note determined
Gender issues and concerns in development, dissemination adoption and scaling up	<ul style="list-style-type: none"> - Low literacy for women yet they take care of lactating camels in the boma, to feed them and market milk. Youths on fodder harvesting and feeds mixing - Training on Feed conservation, value addition and feed requirements for different age and productive stage. - Men benefit from higher value of healthy camels; women benefit from more milk volumes produced and youth in taking care of healthy camels
Gender related opportunities	<ul style="list-style-type: none"> • Men will be able to market more milk and live animals as a result of improved feeding • More youth will be hired for herding, milking and milk transportation to the collection points
VMG issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> - Milk is important for health and there is need to target VMGs for dissemination - Target VMGs for camel feed formulation upscaling activities and ensure their animals are included in scaling up of technologies - Need to train them on value addition and agri-business

VMG related opportunities	Improved livelihoods for pastoralists from selling high volumes of milk, hence improved nutrition, increased income, increased involvement of VMGs in milk marketing
E: Case studies/profiles of success stories	
Success stories from previous similar projects	<p>Somali camel is gaining popularity for its ability to produce more milk, and are also available in the market and the three-sub type (<i>Geilab, Shifta and Horr</i>) are adaptable in all pastoral areas.</p> <p>In Isiolo (Kulamawe area), which is 100 km from Isiolo, only camel milk is sold and transported to Isiolo town daily. Between 500-1200 L is sold depending on season for sale in Nairobi the following day at a cost of KES 100-150 per L for export and KES 70-100 per L for the local market. A family with one camel will sell the morning milk at KES 300 and use the evening milk for home use thus earning over 1 USD per day.</p>
Application guidelines for users	Manual for feeding camels using alternative feed resources to be developed as per the TIMP description above
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO-SGCRI P.O. Box 147-60500 Marsabit director.sgir@kalro.org
Lead organization and scientists	KALRO and Egerton University, Amos Adongo; Prof. J. Matofari; O. Kashongwe, Sagala I. J
Partner organizations	Egerton University, Kenya camel association, Kenya livestock marketing council, The County government's department of livestock

Gaps

- Training on management of the camel for milk production
- Field surveillance in participating villages to monitor adoption of the technology, and address/document challenges faced during implementation by target groups

2.2 Modified Chumvi Kuria for camels

TIMP Name	Modified Chumvi Kuria for camels
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Inadequate mineral nutrition/mineral deficiency lowering milk production

What is it? (TIMP description)	The formulation ratio: 1 dicalcium phosphate: 0.992 Chalbi salt: 0.873 calcium carbonate: 0.001 Magnesium sulphate.
Justification	Mineral deficiency is a major nutritional limitation to productivity in camels in Kenya. Camel keeping communities have traditionally not used feed supplements for camels believing their pastures/browse and water were adequate to meet their requirement. However, changing lifestyle restricting extended migration has denied the camels access to salty waters that previously supplied the necessary minerals. This formulation has been found to improve milk yield of camels by 17% and calf growth by 25%.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Livestock feed producers at local regional and national levels
Approaches used in dissemination	Commercialization through livestock feed producers.
Critical/essential factors for successful promotion	Cost benefit analysis
Partners/stakeholders for scaling up and their roles	KALRO (Research and Information generation) County Governments (policy, resources), Egerton University (research and training), local NGO in livestock VCs (community mobilization and training), Kenya Livestock Marketing Council (policy implementation and advocacy)
C: Current situation and future scaling up	
Counties where already promoted, if any	Parts of Wajir and Garissa
Counties where TIMPs will be upscaled	Wajir, Garissa and Mandera
Challenges in development and dissemination	Funds to support local groups to establish cottage industries, release procedures of the formula not clear
Suggestions for addressing the challenges	Source for funds to fast track patenting of the formula and then sell it to the feed companies
Lessons learned in up scaling, if any	-Improving the mineral nutrition of camels can substantially increase the milk yield -Manufacturing and promotion of the product are necessary to stimulate adoption
Social, environmental, policy and market conditions necessary for development and up-scaling	Commercialization and promotion of the product across borders especially within the IGAAD EAC region
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Would require about KES 500,000 (USD 5556)
Estimated returns	Cost benefit and market demand data would be needed to estimate returns
Gender issues and concerns in development,	No major gender issues although men tend to have more say in how camels are managed

dissemination, adoption and scaling up	
Gender related opportunities	Men have a bigger responsibility over camels than women and are therefore likely to financially benefit more than women
VMG issues and concerns in development, dissemination, adoption and scaling up	The technology is useful for camel keepers therefore the need to involve VMGs keeping camels Adoption will not be a problem for it addresses the current community needs
VMG related opportunities	Improved livelihoods for pastoralists
E: Case studies/profiles of success stories	
Success stories	No case study has been conducted
Application guidelines for users	There is a previously prepared brochure which will be revised in line with the modification done and the same will be available for reference
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires further validation; 3. Requires further research)	Validated and Ready for upscaling
G: Contacts	
Contacts	Institute Director, KALRO-SGCRI P.O. Box 147-60500 Marsabit director.sgir@kalro.org
Lead organization and scientists	KALRO SGCRI Sagala J., K. Changwony, Walaga H.
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

2.3 Estimating live weight of camel calves

TIMP Name	Formula for estimating live weight of camel calves
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Slow growth of camel calves
What is it? (TIMP description)	Body weight (k) = 200.86+105.91 TG(m)+79.63 HG(m)+56.22 SH(m)] Where; TG – thoracic girth HG – heart girth SH – shoulder height This involves estimating the live weight of camel calves using linear body measurements
Justification	Need for pastoralists to monitor the weight and growth performance of their camel calves and be able to correctly administer correct drug dosage and institute feed supplementation early enough.

B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Pastoralists and extension agents
Approaches used in dissemination	
Critical/essential factors for successful promotion	Building the capacity of extension agents to train pastoralists.
Partners/stakeholders for scaling up and their roles.	KALRO (Research and information generation) County Governments (policy, resources), Egerton University (research and training), local NGO in livestock VCs (community mobilization and training), Kenya Livestock Marketing Council (policy implementation and advocacy).
C: Current situation and future scaling up	
Counties where already promoted if any	Wajir and Garissa
Counties where TIMPs will be upscaled	Wajir, Garissa and Mandera
Challenges in development and dissemination	Use of the technology in initial stages requires more skill than most herders have.
Suggestions for addressing the challenges	The training of the herders should mainly target the members of the family who are sufficiently literate as to be able to assimilate the complexities of calculating weights.
Lessons learned in up scaling, if any	Can assist in monitoring camel growth for early feed supplementation during drought. Drug administrations will be more accurate with better weight estimation.
Social, environmental, policy and market conditions necessary for development and up-scaling	Agreement from the targeted communities to participate in the training sessions. The technology is cheap and can be used everywhere once the formula is understood and internalized.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Tape measure (KES 100 or USD 1.1) and a simple calculator (KES 200 or USD 2.2).
Estimated returns	Cannot be directly estimated
Gender issues and concerns in development, dissemination, adoption and scaling up	- Both men and women should be involved to be able to use the technology - Men women warriors and the boys who have attained the herding age should be targeted during dissemination
Gender related opportunities	The male gender have a bigger responsibility over camels than women and are therefore likely to economically benefit more than women
VMG issues and concerns in development, dissemination, adoption and scaling up	- Pastoral women are the ones that take care of camel calves and there is need to target VMGs for dissemination - Target VMGs for camel milk production upscaling activities and ensure their animals are included in scaling up of technologies
VMG related opportunities	Improved livelihoods for pastoralists from selling high volumes of milk, hence improved nutrition, increased income, increased involvement of

	VMGs in milk marketing, need to train them on value addition and agri-business
E: Case studies/profiles of success stories	
Success stories	
Application guidelines for users	A 5 m tape measure (essential) Calculator (basic knowledge required) The formula estimates the live weight of camel calves with 95% level of accuracy
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires validation; 3. Requires further research)	Validated and Ready for upscaling
G: Contacts	
Contacts	Institute Director, KALRO-SGCRI P.O. Box 147-60500 Marsabit director.sgir@kalro.org
Lead organization and scientists	SGCRI KALRO, Sagala J. and K. Changwony
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

3. Health Management

3.1 Oral rehydration in camels

TIMP Name	Oral rehydration therapy for Camels calves
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	High mortality in camel calves
What is it? (TIMP description)	It is a formulation of honey, salt, eggs, and Sulphur-based drugs. It consists of: 1. 3 table spoonful honey + 1½ table spoonful table salt + 3 litres water 2. Eggs from chicken that interact with or pick parasites from livestock including camels 3. Administer Sulphur based drugs e.g. S-dime tablets
Justification	The technology(s) is easy to use, cheap and most importantly has capacity to reduce calf mortality
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Camel pastoralists
Approaches used in dissemination	Field days, demonstrations, agricultural shows, training of trainers

Critical/essential factors for successful promotion	Need to train more trainers, avail adequate training materials (manuals brochures etc.)
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> - KALRO (Research and Information generation) - MoAL&F, Food for the Hungry (community mobilization and training), - World Vision International (community mobilization and training), - Veterinarians Without Borders, Suisse, Kenya Livestock Marketing Council, Community Based Animal Health Groups (community mobilization and training)
C: Current situation and future scaling up	
Counties where already promoted if any	Marsabit, Isiolo
Counties where TIMPs will be upscaled	Garissa, Wajir and Mandera
Challenges in development and dissemination	Inadequate financial and human resource capacity, traditional beliefs, especially on use of eggs
Suggestions for addressing the challenges	Training more trainers, linking with more partners, awareness creation of/among camel pastoralists
Lessons learned in up scaling, if any	Continued capacity building of pastoralists can boost adoption of the technology
Social, environmental, policy and market conditions necessary for development and up-scaling	Calf mortalities due to diarrhea reduce herd structure and numbers and also affect replacements. This necessitates this intervention.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Controlling diarrhea in one calf < KES 200 (USD 2.2).
Estimated returns	Equivalent to the market value of the calves saved from death through the use of this technology
Gender issues and concerns in development, dissemination, adoption and scaling up	Men, women, warriors and the boys who have attained the herding age should be targeted during dissemination
Gender related opportunities	Women are responsible for calf feeding and post-harvest management of camel milk
VMG issues and concerns in development, dissemination, adoption and scaling up	Need to consider them in the design of the trainings
VMG related opportunities	Improved livelihoods arising from faster herd build-up due to decreased calf mortalities
E: Case studies/profiles of success stories	
Success stories	No case study has been conducted
Application guidelines for users	On the rehydration 300 ml of the mixture are orally administered on 4 hourly intervals until the diarrhea stops; sugar can be used in place of honey if the latter is not available. Orally administer one stirred egg per

	day until the diarrhea stops; Sulphur drugs should be used according to the instructions of the manufacturer
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-SGCRI P.O. Box 147-60500 Marsabit director.sgir@kalro.org www.kalro.org
Lead organization and scientists	KALRO SGCRI Sagala J. and K. Changwony
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

3.2 Integrated Control Strategy for Camel *Surra*

TIMP name	Integrated Control Strategy for Camel <i>Surra</i> (camel trypanosomosis)
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	High incidence of <i>Surra</i> in camel keeping areas in the country
What is it? (TIMP description)	Integrated technologies and approaches that optimize efficiency in camel production, minimize production losses and geographical spread of the disease
Justification	<ul style="list-style-type: none"> - Camel <i>Surra</i> is the most serious disease of camels that reduce milk and meat production - It compromises household food and nutrition security of millions of pastoralists and their resilience in the increasing effects of climate change - Current control practices are insufficient to significantly reduce morbidity, mortality and the associated economic losses
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Pastoralists, County Governments
Approaches to be used in dissemination	Field days, Demonstrations, leaflets, FFS
Critical/essential factors for successful promotion	<ul style="list-style-type: none"> - Pilot-test the integrated control strategy - Ensure full involvement of the pastoralists and stakeholders in the camel milk and meat value chain
Partners/stakeholders for scaling up and their roles	County governments (extension services) KALRO (Research and information generation)
C: Current situation and future scaling up	

Counties where already promoted if any	Marsabit
Counties where TIMP will be up scaled	Baringo, Garissa, Marsabit Tana River, Isiolo, Taita Taveta, Laikipia, Kajiado, West Pokot
Challenges in dissemination	Yet to be determined
Suggestions for addressing the challenges	None
Lessons learned in up scaling if any	Prophylaxis prevents camel trypanosomosis (surra)
Social, environmental, policy and market conditions necessary	Adherence to the animal disease control policy guidelines
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Yet to be determined
Estimated returns	Yet to be determined
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> - Both men and women should be involved to be able to use the technology - Men women warriors and the boys who have attained the herding age should be targeted during dissemination
Gender related opportunities	Improved productivity of animals increases household income leading to more business opportunities for all
VMG issues and concerns in development, dissemination, adoption and scaling up	There is need to reach out to marginalized and vulnerable persons with this information as they are the least likely to access regular veterinary services for the management of surra.
VMG related opportunities	Improved health lead to improved productivity of animals, which in turn increases household income leading to more business opportunities for VMGs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Yet to be documented
Application guidelines for users	A pamphlet has been developed detailing how the integrated management of the disease should be carried out.
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO – BioRI Muguga P.O. Box 362 -00902 KIKUYU, Kenya
Lead organization and scientists	KALRO-BioRI Muguga, Chemuliti J., Godia L., Wanjala K., Mdachi R., Wamwiri F., Auma J., Alusi P.

Partner organizations	Terra Nouva, IGAD Sheik Technical Veterinary School (ISTVS)
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Gaps

- i) Conduct promotional activities to catalyze the adoption of the management practice for wide use in the camel rearing regions to control surra
- ii) Determine the cost-benefit of using the practice
- iii) Assess development, adoption and scaling up of the technology with gender and VMGs in consideration
- iv) On farm validation of the management practice

3.3 pH-based mastitis tests

TIMP name	pH-based mastitis kit
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Economic losses due to high incidence of sub-clinical mastitis in dairy animals
What is it? (TIMP description)	The technology is a paper strip impregnated with pH indicator. The color of the strip changes based on the acidity (slight acidity is normal milk) and alkalinity (signifying presence of mastitis) of milk
Justification	High prevalence of subclinical mastitis in dairy cattle affects milk quality and marketability. Detection methods currently used are difficult to interpret by farmers. The trend is to encourage sale of milk based on somatic cell count hence the need for a convenient pen-side mastitis test kit. This will also assist in early detection and control of mastitis for increased production of quality milk. The opposite picture shows spoilt (left) and normal (right) milk.
	
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Cattle and camel keepers, County veterinary and livestock staff, Kenya Dairy Board (KDB), dairy cooperative societies
Approaches to be used in dissemination	Field days, shows and exhibitions
Critical/essential factors for successful promotion	Simple for use by animal health service providers
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • KALRO (Technology generation), • Farmers, dairy cooperatives (end users), • County Governments (extension services), • Masinde Muliro University (research), • Kibabii University (research),
C: Current situation and future scaling up	
Counties where already promoted if any	None

Counties where TIMP will be up scaled	Baringo, Garissa, Marsabit Kakamega, Tana River, Isiolo, Tharaka Nithi, Taita Taveta, Laikipia, Nyandarua, Bomet, Kericho, Uasin Gishu, Elgeyo Marakwet, Busia, Kajiado, Nyeri Machakos, Kisumu, Siaya, West Pokot
Challenges in dissemination	Limited supply of the kit and awareness of its use
Suggestions for addressing the challenges	i) Set up kit production unit at KALRO – VSRI Muguga and support production at MMUST and Kibabii Universities. ii) Develop and package user guidelines and promotion.
Lessons learned in up scaling if any	Farmers are willing to adopt the technology
Social, environmental, policy and market conditions necessary	Veterinary Medicines Directorate (VMD) authorization of the use of the kit, sustainable supply, registration with Kenya Industrial Property Institute (KIPI).
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Yet to be determined
Estimated returns	Yet to be determined
Gender issues and concerns in development, dissemination, adoption and scaling up	The technology can be used by either gender
Gender related opportunities	The kit has the potential to contribute to increased milk production and create opportunities for employment for men, women and the youth through value addition and marketing.
VMG issues and concerns in development, dissemination, adoption and scaling up	Visually impaired persons are disadvantaged since the technology is based on colour visualization
VMG related opportunities	It simple and cost-effective technology that can be used by resource poor people
E: Case studies/profiles of success stories	
Success stories	Yet to be documented
Application guidelines for users	A simple procedure on how to use the strips had been developed
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO – VSRI, Muguga P.O. Box 32 -00902 KIKUYU, Kenya
Lead organization and scientists	KALRO; Peter Ndirangu and Monica Maichomo
Partner organizations	MMUST and Kibabii University

Gap

- i) Validation of pH-based mastitis kit for detection and control of sub clinical mastitis dairy goats
- ii) Determine the cost-benefit of using the test in the control of sub-clinical mastitis in dairy animals
- iii) Develop guidelines for successful use of the test

3.4 Mastitis control practices

TIMP name	Mastitis Control
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Economic losses due to high incidence of sub-clinical mastitis in dairy animals
What is it? (TIMP description)	This is the regular pen-side testing of milk using a simple, easy-to-use mastitis kit to rapidly detect sub-clinical mastitis. The testing of each animal will enable early detection and treatment and so minimize loss and increase marketable milk.
Justification	High prevalence of subclinical mastitis in camel affects milk quality and marketability. Pastoralists have inadequate knowledge on management of mastitis in lactating camels. The practice is to encourage sale of milk based on somatic cell count hence the need for a convenient pen-side mastitis test kit. This will also assist in early detection and control of mastitis for increased production of quality milk (white milk shown on the right in picture).
	
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Cattle and camel keepers, County veterinary and livestock staff, Kenya Dairy Board (KDB), dairy cooperative societies
Approaches to be used in dissemination	Field days, shows and exhibitions
Critical/essential factors for successful promotion	Simple for use by animal health service providers
Partners/stakeholders for scaling up and their roles	KALRO (research and information generation) Farmers (end users), County Governments (extension services, Egerton University, Milk bulkers/ cooperatives (end users)
C: Current situation and future scaling up	
Counties where already promoted if any	Isiolo and Marsabit
Counties where TIMP will be up scaled	Marsabit, Isiolo, Garissa, Mandera, Wajir, West Pokot
Challenges in dissemination	Limited supply of the kit and awareness of its use
Suggestions for addressing the challenges	Capacity building on control and prevention of subclinical mastitis

Lessons learned in up scaling if any	Farmers are willing to adopt the technology
Social, environmental, policy and market conditions necessary	Increased demand for clean, hygienic milk by consumers and processors.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Yet to be determined
Estimated returns	Yet to be determined
Gender issues and concerns in development, dissemination, adoption and scaling up	The technology can be used by men, women and the youth.
Gender related opportunities	Has the potential to contribute to increased milk production and create opportunities for employment through value addition and marketing.
VMG issues and concerns in development, dissemination, adoption and scaling up	Visually impaired persons are disadvantaged since the technology is based on colour visualization
VMG related opportunities	It simple and cost effective information that can be used by resource poor people.
E: Case studies/profiles of success stories	
Success stories	Yet to be documented
Application guidelines for users	Guidelines for daily rapid testing for mastitis have been developed
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO – VSRI, Muguga P.O. Box 32 -00902 KIKUYU, Kenya
Lead organization and scientists	KALRO Peter Ndirangu and Monica Maichomo
Partner organizations	MMUST and Kibabii University

4. Post-Harvest and Value Addition

4.1 The donkey milk carrier

TIMP Name	The donkey milk carrier
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Unhygienic and expensive plastic containers

What is it? (TIMP description)	The tool is made of canvas which withstands tensile stress. It comprises of 4 chambers for carrying 4 metal cans. The bottom of each compartment is flat and semi-circular to allow for standing before placement on the donkey or camel. It has six straps for tying around the animal, a soft padding to enhance comfort.
Justification	Introduction of metal cans enhances hygienic handling of marketed milk and reduces losses along the milk productivity value chain
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Camel milk producers
Approaches used in dissemination	Demonstrations in field days, exhibition in ASK shows, capacity building on benefits of using metal cans.
Critical/essential factors for successful promotion	Mostly target camel farmers who are already connected to milk traders and introduce others gradually based on demand, identification of designers of the carrier is essential.
Partners/stakeholders for scaling up and their roles	NGOs, Kenya Camel Association (Community mobilization and training), MoAL&F (Policy and extension), camel milk producers, milk traders, MOPH, County Governments (extension), transporters, consumers (logistics and feedback) KALRO (Technology generation)
C: Current situation and future scaling up	
Counties where already promoted. if any	Marsabit and Isiolo
Counties where TIMPs will be upscaled	Mandera, Wajir and Garissa and other ASAL counties
Challenges in development and dissemination	Poverty hence cannot purchase the metal cans, poor market linkages may discourage producers from adopting the technology, metal cans are not easily accessible by camel milk producers
Suggestions for addressing the challenges	Encourage input suppliers to invest in metal cans and avail them closer to producers and collectors, train artisans on design of the carrier for easy access by producers, training on hygienic handling and dispensing of milk
Lessons learned in up scaling, if any	Camel milk producers can adopt the technology only if properly linked to traders who are also willing to offer better prices for quality milk
Social, environmental, policy and market conditions necessary for development and up-scaling	There is need to extend the regulation on milk containers to the camel milk handlers as well
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The technology costs KES 2000 (USD 22.2) exclusive of the metal can
Estimated returns	Still undergoing study

Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> - Target producers who in most cases are men - Can be used effectively by household members
Gender related opportunities	Mostly men are involved in production and make such decisions on husbandry practices at farm level. There is need to target them to reinforce linkages with production practices and market demands.
VMG issues and concerns in development, dissemination, adoption and scaling up	Technology has a cost (initial and replacement cost) and may be less affordable by some VMGs.
VMG related opportunities	Technology reduces milk loses and so more milk is marketed for increased income and improved livelihoods including those of VMGs.
E: Case studies/profiles of success stories	
Success stories	Camel milk losses were reduced through this technology when it was tested
Application guidelines for users	Guidelines have been developed but there is need to extend the regulation on milk containers to the camel milk handlers as well.
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 SGRI P.O. Box 147-60500 Marsabit Tel. +254 69 210 2040 Fax +254 69 210 2220 marsabit@kalro.org
Lead organization and scientists	KALRO, K. Changwony and Amos Adongo (amos.adongo@kalro.org ; adongoam@gmail.com)
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

4.2 Improved hemp cooling technology for milk marketing

TIMP Name	Improved hemp cooling technology for camel milk marketing
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Milk spoilage and losses.
What is it? (TIMP description)	This is a fabric made from sisal fiber. Clean sisal hemp is wrapped around metal milk can. The humped container is soaked in clean water for at least 30 minutes before the milk is introduced. Soaking

	the container after wrapping assists in cooling the milk through evaporation.
Justification	More fresh milk will be available for consumption and sale to a large number of consumers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Camel milk producers and collectors.
Approaches used in dissemination	Practical demonstrations in field days, ASK shows, radio talk shows TV programs.
Critical/essential factors for successful promotion	Funds to facilitate wider coverage, mostly target camel producers who are already connected to milk traders and introduce others gradually.
Partners/stakeholders for scaling up and their roles.	KALRO (research and information generation) SNV (milk marketers training), Kenya Camel Association (mobilization and training), MoAL&F (extension), Camel milk producers, milk traders, transporters consumers (logistics and feedback).
C: Current situation and future scaling up	
Counties where already promoted, if any	Marsabit and Isiolo
Counties where TIMPs will be upscaled	Marsabit, Wajir, Mandera, Isiolo and Garissa, West Pokot
Challenges in development and dissemination	Poor road network, nomadism, frequent droughts, poor market linkages.
Suggestions for addressing the challenges	Improve rural access roads, map out all camel movement route and establish collection centers in tandem with grazing points, organize chain actors for information sharing and collective action platforms, train producers and traders on hygienic handling and dispensing of milk
Lessons learned in up scaling, if any	Producers embrace technologies if it has direct benefits to them The technology must be accompanied by trainings on hygiene.
Social, environmental, policy and market conditions necessary for development and up-scaling	KDB to come up with policy that encourages processing and trading in camel milk in Kenya.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Wrapping one 10 L metal can costs below KES 200 (USD 2.2)
Estimated returns	Reduces milk spoilage by 44%
Gender issues and concerns in development, dissemination, adoption and scaling up	- Focus should be on women in the business - Target women at collection points and men at production especially when animals move far from collection points
Gender related opportunities	Target the more than 80% of milk traders who are women
VMG issues and concerns in development, dissemination, adoption and scaling up	Technology requires some initial financial capital which may prevent some vulnerable groups from adoption

VMG related opportunities	Business opportunities can arise from fabrication of the hemp coolers. VMGs can
E: Case studies/profiles of success stories	
Success stories	The technology is currently adopted by 3 trial milk producers in Kulamawe.
Application guidelines for users	Hemped container MUST be soaked in clean water at least 30 minutes before putting milk. Works well if moist most of the time, if carried when exposed to wind can cool faster over short distance and if exposed over longer distance can dry quickly and may require re-soaking.
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 SGRI P.O. Box 147-60500 Marsabit Tel. +254 69 210 2040 Fax +254 69 210 2220 marsabit@kalro.org
Lead organization and scientists	KALRO K. Changwony and Amos Adongo (amos.adongo@kalro.org ; adongoam@gmail.com)
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

4.3 Solar milk cooler

TIMP Name	Solar milk cooler
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Post-harvest loss of milk through spoilage because high temperatures reduce the shelf life of fresh milk.
What is it? (TIMP description)	A solar bulk milk cooler is system of solar power generation unit, power conditioning unit, a refrigeration unit with a cold water/ice storage tank and a milk cooling/storage tank with accessories. The system has minimum battery power storage to run the electronics and pumps for at least three days without solar. The refrigeration system should convert at least 70% of the solar energy available from solar panels into cold water or ice without use of batteries. The stored cold water/ice should be able to cool milk for 3 days in absence of solar energy to 4°C.

Justification	Due to high temperatures in Northern Kenya and the absence of facilities to quickly cool milk, there are more post-harvest losses which reduce amount to marketable milk and so reduce profitability. This technology does not require electricity grid and its use will ensure that more fresh milk will be available for consumption and sale to many consumers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Camel milk bulkers and sellers (women groups, producers groups, milk retailers)
Approaches used in dissemination	Commercialization, Practical demonstrations in field days, ASK shows, radio talk shows TV programs.
Critical/essential factors for successful promotion	Commercialization, skills in operation and maintenance, group approach to use and capacity building in milk hygiene and handling.
Partners/stakeholders for scaling up and their roles.	Egerton University (Research and Technology generation), County Governments (extension services), KALRO (Technology validation) Local service providers and fabricators of the technology.
C: Current situation and future scaling up	
Counties where already promoted. if any.	Isiolo and Nakuru
Counties where TIMPs will be upscaled	Wajir, Marsabit, Mandera Garissa
Challenges in development and dissemination	Cost is high for average camel milk value chain actors
Suggestions for addressing the challenges	Support through groups to acquire the technology
Lessons learned in up scaling, if any	None
Social, environmental, policy and market conditions necessary for development and up-scaling	KDB to come up with policy that encourages processing and trading in camel milk in Kenya. Policies be put in place at County level of hygienic handling and marketing of camel milk
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	USD 30,000 for 300 L capacity
Estimated returns	Not yet done
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> - Targets women in milk business, men and youth directly involved in milk production and transportation - The technologies directly targets women who are traditionally assigned the role of milk handling. Youth can be targeted with capacity building in hygiene production and transportation nodes
Gender related opportunities	Target the more than 80% of milk traders who are women
VMG issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> • Need to access to clean and hygienic milk for better nutrition outcomes • It is a relatively expensive technology and most VMGs may be locked out of it by the high cost

VMG related opportunities	Enterprises spun along the value chain may benefit individuals from the VMGs who choose to venture into business within the chain.
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Should be installed in a clean dust free environment. Operator manual is available for use
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires validation; 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, SGRI P.O. Box 147-60500 Marsabit Tel. +254 69 210 2040 Fax +254 69 210 2220 marsabit@kalro.org
Lead organization and scientists	KALRO K. Changwony, Prof Matofari J.W and Amos Adongo
Partner organizations	Egerton University (research), County Governments (extension) MoAL&F (extension)

4.4 Camel Ghee

TIMP Name	Camel Ghee
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	
What is it? (TIMP description)	Camel ghee is a light golden brown clarified butter. It is made from cream centrifuged from camel milk using manual cream separator. The cream is boiled then cooled to room temperature before packaging into sterile containers preferably bottles. About 15 L of camel milk yield 350 g of ghee.
Justification	Has longer shelf life than milk hence can be used to address food security in dry season
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Women and youth
Approaches used in dissemination	Demonstrations, field days, pamphlets
Critical/essential factors for successful promotion	Should be promoted during rainy seasons and immediately after when there is a milk glut

Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> - KALRO (research and training) - Egerton University (research and training), - County Governments (extension), - Local service providers and fabricators of the technology of the cream separator (logistics and feedback)
C: Current situation and future scaling up	
Counties where already promoted, if any	Marsabit and Isiolo
Counties where TIMPs will be upscaled	Wajir, Marsabit, Mandera Garissa
Challenges in development and dissemination	Limited access to cream manual separator
Suggestions for addressing the challenges	Linking of women milk vendors with fabricators of cream separator. Capacity building on processing of ghee.
Lessons learned in up scaling, if any	Has a long shelf life, can serve to enhance food security during the dry season in the areas where camel milk is produced
Social, environmental, policy and market conditions necessary for development and up-scaling	Wider acceptability of camel Ghee as a food is necessary for this technology to be upscaled.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of input would be approximately KES 80,000. The process can produce substantial quantities of ghee but there is need for cost benefit analysis
Estimated returns	No information
Gender issues and concerns in development, dissemination, adoption and scaling up	<ul style="list-style-type: none"> -Focus on women as currently they are considered poorer than men in northern Kenya -Empower women to set up SME on sale of processed ghee
Gender related opportunities	Women mostly are in charge of camel milk and value addition to milk would easily lead to economic empowerment for women
VMG issues and concerns in development, dissemination, adoption and scaling up	It is a fairly expensive technology. Most VMGs may not afford it.
VMG related opportunities	Employment opportunities may arise along the value chain and VMGs will secure jobs and earn incomes.
E: Case studies/profiles of success stories	
Success stories	Was successfully tested and validated among Salato women in Samburu County
Application guidelines for users	User manual/brochures available. Should be accompanied with capacity on quality assurance training.
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires	Ready for upscaling

validation; 3. Requires further research)	
G: Contacts	
Contacts	Institute Director, KALRO SGRI P.O. Box 147-60500 Marsabit Tel. +254 69 210 2040 Fax +254, 69 210 2220 marsabit@kalro.org
Lead organization and scientists	KALRO K. Changwony, Amos Adongo/KALRO and Prof Matofari J.W/Egerton University
Partner organizations	County Governments –MoAL&F, Kenya Camel Association

5 Camel Milk business

TIMP Name	Enhancing Livestock markets management through promoting adoption of co-management model (CMM)
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Livestock markets face various challenges which hinder them from operating at maximum capacity. Functional markets are key to ensuring sustenance of livelihoods of pastoralist communities as well as facilitating the sustainable supply of livestock products to consumers. However, there is inadequate support for the marketing of livestock and livestock products while existing marketing organizations are weak. Livestock market governance has been weak, thus creating challenges such as tax evasion and insecurity. This has caused traders to stay away from existing markets.
What is it? (TIMP description)	The Co-Management Model (CMM) for livestock markets is defined as a system of management “in which livestock farmers and other actors in the livestock value chain negotiate, define, and guarantee amongst themselves a fair sharing of the marketing functions, entitlements and responsibilities in the management of markets”. This model of managing livestock markets represents a departure from the extant system in which key livestock markets are owned and managed by County Governments with little or no involvement of the local community and no arrangements for sharing revenue derived from the livestock market. The model is a partnership between communities and County Governments to jointly manage livestock markets, share responsibilities and the revenue generated from them according to a pre-agreed schedule through an Act of County Assembly for the benefit of the communities and all other actors.

	Other agencies involved in the intervention play supportive roles to the optimal functioning of the markets.
Justification	<p>Livestock markets are a critical component of the livestock value chain since they serve as the main platform for community members to sell their livestock and sustain their livelihoods. This makes the markets instrumental in improving pastoral household income. The markets are governed and managed by Livestock Marketing Associations (LMAs) elected by all the stakeholders, including the community to facilitate day to day operations of the market.</p> <p>In the livestock market where the co-management model is operational, several tangible benefits have emerged, these includes;</p> <ul style="list-style-type: none"> • Improved market organization & efficiency. The LMAs play a vital role in facilitating this. • Reduced risks for sellers and buyers • Increased trade and improved producer prices • Improved revenue collection/ income generation for the County governments • Improved livelihoods; increased funding for community development from the resource generated from the livestock markets
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Livestock producers, traders, local leaders, officials from the local administration
Approaches used in dissemination	Facilitating legislative process to anchor the model in law; supporting stakeholders’ consultation processes through public participation; training, coaching and mentorship for LMAs
Critical/essential factors for successful promotion	Development of all necessary structures both at County and Community levels to facilitate rolling out the model
Partners/stakeholders for scaling up and their roles	<ul style="list-style-type: none"> • ILRI (marketing research) • County Government department of livestock production, veterinary services, trade and finance (regulations, security and market information) • County Assembly for legislation processes • Kenya Livestock Marketing Council (KLMC) for logistics and mobilization • Livestock Marketing Association (LMAs) • Livestock producers, traders and other market actors
C: Current situation and future scaling up	
Counties where already promoted, if any	Isiolo, Marsabit, Garissa, Wajir and Mandera, Baringo, Samburu, Tana River
Counties where TIMPs will be upscaled	Isiolo, Marsabit, Garissa, Wajir and Mandera, Baringo, Samburu, Tana River

Challenges in dissemination	The co-management model has not yet been anchored in law in most of the ASAL counties; leaving the legitimacy of LMAs in managing livestock markets legally vulnerable. This weakens any arrangement between the County Governments, LMAs and the Communities especially on revenue sharing, as this can be challenged.
Recommendations for addressing the challenges	There is need to engage the respective County Executive and the Legislators to anchor the CMM arrangement in law. Most of the Counties are at various stages of developing bills to advocate for the entrenchment of CMM. The proposed work will involve assessing each County and finding out the needs for each as far as adoption of CMM is concerned. The assessment will also draw lessons from markets that have fully adopted CMM. Additionally, CMM entails putting up CMM structures both at County and Community level to make the model a success. The generated information will be synthesized to inform decision making.
Lessons learned	Adoption of CMM has given birth to a new partnership between the communities and the County government. This has not only allowed members of the community to benefit from the markets, but has also enhanced optimal functioning of markets, as well as enhancing County government's role as a facilitator. With the establishment of this new partnership, the community members have embraced ownership of market and become increasingly willing to pay all County revenue/fees without duress.
Social, environmental, policy and market conditions necessary	The model provides avenue for engagement of all livestock market actors/stakeholders and so public participation is key in the establishment process. The County governments, local communities and the market actors have been made the key drivers of market governance and their buy-in is essential.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Estimated cost KES 4 Million The funds shall be used to facilitate the following; <ul style="list-style-type: none"> • Training of Livestock marketing associations (LMAs) • Facilitate coaching and mentoring sessions for LMAs • Support experiential learning for LMAs • Strengthen marketing groups and enhancing livestock market development & governance
Estimated returns	Once the model is established and strengthened, the following returns are anticipated; <ul style="list-style-type: none"> • Improved market organization & efficiency, Leading to competitive and inclusive markets • Reduced risks for sellers and buyers • Increased trade and improved producer prices • Improved revenue collection/income generation for the County Governments • Improved livelihoods; enhanced household income, increased funding for community development from the resource generated from the livestock markets

Gender issues and concerns in development, dissemination, adoption and scaling up	-The approach is gender friendly; women, men and youth will be given opportunity to be members of the Livestock Marketing Associations. -The Communities will be sensitized and guided to take cognizance of the 2/3 gender rule during the whole CMM adoption process
Gender related opportunities	Women and youth will be supported to take advantage of the opportunities and enabling environment created by CMM
VMG issues and concerns in development, dissemination, adoption and scaling up	-The VMGs need to be specifically included in the development of policies and laws and be made part of all the engagements in the development and dissemination of the model -The community and market actor's engagement process might take longer than anticipated
VMG related opportunities	The partnership creates a conducive environment where the concerned parties (County Government and Communities) work together to deliver a competitive and inclusive markets which will afford VMGs visibility and opportunities for business.
E: Case studies/profiles of success stories	
Success stories	Empowering the community members, through LMAs to take lead in market governance and other marketing initiatives has in the past inspired a sense of ownership and enhanced accountability and transparency in market operations in Isiolo and Marsabit. Cases of revenue evasion and insecurity minimized, leading to optimal functioning of markets as well as increased market participation.
Application guidelines for users	CMM will be promoted following guidelines and provisions derived from Isiolo Livestock sale yards Act, 2016 and Marsabit Livestock Trade and Markets bill, 2019. Each County will adapt them to their unique situation. Experiences/Lessons learned from Oldonyiro livestock market (Isiolo); Merille market (Marsabit); livestock markets in Samburu and Baringo Counties, will also inform the role out process.
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
G: Contacts	
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Lead organization and scientists	ILRI George Wamwere-Njoroge & Adan Abdi Kutu
Partner organizations	Respective County Governments (County legislation), Kenya Livestock Marketing Council (KLMC), Frontier County Development Council (FCDC) and LMAs (mobilization and training)