KALRO
Kenya Agricultural & Livestock Research Organization

NAVCDP
NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

Inventory of Climate Smart Agriculture Technologies, Innovations and Management Practices for Chicken Value Chain

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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 verify site-specific details that relate to their agro-climatic zones from their area agricultural extension officers.

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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 Cashew 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 Indigenous Chicken Value Chain. It is expected to herald new ways of delivering training content that will enable realization of the project objectives and aspirations.

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

PREFACE

The National Agricultural Value Chain Development Project (NAVCDP) is a Government of Kenya project with support from the World Bank. The five-year project is being implemented in 34 counties clustered in seven regions at an approximate cost of U$ 275 million. The project development objective (PDO) is "increase market participation and value addition for targeted farmers in select value chains in project areas." It is expected that this objective will be achieved through implementing the five project components, namely; Building Producer capacity for climate resilient stronger value chains; Climate Smart Value Chain Ecosystem Investments; Piloting Climate Smart Safer Urban Food Systems; Project Coordination and Management; and Contingent Emergency Response Component.

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

The National Agricultural Value Chain Development Project has partnered with KALRO to continue strengthening and expanding the existing inventory of TIMPs with an emphasis on climate resilience, value addition, nutrition, and safer food production practices. Through this partnership, KALRO has developed Technologies, Innovations and Management Practices (TIMPs) inventories for the two new value chains - Rice and Pyrethrum, and revised existing inventories of TIMPs for all other value chains developed during the implementation of KCSAP and NARIGP. It also supports the strengthening of the existing Big Data platform at KALRO as the foundational database for insight-driven, more productive, resource-efficient and climate-resilient farming. Finally, the Ministry of Agriculture, Livestock Development (MoALD) has put in place relevant support mechanisms with KALRO to oversee effective implementation, coordination of research linkages and agriculture digitization.

In developing suitable inventories of TIMPs and corresponding ToT manuals, KALRO has leveraged information resources as well as those of its partners and collaborators. Use of these information resources, coupled with the accompanying training and contribution of the other project components, will go a long way in enabling NAVCDP to meet its development objectives.

The National Project Coordination Unit is grateful to all who participated in the development and production of this revised Inventory of TIMPs for Indigenous Chicken Value Chain. It is my hope that counties and other users will put this resource to good use as they transform and reorient their agricultural systems to make them more productive and resilient while minimizing GHG emissions under the new realities of the changing climate.

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

TABLE OF CONTENTS

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

4SIP	Strategic Semi-Intensive System Supplementation Package
AIP	Agricultural Innovation Platforms
ASALs	Arid and Semi-Arid Lands
ASHE	*Aloe Secundiflora* Herbal Extracts
ASK	Agricultural Society of Kenya
BQs	Bill of Quantities
BSF	Black Soldier Fly
CIG	Common Interest Groups
CIGs	Common Interest groups
CSA	Climate Smart Agriculture
DVS	Directorate of Veterinary Services
FFBS	Farmer Field and Business Schools
FFS	Farmer Field School
GHG	Greenhouse Gases
HACCP	Hazard Analysis and Critical Control Points
IBD	Infectious Bursal Disease
IC	Indigenous Chicken
IMM	Integrated Manure Management
IPR	Intellectual Property Rights
KALRO	Kenya Agricultural and Livestock Research Organization
KAPOFF	KALRO Poultry Feed Formulation
KCSAP	Kenya Climate-Smart Agriculture Project
KEVEVAPI	Kenya Veterinary Vaccine Production Institute
Kg	Kilogram
KIPI	Kenya Industrial Property Institute
KIRDI	Kenya Industrial Research and Development Institute
MoALD	Ministry of Agriculture, Livestock Development
NGO	Non-Governmental Organization
NPN	Non-protein Nitrogen
PDO	Project Development Objective
PPP	Public-Private Partnership
SMEs	Small and Medium Enterprises
TIMPs	Technologies, Innovation and Management Practices
ToT	Training of Trainer
VC	Value Chain
VMD	Veterinary Medicine Directorate
VMG	Vulnerable and Marginalized Group

1.0 DEFINITION OF TERMS AND SUMMARY TABLES OF CLIMATE SMART AGRICULTURE INDIGENOUS TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES (TIMPS)

1.1 Definition of terms

Technology: This is defined as an output of a research process which 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.

Management practice: This is defined as recommendation(s) on practice(s) that is/are considered necessary for a technology to achieve its optimum output. 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.

Innovation: This is defined as a modification of an existing technology for an entirely different use from the original intended use. For example, a fireless cooker can be modified to be used as a brooder.

1.2 Summary of Inventory of TIMPs in the Indigenous Chicken Value Chain

The inventory process resulted in a total of 54 TIMPs including 38 technologies, 4 innovations, and 12 management practices, distributed among the 9 sub-themes, as indicated in Table 1.

Table 1: Sub themes and TIMPs

Commodity/VC	Sub-Theme	Technologies	Innovations	Management Practices
Indigenous chicken	Breeds	3	2	0
	Housing and production systems	1	0	1
	Hatching and brooding	1	0	2
	Feeds and feeding	18	0	0
	Animal health	6	1	1
	Manure management	0	0	1
	Value Addition	9	1	2
	Agribusiness	0	0	4
	Policy and Regulations	0	0	1
Overall Total		**38**	**4**	**12**

1.3 Summary of Status of TIMPs in Indigenous Chicken Value Chain

The inventory process resulted in a total of 39 TIMPs that are ready for upscaling and 15 TIMPs that require validation 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
Indigenous chicken	Breeds	3	2	0
	Housing and production systems	1	1	0
	Hatching and brooding	3	0	0
	Feeds and feeding	17	1	0
	Animal health	3	5	0
	Manure management	1	0	0
	Value Addition	6	6	0
	Agribusiness	4	0	0
	Policy and Regulations	1	0	0
Overall Total		**39**	**15**	**0**

Table 3: Inventory of Indigenous Chicken TIMPs by Category and Status

TIMPs Sub-heme	TIMPs Title	TIMPs Category	Status
2.1 Breeds	2.1.1 KALRO Improved Indigenous Chicken (KIC1)	Technology	Ready for upscaling
	2.1.2 KALRO Improved Indigenous Chicken (KIC2)	Technology	Ready for upscaling
	2.1.3 KALRO Improved Indigenous Chicken (KIC3)	Technology	Ready for upscaling
	2.1.4 Chicken Artificial Insemination Protocol (Spatula Method)	Innovation	Require validation
	2.1.5 Physical Identity Markers for Male and Female Day-Old Chicks	Innovation	Require validation
2.2 Housing and production systems	2.2.1 Semi-free range housing for indigenous chicken	Technology	Ready for upscaling
	2.2.2 Strategic Semi-Intensive System Supplementation Package (4SIP)	Manageme nt	Ready for upscaling
2.3 Hatching and brooding	2.3.1 Improved hatching management practices	Management	Ready for upscaling
	2.3.2 Selection and grading of table eggs	Management	Ready for upscaling
	2.3.3 Hay box brooder	Technology	Ready for upscaling
2.4 Feeds and Feeding	2.4.1 Black soldier fly Larvae meal (BSF): alternative protein source	Technology	Ready for upscaling
	2.4.2 Feed additives	Technology	Ready for upscaling
	2.4.3 Cockroach Meal; alternative protein feed for chicken	Technology	Requires validation
	2.4.4 KALRO Poultry Feed Formulation (KAPOFF) - Mobile	Technology	Ready for upscaling

TIMPs Sub-heme	TIMPs Title	TIMPs Category	Status
	application		
	2.4.5 Sorghum based layer diets	Technology	Ready for upscaling
	2.4.6 Cassava based layer diets	Technology	Ready for upscaling
	2.4.7 Affordable Maize-based Feed Ration for Growers	Technology	Ready for upscaling
	2.4.8 Affordable Maize/Maize germ-based Feed Ration for Growers	Technology	Ready for upscaling
	2.4.9 Affordable Sorghum-based Feed Ration for Growers	Technology	Ready for upscaling
	2.4.10 Affordable Sorghum/Maize germ-based Ration for Growers	Technology	Ready for upscaling
	2.4.11 Affordable Maize/Sorghum-based Feed Ration for Growers	Technology	Ready for upscaling
	2.4.12 Affordable Maize-based Feed Ration for Layers	Technology	Ready for upscaling
	2.4.13 Affordable Maize/Maize germ-based Feed Ration for Layers	Technology	Ready for upscaling
	2.4.14 Affordable Sorghum-based Feed Ration for Layers	Technology	Ready for upscaling
	2.4.15 Affordable Sorghum/Maize germ-based Feed Ration for Layers	Technology	Ready for upscaling
	2.4.16 Affordable Maize/Sorghum-based Feed Ration for Layers	Technology	Ready for upscaling
	2.4.17 Moringa Leaf meal-based Feed	Technology	Ready for upscaling
	2.4.18 Naivasha long feed trough	Technology	Ready for upscaling
2.5 Animal Health	2.5.1 Thermostable Newcastle Disease vaccine (AVIVAX-I2)	Technology	Ready for upscaling
	2.5.2 Live Gumboro Vaccine	Technology	Ready for upscaling
	2.5.3 Bivalent Newcastle disease and Gumboro vaccine	Technology	Requires Validation
	2.5.4 Monovalent Newcastle disease vaccine	Technology	Requires Validation
	2.5.5 Monovalent Gumboro Vaccine	Technology	Requires Validation
	2.5.6 *Aloe Secundiflora* Herbal Extracts (ASHE)	Technology	Requires validation
	2.5.7 Mobile-phone chicken disease reporting tool	Innovation	Requires validation
	2.5.8 Biosecurity practices	Management	Ready for upscaling
2.6 Manure management	2.6.1 Integrated chicken manure management for crop and dairy production	Management	Ready for upscaling
2.7 Value addition	2.7.1 Hygienic handling of table eggs	Management	Ready for upscaling
	2.7.2 Chicken egg value added products	Technology	Ready for upscaling
	2.7.2.1 Pasteurized eggs	Technology	Ready for upscaling
	2.7.2.2 Pickled eggs	Technology	Ready for upscaling
	2.7.2.3 Egg Powder	Technology	Ready for upscaling
	2.7.3 Processing of Fresh Chicken Meat	Management	Ready for upscaling
	2.7.4 Chicken meat value-added products		

TIMPs Sub-heme	TIMPs Title	TIMPs Category	Status
	2.7.4.1 Dressed chicken	Technology	Requires validation
	2.7.4.2 De-skinned chicken	Technology	Ready for upscaling
	2.7.4.3 Deboned chicken	Technology	Requires validation
	2.7.4.4 Cuts of dressed chicken meat	Technology	Requires validation
	2.7.4.5 Chicken nuggets	Innovation	Requires validation
	2.7.4.6 Grilled Chicken	Technology	Requires validation
	2.7.4.7 Chicken Marination	Technology	Requires validation
2.8 Agribusiness	2.8.1 Records and Records Keeping	Management	Ready for Upscaling
	2.8.2 Marketing of Chicken Products	Management	Ready for Upscaling
	2.8.3 Economic analysis	Management	Ready for Upscaling
	2.8.4 Business Planning	Management	Ready for Upscaling
2.9 Policy and Regulations	2.9.1 Policy options and regulations	Management	Ready for Upscaling

2.0 DETAILED INDIGENOUS CHICKEN (MEAT AND EGGS) VALUE CHAIN TIMPS

2.1 Breeds

2.1.1 KALRO Improved Indigenous Chicken (KC) – Technology

2.1.1 TIMP name	KALRO Improved Indigenous Chicken (KC)
Category (i.e. technology, innovation or management practice)	 Technology KC1
A: Description	
Problem to be addressed.	Low genetic potential in local chicken breeds
What is it? (TIMP description)	It is a breed that is highly suitable for both commercial and subsistence chicken farming. This breed is characterized by its rapid growth rate, with males reaching 2 kg by 4 months of age, and hens starting to lay eggs at just 4.5 months. Each bird typically lays 200-230 eggs per year, with each egg weighing 50-60 grams. Furthermore, they can scavenge for some of their food, reducing feeding expenses. Notably, this breed is adaptable to diverse environmental conditions, making it versatile in various agro-ecologies.
Justification	The KC1 chicken breed exhibits faster growth rates, resulting in quicker attainment of marketable size, which shortens production cycles and increases income generation for farmers. The breed is a prolific egg layer, providing a consistent source

2.1.1 TIMP name	KALRO Improved Indigenous Chicken (KC)
	of high-quality protein. Besides laying larger eggs, KC1 breed demonstrates resilience to extreme weather changes, making them a dependable source of income and nutrition, especially in regions prone to climate variability. Their adaptability to a range of environmental conditions contributes to building adaptive capacity in target groups and communities, ensuring a stable source of food and income even in adverse weather conditions.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers (small, medium, and large scale), women, youth, and VMGs, processors (value addition), traders, consumers; private multipliers; researchers, development partners and agripreneurs.
Approaches to be used in dissemination	• 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	• Sustaining a favorable market for Indigenous Chickens (IC) products is critical in promoting the KALRO improved chicken. • Improved management practices that enable these unique breeds to express their full genetic potential. • Enhancing nutrition, health, and overall production and productivity to ensure this chickens thrive and meet market demands efficiently. • Fostering a Public-Private Partnership (PPP) model, which plays a pivotal role in achieving sustainability. • Favorable and thriving market environment.
Partners/stakeholders for scaling up and their roles	• Private multipliers will multiply the germplasm for distribution to farmers • National, and county governments, faith-based organizations, and development partners to take up the technology and avail it to farmers as a tool for poverty alleviation and food and nutrition security • Private entrepreneurs take commercial multiplication and distribution of day-old chicks • KALRO Centers (Kakamega, Naivasha, and Msabaha) responsible for genetic material maintenance and enhancement. • Producer organizations (CIGs, VMG) tasked with rallying farmers to aggregate KC products, procure inputs, and

2.1.1 TIMP name	KALRO Improved Indigenous Chicken (KC)
	engage in collective production. • Processors focused on value addition for KC products. • County Governments responsible for funding and farmer
C: Current situation and future scaling up	
Counties where already Promoted if any	Nakuru, Bungoma, Samburu, Baringo, Kiambu, Kakamega, Machakos, Makueni, Murang'a, Uasin Gishu, Taita Taveta, Lamu, Wajir, Siaya, Kisumu, Bomet, Kericho, Laikipia, Elgeyo Marakwet, Turkana, Nyeri, Nyandarua, Tharaka Nithi, Meru, Homabay, Migori, Busia, West Pokot, Isiolo, Vihiga, Tana River, Garissa, Narok, Trans Nzoia, Kitui, Embu, Nairobi and Samburu
Counties where TIMPs will be up scaled	All Indigenous Chicken-rearing counties, including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Low literacy, skills, and knowledge about chicken farming. • Limited information sharing through digital networks. • Lack of a commercial orientation in traditional farming practices. • The high cost of inputs, coupled with fluctuating market prices. • Disorganized marketing channels.
Suggestions for addressing the challenges in upscaling if any	• Enhance knowledge sharing through hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • Enhance information sharing via digital networks. • Promote commercialization through aggregation. • Promote use of locally available feed ingredients for quality feeds • Formulate policies to reduce input costs. • Streamline market outlets (primary, secondary and tertiary markets)
Lessons learned in upscaling if any	• Practical skills and knowledge enhance upscaling of TIMPs • Continuous capacity building of end users/beneficiaries • PPPs to eliminate counterfeit suppliers.
Social, environmental, policy and market conditions necessary for development and upscaling	• Continuous improvement of genetic material to match market demand • Reliable market channels and stable prices • Increase chick production through PPP • Promote aggregations of chicken products and value addition
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	

2.1.1 TIMP name	KALRO Improved Indigenous Chicken (KC)
Basic costs	• KES 120 per day old chick • KES 280 per month old chick • KES 1,000 per tray of 30 fertile eggs • KES 1,500 per breeding cock
Estimated returns	• 50% increase in egg production compared to local chicken
Gender issues and concerns in development, dissemination adoption and scaling up	• Women and youth may have limited access to finances to acquire the required inputs such as improved Indigenous chicken and feeds • Slow information and awareness flow for female farmers due to low academic levels • Training materials and strategies may not be favorable to women farmers • Due to their many roles, women may have limited access to education, training and extension services • Women may have limited access to markets because of their limited mobility
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • KALRO chicken has high local demand therefore offers an opportunity for women and youth who are mostly involved in production and marketing of products • Developing gender friendly training materials with illustrations to enhance communication for all gender • Proper timing of agricultural related meetings will allow participation by all the gender categories
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have limited access to training and extension services • VMGs may have limited access to markets since they may not travel to distant markets due to disability or a lack of exposure • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • VMG adoption is low due to a lack of awareness.
VMG related opportunities	• Increased production will result in increased consumption and utilization of indigenous chicken, and thus improved VMG health. • Connect VMGs to financial resources to empower them.
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Proper housing, feeds and feeding, strict biosecurity procedures for disease prevention, adherence to vaccination guidelines and record keeping

2.1.1 TIMP name	KALRO Improved Indigenous Chicken (KC)
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	• Ready for upscaling • Further research is required to develop an egg and meat line • Develop PPPs to increase multiplication of KC
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO NRI; Drs. Joseph Munyasi, Ann Wachira, David M. Mwangi, Peter Alaru, Ludovicus Okitoi, Tobias K'Oloo, Sophie Miyumo and Ochieng Ouko
Partner organizations and their roles	• KALRO Centers (Kakamega, Naivasha, and Msabaha) • Producer organizations (CIGs, VMG) • Processors • County Governments

Gaps:

1. Develop descriptors and establish a standardized bird inspection and registration process for IC breed lines.
2. Enhance KALRO's research capabilities through infrastructure development.
3. Introduce new climate-smart IC breed lines to benefit smallholder and disadvantaged stakeholders in the IC subsector, with one dual-purpose line ready for upscaling and plans to develop two additional lines (one for eggs and one for meat).
4. Produce and multiply parental stock for the newly developed IC breed lines.
5. Preserve selected IC ecotypes to create a sustainable and diverse gene pool for integration into the developed IC breed lines.
6. Assess consumer preferences, considering both meat and egg quality attributes.

2.1.2 KALRO Improved Indigenous Chicken (KC 2) – Technology

2.1.2 TIMP name	KALRO Improved Indigenous Chicken (KC2)
Category (i.e. technology, innovation or management practice)	Technology KC2
A: Description	
Problem to be addressed.	Low genetic potential in local chicken breeds
What is it? (TIMP description)	**Is** a breed renowned for its suitability in both commercial and subsistence chicken farming due to its rapid growth rate. They start laying eggs at just 4.5 months of age, and the males can reach 2 kg in weight by 4 months. Each bird typicallylays 200-230 eggs annually, weighing 50-60 grams each. Furthermore, they can scavenge for some of their food, reducing feeding costs. . Notably, this breed is adaptable to diverse environmental conditions, making it versatile in various agro-ecologies.

Justification	The KC2 chicken exhibits faster growth rates, attaining marketable size in a shorter duration and increases income generation for farmers. The chicken is a prolific egg layer of larger eggs, providing a consistent source of high-quality protein. The breed is resilient to extreme weather changes and is a dependable source of income and nutrition, especially in regions prone to climate variability. Adopting KC2 chicken contributes to reducing greenhouse gas emissions due to their lower environmental footprint, requiring less land, water, and feed for the same meat or egg production.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers (small, medium, and large scale), women, youth, and VMGs, processors (value addition), traders, consumers; private multipliers; researchers, development partners and agripreneurs.
Approaches to be used in dissemination	• 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 servic
Critical/essential factors for successful promotion	• Sustained favorable market for Indigenous Chickens products • New and enhanced management practices for unlocking genetic potential and dealing with new challenges • A Public-Private Partnership (PPP) model is pivotal for achieving sustainability.
Partners/stakeholders for scaling up and their roles	• Private Multipliers will multiply the germplasm for distribution to farmers • National, and County governments, faith-based organizations, and development partners to take up the technology and avail it to farmers as a tool for poverty alleviation, food and nutrition security. • Private entrepreneurs take commercial multiplication and distribution of day-old chicks
C: Current situation and future scaling up	
Counties where already Promoted if any	Nakuru, Bungoma, Samburu, Baringo, Kiambu, Kakamega, Machakos, Makueni, Murang'a, Uasin Gishu, Taita Taveta, Lamu, Wajir, Siaya, Kisumu, Bomet, Kericho, Laikipia, Elgeyo Marakwet, Turkana, Nyeri, Nyandarua, Tharaka Nithi, Meru, Homabay, Migori, Busia, West Pokot, Isiolo, Vihiga, Tana River, Garissa, Narok, Trans Nzoia, Kitui, Embu, Nairobi and Samburu
Counties where TIMPs will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties:

	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Low literacy, skills, and knowledge about chicken farming. • Limited information sharing through digital networks. • Lack of a commercial orientation in traditional farming practices. • The high cost of inputs, coupled with fluctuating market prices. • Disorganized marketing channels.
Suggestions for addressing the challenges in upscaling if any	• Enhance knowledge sharing through hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • Enhance information sharing via digital networks. • Promote commercialization through aggregation. • Promote use of locally available feed ingredients for quality feeds • Formulate policies to reduce input costs. • Streamline market outlets (primary, secondary and tertiary markets)
Lessons learned in upscaling if any	• Practical skills and knowledge enhance upscaling of TIMPs • Continuous capacity building of end users/beneficiaries • PPPs to eliminate counterfeit suppliers.
Social, environmental, policy and market conditions necessary for development and upscaling	• Continuous improvement of genetic material to match market demand • Reliable markets channels and stable prices • Increase chick production through PPP • Promote aggregations of chicken products and value addition
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 120 per day old chick • KES 280 per month old chick • KES 1,000 per tray of 30 fertile eggs • KES 1,500 per breeding cock
Estimated returns	• KES 6,000 per hen per production cycle based on hatching egg production
Gender issues and concerns in development, dissemination adoption and scaling up	• Women and youth may have limited access to finances to acquire the required inputs such as improved Indigenous chicken and feeds • Slow information and awareness flow for female farmers due to low academic levels • Training materials and strategies may not be favorable to women farmers • Due to their many roles, women may have limited access to education, training and extension services

	• Women have limited access to markets because of their limited mobility
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • KALRO chicken has high local demand therefore offers an opportunity for women and youth who are mostly involved in production and marketing of products • Developing gender friendly training materials with illustrations to enhance communication for all gender • Proper timing of agricultural related meetings will allow participation by all the gender categories
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have limited access to training and extension services • VMGs may have limited access to markets since they may not travel to distant markets due to disability or a lack of exposure • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • VMG adoption is low due to a lack of awareness.
VMG related opportunities	• Increased production will result in increased consumption and utilization of indigenous chicken, and thus improved VMG health. • Connect VMGs to financial resources to empower them.
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Proper housing, feeds and feeding, strict biosecurity procedures for disease prevention, adherence to vaccination guidelines and record keeping
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	• Ready for upscaling • Further research is required to develop an egg and meat line • Develop PPPs to increase multiplication of KC
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO NRI ; Drs. Joseph Munyasi, Ann Wachira, David M. Mwangi, Peter Alaru, Ludovicus Okitoi, Tobias K'Oloo, Sophie Miyumo and Ochieng Ouko
Partner organizations	• KALRO Centers. • Producer organizations (CIGs, VMG. • Processors. • County Governments responsible for funding and farmer mobilization and providing extension services for follow-ups.

Gaps:

1. Develop descriptors and establish a standardized bird inspection and registration process for IC breed lines.
2. Enhance KALRO's research capabilities through infrastructure development.
3. Introduce new climate-smart IC breed lines to benefit smallholder and disadvantaged stakeholders in the IC subsector, with one dual-purpose line ready for upscaling and plans to develop two additional lines (one for eggs and one for meat).
4. Produce and multiply parental stock for the newly developed IC breed lines.
5. Preserve selected IC ecotypes to create a sustainable and diverse gene pool for integration into the developed IC breed lines.
6. Assess consumer preferences, considering both meat and egg quality attributes.

2.1.3 KALRO Improved Indigenous Chicken (KC3)

2.1.3 TIMP name	**KALRO Improved Indigenous Chicken (KC3)**
Category (i.e. technology, innovation or management practice)	Technology
A: Description	
Problem to be addressed.	**KC3 breed** • Availability of breed with black plumage that is culturally unpopular • Inability to align an appealing chicken plumage to the rising market demand, especially among the Western population through breeding. • Long-standing challenge of low genetic potential in local chicken for both meat and egg production in Western Kenya and other regions.
What is it? (TIMP description)	The KC3 breed is an improved scavenging chicken breed with an attractive plumage that is highly suitable for both commercial and subsistence farming due to its high growth rate. The females start laying eggs at 4.5 months of age while males attain 2 kg in liveweight at 4 months of age. Average egg production is 200-230 eggs per year, with medium weight and a likable light brown-cream colour. The breed is adaptable to various agro-ecologies and different environmental conditions
Justification	The KC3 chicken breed exhibits faster growth rates, resulting in quicker attainment of marketable size, which shortens production cycles and increases income generation for farmers. It is a prolific egg layer with larger eggs providing a consistent source of high-quality protein. The chicken breed is resilient to extreme weather changes, making them a dependable source of income and nutrition, especially in regions prone to climate variability. In addition, the attractive brown plumage makes it accepted across many communities. Adopting the KC3 chicken contributes to reducing greenhouse gas emissions due

2.1.3 TIMP name	KALRO Improved Indigenous Chicken (KC3)
	to their lower environmental footprint, requiring less land, water, and feed for the same meat or egg production.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers (small, medium, and large scale), women, youth, and VMGs, processors (value addition), traders, consumers; private multipliers; researchers, development partners and agripreneurs.
Approaches to be used in dissemination	• 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	• Sustained favorable market for Indigenous Chickens products • New and enhanced management practices for unlocking genetic potential and dealing with new challenges • A Public-Private Partnership (PPP) model is pivotal for achieving sustainability
Partners/stakeholders for scaling up and their roles	• Private Multipliers will multiply the germplasm for distribution • National, and County governments, faith-based organizations, and development partners will take up the technology and avail it to farmers as a tool for poverty alleviation, food and nutrition security as well as income generation.
C: Current situation and future scaling up	
Counties where already Promoted if any	Nakuru, Bungoma, Baringo, Nandi, Kiambu, Kakamega, Siaya, Kisumu, Turkana, Homabay, Migori, Bomet, Kitui, Kisii, Meru, Busia, West Pokot, Isiolo, Vihiga, Trans Nzoia, Nairobi and Kajiado
Counties where TIMPs will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Low literacy, skills, and knowledge about chicken farming. • Limited information sharing through digital networks. • Lack of a commercial orientation in traditional farming practices. • The high cost of inputs, coupled with fluctuating market prices. • Disorganized marketing channels.

2.1.3 TIMP name	KALRO Improved Indigenous Chicken (KC3)
Suggestions for addressing the challenges in upscaling if any	• Enhance knowledge sharing through hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • Enhance information sharing via digital networks. • Promote commercialization through aggregation. • Promote use of locally available feed ingredients for quality feeds • Formulate policies to reduce input costs. • Streamline market outlets (primary, secondary and tertiary markets)
Lessons learned in upscaling if any	• Practical skills and knowledge enhance upscaling of TIMPs • Continuous capacity building of end users/beneficiaries • PPPs to eliminate counterfeit suppliers.
Social, environmental, policy and market conditions necessary for development and upscaling	• Continuous improvement of genetic material to match market demand • Reliable markets channels and stable prices • Increase chick production through PPP • Promote aggregations of chicken products and value addition • Breed is early maturing reaching egg laying and table weight quiet early thus saving on costly feeds and drawing too much from the environment.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 120 per day old chick • KES 280 per month old chick • KES 1,000 per tray of 30 fertile eggs • KES 1,500 per breeding cock
Estimated returns	• KES 1,500 per hen per production cycle
Gender issues and concerns in development, dissemination adoption and scaling up	• Women and youth may have limited access to finances to acquire the required inputs such as improved Indigenous chicken and feeds • Slow information and awareness flow for female farmers due to low academic levels • Training materials and strategies may not be favorable to women farmers • Due to their many roles, women may have limited access to education, training and extension services • Women may have limited access to markets because of their limited mobility
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • KALRO chicken has high local demand therefore offers an opportunity for women and youth who are mostly involved in production and marketing of products • Developing gender friendly training materials with illustrations to enhance communication for all gender • Proper timing of agricultural related meetings will allow

2.1.3 TIMP name	KALRO Improved Indigenous Chicken (KC3)
	participation by all the gender categories
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have limited access to training and extension services • VMGs may have limited access to markets since they may not travel to distant markets due to disability or a lack of exposure • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • VMG adoption is low may be due to a lack of awareness.
VMG related opportunities	• Increased production will result in increased consumption and utilization of indigenous chicken, and thus improved VMG health. • Connect VMGs to financial resources to empower them.
E: Case studies/profiles of success stories	
Success stories	https://youtu.be/mEBc6LJ-c-w?si=4TsAiNIddctNvF9F
Application guidelines for users	Proper housing, feeds and feeding, strict biosecurity procedures for disease prevention, adherence to vaccination guidelines and record keeping
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	• Ready for upscaling • Further research is required to develop an egg and meat line • Develop PPPs to increase multiplication of KC
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO NRI KAKAMEGA; Drs. Joseph Munyasi & Ann Wachira,
Partner organizations	• KALRO NRI (Kakamega, Naivasha & Msabaha) • County Governments

Gaps:

1. Development of descriptors and stabilization of bird inspection and registration of IC breed lines
2. Improve KALRO's capacity to carry out research through infrastructure development.
3. New climate-smart IC breed lines among smallholder and disadvantaged actors in the IC subsector (1 dual purpose line is ready for upscaling but two lines (egg and meat) will be developed)
4. Production and multiplication of parental stock for the developed IC breed lines
5. Conservation of selected IC ecotype to form a sustainable, diverse gene pool for introgression into developed IC breed lines.
6. Evaluate consumer preference based on both meat and egg quality attributes
7. Preference based on both meat and egg quality attributes.

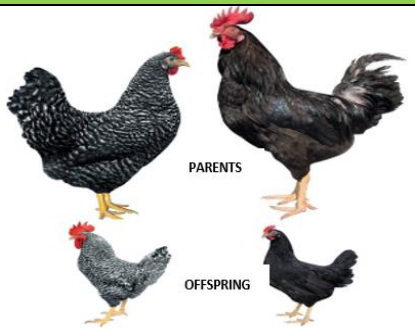
2.1.4 Chicken Artificial Insemination Protocol (Spatula Method)

2.1.4 TIMP Name	Chicken Artificial Insemination Protocol (Spatula Method)
Category (i.e. technology, innovation or management practice) ``	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	The drawbacks of the traditional intra-vaginal method, including its slow, laborious process, stress to hens, technical complexity, extensive training requirements, and high cost, by providing a more efficient, less stressful, and cost-effective alternative.
What is it? (TIMP description)	This is an artificial insemination method that involves placing semen into the cloaca of a laying hen using a spatula to enable the production of fertile eggs. The protocol includes training of cocks for semen retrieval, collection of semen, preparation of a semen extender, extension of semen, and placement of semen into the cloaca using a spatula (hence the name of the protocol).
Justification	The adoption of this protocol will revolutionize chicken production practices, leading to a multitude of benefits. By enabling a higher cock-to-hen mating ratio, the spatula method maximizes the utilization of superior male genetics, accelerating genetic progress. This, in turn, leads to a reduction in cock maintenance costs, as fewer roosters are required to maintain a productive flock. The enhanced selection intensity and accuracy facilitated by the spatula technique enable breeders to make more precise genetic selections, further accelerating genetic gains. Consequently, this protocol ultimately translates into increased productivity, enabling chicken producers to achieve higher yields and greater profitability.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	This TIMP will find applications from breeders, strategic multipliers and agripreneurs.
Approaches to be used in dissemination	• 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	• Involvement of all value chain stakeholders in the promotion process. • Effective awareness creation through farmer training. • Backstopping and impact assessment of the training process. • Availability, accessibility, and affordability of good quality breeds.

2.1.4 TIMP Name	Chicken Artificial Insemination Protocol (Spatula Method)
Partners/stakeholders for scaling up and their roles	KALRO, The State Department for Livestock and Egerton University: Research and development of technologies/ Innovations.
C: Current situation and future scaling up	
Counties where already/Promoted if any	None
Counties where TIMPs will be upscaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	Some information channels are difficult to use due to low literacy levels, requiring demonstration.
Suggestions for addressing the challenges in upscaling if any	Enhance knowledge sharing through hands-on training and experience in farmer field schools and pastoral field schools.
Lessons learned in upscaling if any	Continuous capacity building of extension service providers on the innovation
Social, environmental, policy and market conditions necessary for development and upscaling	Attractive dissemination methods that are in line with varied cultures among chicken farming communities.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Kes. 1,500 (Production of pictures to enable visualization of physical identifications)
Estimated returns	One ejaculate will serve 15 hens producing over 100 chicks while in natural mating, one ejaculate can only serve one hen and produce seven chicks.
Gender issues and concerns in development, dissemination adoption and scaling up	• Women may have limited access to education, training and extension services • Women may have less access to resources such as credit, implements and inputs for chicken production • Women may have less access to skills and knowledge on artificial insemination • Women and youth may have less access to land for chicken production
Gender-related opportunities	• The artificial insemination (AI) sector presents promising opportunities for young individuals to establish and run successful businesses. • Unlike other livestock sectors, women play a more prominent role in the management and marketing of chickens and their products, fostering their confidence and engagement in chicken production. • The high adoption rate of AI among women stems from their direct control over the financial benefits generated from chicken sales and derived products. • Affirmative action programs facilitate access to credit for women and youths, enabling them to acquire the necessary resources to venture into AI businesses.

2.1.4 TIMP Name	Chicken Artificial Insemination Protocol (Spatula Method)
	• Well-structured and gender-inclusive markets and marketing systems encourage the participation of women and youths in the AI sector.
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge • VMGs may also have limited access to finances to buy the technology • 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	• Affirmative action opportunities exist for women and youths to acquire the required credit • Employment opportunities exist for youths in performing the task of artificial insemination • This technology is simple and would create employment for VMGs at the local level
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Magothe T.M., Ouko V. O., Miyumo S., K'Oloo T.O., Okeno T.O., Ngeno K., Wasike C.B., Kahi A.K., Alaru P.O. and E.D. Ilatsia.(In press) A novel artificial insemination technique in chicken: application in indigenous chicken in Kenya, *South African Journal of Animal Science* A demonstration vedeo can be found at: https://www.youtube.com/watch?v=iEQoUrob8oI
F: Status of TIMPs readiness	
(1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Requires the validation in different agro-ecologies
G: Contacts	
	Institute Director Non-Ruminant Research Institute (KALRO) P.O. Box 169-50100 Kakamega Kalro.Kakamega@kalro.org, kalropoultrykakamega@kalro.org, kalropoultry@kalro.org
Leadorganization and scientists	KALRO: Peter Alaru, Ouko V. O., Miyumo S., K'Oloo T.O. and E.D. Ilatsia
Partner organizations	State Department for Livestock: Magothe T.Magothe., Moi University: Ngeno Kiplangat

2.1.5 Physical Identity Markers for Male and Female Day-Old Chicks

2.1.5 TIMP Name	Physical Identity Markers for Male and Female Day-Old Chicks
	 
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Inability to identify and separate day-old males and female chicks for specialized production of either eggs (hens only) or meat (cocks only).
What is it? (TIMP description)	This is the process of differentiating male and female chicks utilizing the expression of the barred gene. Parents are mated to ensure that the offspring inherit the barring gene. The feasibility of using a white spot on the head, neck, or any other body part of day-old chicks, as well as the rate of feather growth (down feathers), are suitable physical markers for identifying male and female day-old chicks of KC1 and KC2. Distiguishing between male and female day-old chicks is possible due to the relationship between plumage colour (barred and non-barred) and feather growth rate. The best results from this approach are obtained when a cross between KC1 and KC2 is used.
Justification	This technique is able to identify male and female day old chicks effectively. It therefore addresses the critical need to distinguish between day-old male and female chicks, catering to the specific requirements of specialized farming operations. By enabling early identification of male and female chicks, it allows farmers to tailor their management practices and feeding strategies to optimize production efficiency and profitability. This method aligns with the growing demand for specialized chicken production, ensuring that farmers can meet the specific requirements of egg or meat production with greater precision.
B: Assessment of dissemination and scaling up/out approaches	

2.1.5 TIMP Name	Physical Identity Markers for Male and Female Day-Old Chicks
Users of TIMP	Breeders, strategic multipliers, large scale farmers who will need to seperate male and female chicks before distribution and agripreneurs.
Approaches to be used in dissemination	• 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	• Involvement of all value chain stakeholders in promotion processes. • Effective awareness creation through training. • Backstopping and training impact assessment. • Availability, accessibility and affordability of good quality breeds
Partners/stakeholders for scaling up and their roles	• KALRO- to research and develop technologies/ Innovations • County government-to provide extension services and regulation of on-farm demonstration • Public and private extension service-to provide extension services • State Department for Livestock- to conduct research and develop technologies/ Innovations.
C: Current situation and future scaling up	
Counties where already/Promoted if any	None
Counties where TIMPs will be upscaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	Some information channels are difficult to use due to low literacy levels, requiring demonstration.
Suggestions for addressing the challenges in upscaling if any	Enhance knowledge sharing through hands-on training/ experiences (in Farmer Field Schools, Pastoral field schools)
Lessons learned in upscaling if any	None
Social, environmental, policy and market conditions necessary for development and upscaling	Supportive policy of national and county governments to promote adaption of physical identification of male and female chicks in the chicken value chain.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 1,000
Estimated returns	Implementing gender separation among chicks can dramatically

2.1.5 TIMP Name	Physical Identity Markers for Male and Female Day-Old Chicks
	enhance the profitability of chicken operations. By segregating male and female chicks at day old, farmers can reap a substantial return on investment, reaching up to 42.8%. The market value of a one-month-old chick from a mixed-gender flock is Kes. 280. However, gender-separated chicks command a premium price of Kes. 400, highlighting the significant financial benefits associated with selling male and female chicks seperately.
Gender issues and concerns in development, dissemination adoption and scaling up	• Women may have less access to skills and knowledge on the TIMP • Women and youth may have limited access to finances to acquire the required inputs such as feeds and other inputs • Women may have limited access to education, training and extension services. • Women and youth may have less access to land for chicken production • Despite their significant contributions to chicken production, women's decision-making power has paradoxically diminished as productivity has increased.
Gender-related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required credit • Employment opportunities exist for youths in performing the task
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge • 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	• This technology is simple and would create employment for VMGs at the local level • Affirmative action opportunities exist for women and youths to acquire the required credit • Employment opportunities exist for youths in performing the task of artificial insemination
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	See provided pictorial
F: Status of TIMPs readiness	
(1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Requires the validation in different agro-ecologies
G: Contacts	
	Institute Director Non-Ruminant Research Institute (KALRO) P.O. Box 169-50100 Kakamega

2.1.5 TIMP Name	Physical Identity Markers for Male and Female Day-Old Chicks
	Kalro.Kakamega@kalro.org, kalropoultrykakamega@kalro.org, kalropoultry@kalro.org
Leadorganization and scientists	KALRO: Peter Alaru, Ouko V. O., Miyumo S., K'Oloo T.O. and E.D. Ilatsia
Partner organizations	State Department for Livestock: Magothe T. Magothe., Moi University: Ngeno Kiplangat

Gaps:

1. Creating awareness to encourage adoption
2. Revising guidelines based on new information

2.2 Housing and production systems

2.2.1 Semi-Range Housing for Indigenous Chicken

2.2.1 TIMP name	Semi-Free Range Housing for Indigenous Chicken
Category (i.e. technology, innovation, or management practice)	Technology
A: Description of the technology	
Problem addressed	Low productivity in chicken due to predation, theft and diseases.
What is it? (TIMP description)	It is a chicken slatted house designed to accommodate up to 100 adult hens. It has a stocking density of 6-8 birds per square meter, ensuring a comfortable living space for the flock. The structure features durable G30 iron sheets measuring 5 meters by 3 meters, providing ample protection from the elements. The raised floor is reinforced with wire mesh, which not only provides a stable platform for the chicken but also aids in waste management. The open sides are enclosed with chicken wire, allowing for proper ventilation and natural lighting. This mobile chicken house offers flexibility in positioning, making it an efficient and practical solution for chicken farming, ensuring the well-being and productivity of the birds.
Justification	Easy chicken manure collection for improves soil health and reduces reliance on synthetic fertilizers at the farm level. The method lowers disease transmission risks by allowing the relocation of chickens, ensuring a safer and hygienic environment. In addition it enhances ventilation in mobile chicken houses, leading to improved air quality and reduced ammonia build-up for the birds. The use of locally-sourced construction materials enhances the cost-effectiveness and adaptability of mobile chicken houses, making them a sustainable choice for regenerative farming practices and improved chicken welfare. The adaptability of these structures gives them the ability to adapt to changing farm conditions, supporting sustainable and holistic farming practices that result in higher-quality eggs.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, extension officers and agripreneurs
Approaches to be used in	• Farmer Field and Business School (FFBS)

2.2.1 TIMP name	Semi-Free Range Housing for Indigenous Chicken
dissemination	• 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	• Utilization of locally available construction materials to minimize costs. • Strict adherence to established stocking density guidelines. • Implementing adaptable ventilation strategies based on current weather conditions. • Elevating the floor to facilitate the efficient removal of manure. • Designing laying nests and feeders to be accessible from outside the house, enhancing biosecurity and security measures.
Partners/stakeholders for scaling up and their roles	• KALRO (Kenya Agricultural and Livestock Research Organization) - Technology provider. • Public and private extension service providers - Offering support and guidance. • KIRDI (Kenya Industrial Research and Development Institute) and County Public Works - Collaborating on architectural design and localized Bill of Quantities (BQs). • Vocational institutions and local artisans (jua kali fabricators) Engaging in skill development and construction work.
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be upscaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Inadequate education and training to improve the skills and knowledge of those involved in chicken farming, • Lack of digital networks for information sharing, • Lack of cost-effective options for building materials, • Lack of standardized specifications for chicken houses
Recommendations for addressing the challenges	• Enhance education and training to improve the skills and knowledge of those involved in chicken farming, • Establish digital networks for information sharing,

2.2.1 TIMP name	Semi-Free Range Housing for Indigenous Chicken
	• Explore cost-effective options for building materials, and implement standardized specifications for chicken houses
Lessons learned	Increased sensitization on importance of chicken houses and the use of locally available materials to optimize adoption
Social, environmental, policy and market conditions necessary	Attractive dissemination methods that are in line with varied culture among chicken farming communities.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 50,000 to house 100 mature birds
Estimated returns	• KES 7,500 for a production cycle of 78 weeks • Reduction in losses from predation and loss of eggs • 30% increased returns with housing than without housing for 100 birds that translates to KES 7,500 worth of eggs per production cycle.
Gender issues and concerns in development, dissemination adoption and scaling up	• Women may have inadequate access to finances to acquire construction material for the chicken as well as other farm inputs • Women may have less access to agricultural information, technology and knowledge • Women may have limited access to education and extension services • Women may have limited access to productive resources such as land and other inputs • Due to time poverty women may not have time to attend training activities head away from their home
Gender related opportunities	• Employment opportunities for youth exists in house construction • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in development, dissemination adoption and scaling up	• This technology may not be affordable to VMGs • VMGs do not have access to input services such as information. • VMGs have limited access to training and extension services • VMGs are frequently excluded from decision-making in development and dissemination activities due to their social status. • VMGs' adoption may be low due to a lack of awareness.
VMG related opportunities	• Employment opportunities for youth exists in house construction • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required credit
E: Case studies/profiles of success stories	
Success stories	Not documented but there could be many successful stories
Application guidelines for users	Use of locally available materials in construction of chicken house without compromising on environment and health of chicken. KALRO Poultry Training Manual
F: Status of TIMPs	

2.2.1 TIMP name	Semi-Free Range Housing for Indigenous Chicken
readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Requires the validation in different agro-ecologies
G: Contacts	
	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO NRI Kakamega; Ann Wachira, David M. Mwangi, Prof. Lucy Kabuage and Peter Alaru
Partner organizations	Vocational Institutions

Gaps:

1. Development of designs and bill of quantities for various agroecological zones

2.2.2 Strategic Supplementation Approach for Semi intensive System

2.1.1 TIMP name	Strategic Semi-Intensive System Supplementation Package (4SIP)
Category (i.e. technology, innovation or management practice)	Management practice 
A: Description	
Problem to be addressed	• Nutritional deficiencies under semi-intensive production systems. • Low growth, productivity and health leading to reduced egg production, increased mortality, and vulnerability to diseases, affecting livelihoods and food security.
What is it? (TIMP description)	Strategic Semi-Intensive System Supplementation Package (4SIP) is a cost-effective approach to raising chickens, which boosts productivity and profitability. The 4SIP package consists of precise management practices and a formulated ration that provides indigenous chickens with essential nutrients that are deficient under the free-range production environment.
Justification	Inadequate management practices and nutrient deficiencies in indigenous chickens raised under semi-intensive production systems hinder their growth, productivity, and health, leading to reduced egg production, low income, increased mortality, and heightened susceptibility to diseases. Targeted management practices and supplementation are crucial for addressing these

2.1.1 TIMP name	Strategic Semi-Intensive System Supplementation Package (4SIP)
	management and nutrient gaps. By implementing the 4SP, farmers can optimize chicken performance under semi-intensive production systems, leading to enhanced productivity (growth rate increases by 47.97% and bodyweight increases by 30.91%) and profitability gains of 34%.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken breeders, farmers (women, youth and VMGs), researchers service providers, extension service providers, private multipliers and agripreneurs.
Approaches to be used in dissemination	• 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	• Requires highlighting its unique qualities and benefits. • Targeting the right audience through various marketing channels, creating compelling content, building relationships with influencers and partners, and exercising patience and persistence • Improve chick availability
Partners/stakeholders for scaling up and their roles	• KALRO - Maintenance of the breed, setting of breeding objectives, genetic evaluation, selection, multiplication and distribution of the breeding material • Private multipliers to multiply the germplasm for distribution to farmers • National, and County governments, faith-based organizations and development partners to take up the technology and avail it to farmers as a tool for poverty alleviation, food and nutrition security. • Universities- Research, production and maintain backup nucleus chicken • Livestock Recording Centre (Ministry of Agriculture and Livestock Development) - Performance recording, genetic evaluation and advisory. • Kenya Livestock Breeders Association - Chicken registration and database management.
C: Current situation and future scaling up	
Counties where already Promoted if any	None
Counties where TIMPs will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties:

2.1.1 TIMP name	Strategic Semi-Intensive System Supplementation Package (4SIP)
	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Many farmers may not be aware of the benefits of chicken supplementation or may have misconceptions about the process, hindering the adoption of supplementation practices. • Farmers may not have access to readily available information on appropriate supplementation strategies, feed options, and cost-effective implementation methods. • Traditional practices and beliefs may influence farmers' decisions regarding chicken rearing, making them reluctant to adopt the supplementation practice. • Farmers may lack the necessary training and support to properly implement supplementation practices, leading to potential misuse or inefficiencies.
Suggestions for addressing the challenges in upscaling if any	• Implement targeted awareness campaigns and education programs to inform farmers about the benefits of chicken supplementation, using various communication channels like radio, mobile messaging, and community meetings. • Provide farmers with access to easily understandable and locally relevant information on supplementation practices, feed options, and cost-effective implementation methods through extension services, demonstrations, and farmer field schools. • Encourage the integration of supplementation practices into existing traditional farming practices to minimize cultural resistance and promote acceptance. • Provide farmers with hands-on training and ongoing support to ensure proper implementation of supplementation practices, addressing any technical challenges or misconceptions.
Lessons learned in upscaling if any	• Continuous capacity building of extension service providers on new breeds • Initiate PPPs to eliminate counterfeit suppliers.
Social, environmental, policy and market conditions necessary for development and upscaling	• Social acceptability of alternative ways of raising chickens • Continuous improvement of genetic material to match market demand • Need to ensure environmental balance e.g through provision of forage • Reliable markets channels and stable prices • Increase chick production through PPP
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Cost per Day-Old Chick: KES 110 • Medication and Vaccination Costs: KES 100 per chicken • Egg Price: KES 15 per egg • Hen Price: KES 600 • Egg Production: 280 eggs in a year (5 eggs per week) • Growth Period: 75 weeks (about 18 months)

2.1.1 TIMP name	Strategic Semi-Intensive System Supplementation Package (4SIP)
	• Average Daily Feed Cost: KES 5 per chicken
Estimated returns	• Net Profit = (Revenue from Egg Sales) + (Sale Price of Chicken) - (Cost of Day-Old Chick) - (Medication and Vaccination Costs) - (Total Feed Cost) • Net Profit = KES 4,200 + KES 600 - KES 110 - KES 100 - KES 2,625 • Net Profit = KES 1,965 per hen per year • Return on investment for raising improved KC2 under a scavenging system with maize to supplement is high, at 34.04%. This means that for every shilling invested, farmers can expect a return of 0.34 shillings.
Gender issues and concerns in development, dissemination adoption and scaling up	• Women may have limited access to education, training and extension services • Women may have less access to resources such as credit, implements and inputs for maize production • Women may have less access to skills and knowledge on semi-intensive supplementation practice • Women and youth may have less access to land for grain (maize) production
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • Chicken production under semi-intensive system has high local demand therefore offers an opportunity for women and youth who are mostly involved in production and marketing of products • Employment opportunities exist for youths in performing semi-intensive supplementation related husbandry tasks
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have limited access to training and extension services • VMGs may have limited access to markets since they may not travel to distant markets due to disability or a lack of exposure • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • VMG adoption is low due to a lack of awareness.
VMG related opportunities	• Affirmative action opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for them in performing semi-intensive supplementation related husbandry tasks
E: Case studies/profiles of success stories	
Success stories	https://www.ilri.org/news/gates-foundation-ceo-mark-suzman-visits-transformative-poultry-research-kenya
Application guidelines for users	Proper housing, feeds and feeding, strict biosecurity procedures for disease prevention, adherence to vaccination guidelines and record keeping as described by: 1) K. Ngeno, Peter Alaru, Magothe Mwaura, Chrilukovian Wasike, Ochieng Ouko, Tobias K'Oloo, and Evans Ilatsia. 2022. Growth performance of KALRO climate-smart

2.1.1 TIMP name	Strategic Semi-Intensive System Supplementation Package (4SIP)
	indigenous chicken breed lines under free-range production environments. 2) Peter Alaru, Magothe Mwaura, Chrilukovian Wasike, Kiplangat Ngeno, Ochieng Ouko, Tobias K'Oloo, Samson Mwangi, Christine Kamidi, Sophie Miyumo and Evans Ilatsia. 2021. KALRO Chicken management manual.
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	• Ready for upscaling • Develop PPPs to increase dissemination of semi-intensive supplementation information
G: Contacts	
Contacts	Moi University P. O. Box 3900 - 30100, Kesses, Eldoret, Kenya
Lead organization and scientists	Moi University Lead Scientist: Dr Kiplangat Ngeno
Partner organizations and their roles	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;

Gaps:

1. County specific strategic supplementation package based on local available feed resources
2. Genotype-based strategic supplementation package

2.3 Hatching and brooding

2.3.1 Improved Hatching Management Practices

2.3.1 TIMP name	Improved Hatching Management Practices
Category (i.e. technology, innovation or management practice)	Management practice
	 
A: Description of the technology, innovation or management practice	
Problem addressed	Low production and financial losses due to poor hatchability of

2.3.1 TIMP name	Improved Hatching Management Practices
	eggs using artificial incubators and lack of proper hatchery management practices
What is it? (TIMP description)	It is a set of practices that encompass a range of measures, including selecting high-quality viable eggs, ensuring proper egg storage conditions, utilizing calibrated incubators, optimizing incubation temperature and humidity levels, providing proper chick brooding environments, and implementing effective disease prevention measures. Implementing optimal hatching practices involves: • Good practices in setting hatching eggs into the artificial incubator, candling to assess egg fertility and transfer of eggs into the hatcher. • Good practices in pulling out, harvesting, grading, and vaccinating day-old chicks.
Justification	Many farmers and multipliers refrain from utilizing artificial incubation due to low egg hatchability rates. The reluctance is as a result of significant financial losses incurred due to unhatched eggs, which may lead to scarcity of chicks in the market. Improving hatchability through enhanced operational procedures enhances access to and availability of chicks in the market, thereby increasing production and incomes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Day-old chick producers using artificial hatching and suppliers of egg incubators, extension agents, service providers, and agripreneurs
Approaches to be used in dissemination	• 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	• Hands-on training during demonstrations • Efficient incubation equipment • Quality hatching eggs
Partners/stakeholders for scaling up and their roles	• County Governments to mobilize the farmers and provide follow up extension services • Public and Private Incubator suppliers and fabricators • Hatching egg producers • Strategic day-old chick producers in selected regions
C: Current situation and future scaling up	
Counties where already promoted if any	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale,

2.3.1 TIMP name	Improved Hatching Management Practices
	Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Counties where TIMP will be upscaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Some knowledge/information channels are difficult to use due to low literacy levels. • Women's multiple roles limit the amount of time available for training. • Limited information sharing via digital network
Suggestions for addressing the challenges	• Elevate knowledge and information sharing through practical, hands-on learning experiences in Farmer Field Schools and Pastoral Field Schools. • Incorporate engaging practical sessions and utilize visual aids during training conducted closer to communities to encourage women's participation. • Craft tailored training models that address the specific needs and challenges of each community, ensuring relevance and effectiveness
Lessons learned in upscaling if any	• Thoroughly test and certify artificial egg incubators prior to distributing them to farmers for practical use. • Securing a reliable source of high-quality hatching eggs is crucial for successful incubation. • Integrate hands-on demonstrations into training sessions to enhance skill acquisition and knowledge retention.
Social, environmental, policy and market conditions necessary	• Socially, enhancing hatchability fosters economic stability. • Strengthening market linkages improves accessibility and profitability. • Minimizing hatchery waste reduces the environmental impact of chicken production. • The demand for day-old chicks remains robust and continues to grow.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of sorting and grade 3000 eggs is KES 900 (0.3 KES per egg)
Estimated returns	• 45% return on investing on good hatching management practices. Therefore returns is KES 54 per egg
Gender issues and concerns in development, dissemination adoption and scaling up	• Financial constraints may hinder women and youth from acquiring essential inputs for the effective implementation of the TIMP. • Women may face limited opportunities to participate in extension services, impeding their ability to implement the TIMP effectively.
Gender related opportunities	• Hatching management practices are low-cost and can easily be adopted by women, youth and VMGs • Improved hatchability will improve the income of women,

2.3.1 TIMP name	Improved Hatching Management Practices
	youth and VMGs • Improve household nutrition and food security with improve hatchability and increase flock sizes at HH level • Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have less access to agricultural information • VMGs may have limited access to training and extension services • Inadequate awareness may lead to low adoption of the technology by VMGs
VMG related opportunities	• These technologies are simple enough for vulnerable and marginalized groups (VMGs) to implement and manage effectively. • The management practices associated with these technologies are within the financial reach of VMGs. • Connecting VMGs to financial resources empowers them to adopt these technologies and improve their livelihoods. • High hatchability rates resulting from these technologies contribute to enhanced food security and improved nutrition for VMGs.
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	• The Animal diseases (hatcheries) rules, 1985 • The Hatchery and Breeder Flock Inspection Protocol, 2018 • The Livestock (chicken Industry) Regulations, 2023 • KALRO (2023) Hatchery Management Guide, KALRO Secretariat, Nairobi Kenya
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Peter Alaru, Ouko V. O., Miyumo S., K'Oloo T.O. and E.D. Ilatsia
Partner organizations	State Department for Livestock, Egerton University.

Gaps:

1. The use of incubators under different agro-ecological zones
2. Minimum operating procedures under different climatic conditions

2.3.2 Selection and Grading of Table Eggs

2.3.2 TIMP name	Selection and Grading of Table Eggs
Category (i.e. technology, innovation or management practice)	Management practice
	
A: Description of the technology, innovation or management practice	
Problem addressed	Hatching losses due to poor egg grading and handling practices account for a significant portion of overall hatchery losses. Up to 50% of hatchery losses can be attributed to these factors, highlighting the importance of implementing effective egg grading and handling procedures. Improper egg grading can lead to the selection of eggs with defects or compromised quality for incubation. These eggs are less likely to hatch, resulting in unnecessary losses. Additionally, poor handling practices during transportation, storage, and incubation can damage eggs, further reducing hatchability rates.
What is it? (TIMP description)	Chicken egg selection and grading is a process of evaluating and classifying hatching eggs based on their quality and suitability for incubation. The process involves inspecting eggs for defects, assessing shell thickness and integrity, measuring weight, cleanliness and determining age from time of lay. Any eggs from sick flock are automatically rejected.

2.3.2 TIMP name	Selection and Grading of Table Eggs
	Eggs that meet the established standards are selected for incubation, while those with defects or compromised quality are rejected to minimize hatching losses and ensure a healthy chick population.
Justification	On-farm factors have up to 50% influence on egg hatchability, and accounting for 50% of hatching losses. It is critical to implement effective farm management practices as well as have the correct genetics material, nutrition, and health standards for the breeder flock, to maximize hatchability Appropriate farm management strategies are essential for optimizing production of good quality eggs and maximizing on profit margin.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Small, medium and large-scale indigenous chicken farmers, strategic multipliers and breeding farms and agripreneurs
Approaches to be used in dissemination	• 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	• Artificial incubators with correct calibration for hatching chicken eggs • Breeder flock in optimal health and correct nutrition • Optimal mating ratio for maximum fertility
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology • County Governments and development partners • Public and private extension agents to give searvice to farmers
C: Current situation and future scaling up	
Counties where already promoted if any	All the 47 counties in the country.
Counties where TIMPs will be promoted	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Some knowledge/information sharing channels are difficult to use due to low literacy levels. • Women's many roles limit the amount of time available for training. • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools)

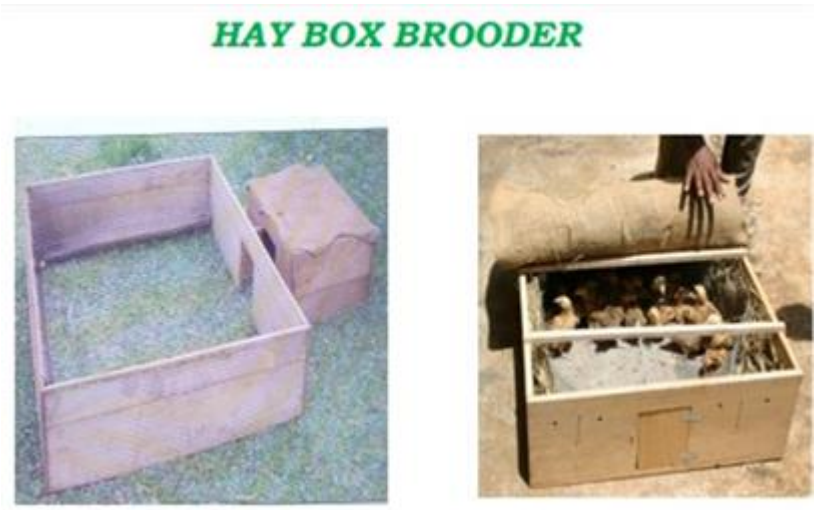
2.3.2 TIMP name	Selection and Grading of Table Eggs
	• More practical sessions and the use of visual aids during training near homes to encourage women to attend • Develop tailored training models specific to each community based on assessed needs
Lessons learned in upscaling	• Poor handling of hatching eggs results in hatchability losses, discouraging farmers from using artificial incubation.
Social, environmental, Policy and market conditions necessary	• Chicken demand continues growing • The market demands consistency in quality and quantity of product.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The cost of sorting and grading 3,000 eggs is KES 900
Estimated returns	45 % return on investing on good quality eggs production. Therefore returns is KES 54 per hatching egg
Gender issues and concerns in development, dissemination adoption and scaling up	• Women and youth may have limited finances to access the required inputs • Limited access to extension services for women • There is need to equip women, youth and other stakeholders with information relating to the TIMP
Gender related opportunities	• Egg selection and grading techniques are affordable and straightforward to implement, making them suitable for adoption by women, youth, and vulnerable and marginalized groups (VMGs). • Enhanced hatchability resulting from egg selection and grading practices will directly contribute to improved incomes for women, youth, and VMGs. • Better household nutrition and food security will be achieved through improved hatchability, leading to increased flock sizes at the household level. • Affirmative action initiatives are available to facilitate financial credit access for women, youths, and VMGs, enabling them to invest in these practices and reap the associated benefits.
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have less access to agricultural information • VMGs have limited access to training and extension services • Inadequate awareness may lead to low adoption of the technology by VMGs
VMG related opportunities	• VMG can easily implement the practices without fear of financial consequences.
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	• Indigenous Chicken Farming: Training manual, https://www.kalro.org/csapp/images/SPADE-CLEP-manual_July-23-small1.pdf • The Hatchery and Breeder Flock Inspection Protocol, 2018
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires	Ready for upscaling

2.3.2 TIMP name	Selection and Grading of Table Eggs
further Research)	
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Peter Alaru, Joseph Munyasi, Evans Ilatsia, Ochieng Ouko,Tobias K'Oloo
Partner organizations	None

Gaps:

1. Accelerated dissemination of information to both public and private extension service providers in order to increase support for small-scale hatchery egg producers.

2.3.3 Hay box brooder

2.3.3 TIMP name	Hay Box Brooder
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	• High chick mortality during the brooding period • Expensive electricity and charcoal heating sources.
What is it? (TIMP description)	 SPECIFICATION OF THE HAY BOXES FOR 10-70 CHICKS No. Chicks / Box Dimension(cm) / Run Dimension(cm) 10 / 30× 26 × 26 / 30× 56 × 56 20 / 30× 37 × 37 / 30× 80 × 80 30 / 30× 45 × 45 / 30× 98 × 98 40 / 30× 52 × 52 / 30× 113 × 113 60 / 30× 63 × 63 / 30× 139 × 139 70 / 30× 68 × 68 / 30× 150 × 150 It is a simple fabricated timber brooding box available in different dimensions, used by smallholder indigenous chicken farmers. The

2.3.3 TIMP name	Hay Box Brooder
	box has four sides covered with timber and one side with wire mesh, while the base on which it rests is not covered. Specifications are available for different chick numbers. It maintains conducive temperature for brooding through the use of insulation material such as hay. A run made of timber and mesh on top allows chicks to rest, feed and drink water during the daytime.
Justification	In rural areas, limited power connectivity, frequent power outages, and expensive charcoal present challenges in rearing day-old chicks. Smallholder farmers suffer significant (30%) losses during this period as a result of predation and chilling of chicks. The hay box brooder protects chicks from predators during the day and provides warmth at night, improving brooding efficiency and chick survival. This solution is affordable for smallholder farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Small-scale chicken farmers, public and private extension service and agripreneurs
Approaches to be used in dissemination	• 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	• Favorable market for Indigenous chicken is sustained • Develop a PPP model to enhance increased production and availability of hay box brooders to farmers • Continuous capacity building of service providers, government extension staff and where possible farmers directly on the importance of the technology.
Partners/stakeholders for scaling up and their roles	• KALRO- source of technology • Jua kali artisans to make the hay box brooders and avail to farmers • Engagement of County governments extension staff to disseminate the technology to farmers • Farmer groups; mobilizing other farmers and promotion of the technology
C: Current situation and future scaling up	
Counties where already promoted	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi

2.3.3 TIMP name	Hay Box Brooder
Counties where TIMPs will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Inadequate extension agents familiar with local dialects of target areas • Low levels of information dissemination due to low literacy levels in the society. • Women's many roles limit the amount of time available for knowledge/information sharing. • Limited information sharing via digital network
Recommendations for addressing the challenges	• Use vernacular local radio stations to promote the technology in local languages for respective counties • Improve hands-on training, visual aids and real-life experience learning in Farmer Field Schools and Pastoral Field Schools. • To enhance women's participation, training sessions should be done in close proximity to their homes. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Need to train farmers in their local dialect
Social, environmental, policy and market conditions necessary	Reliable markets for indigenous chicken products and stable prices
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Based on the size of hay box brooder with a run A 30 x 98 x 98 cm dimension Cost KES 2,500
Estimated returns	A farmer using energy (electricity/charcoal) to brood chicks spends KES 150 per day for 28 days thus KES 4,200 A farmer using this technology saves KES 1,700 for the same brooding period Subsequent broodings cycles will be bonus
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to education, skills and knowledge on the technology • Women may have inadequate access to finances to pay electricity bills and other inputs • Women may have limited access to education, training and extension services
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances

2.3.3 TIMP name	Hay Box Brooder
	• Employment opportunities exist for youth males in manufacturing hay-box brooders and sell them to local farmers
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may also 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 • VMGs have limited access to markets since they may not travel to distant markets due to disability
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in manufacturing hay-box brooders and sell them to local farmers
E: Case studies/profiles of success stories	
Success stories	Farmers who adopted this technology have reported substantial reduction of chick losses during brooding
Application guidelines for users	Place the brooder with the chicks in the open during the day and relocate them indoors at night
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO; Peter Alaru, Ann Wachira, Joseph Munyasi, L. Okitoi, David M. Mwangi, Tobias K'Oloo, Sophie Miyumo, Ochieng Ouko
Partner organizations	

2.4 Feeds and Feeding

2.4.1 Black Soldier Flies (BSF) Alternative Protein Source

2.4.1 TIMP name	Black Soldier -Ffly Larvae Meal (BSF): Alternative Protein Ssource
Category (i.e. technology, innovation or management practice)	Technology

2.4.1 TIMP name	Black Soldier -Ffly Larvae Meal (BSF): Alternative Protein Ssource
A: Description of the technology, innovation or management practice	
Problem addressed	High cost and limited availability of traditional protein sources for chicken feed such as fish and soya meal.
What is it? (TIMP description)	Black Soldier Flies (BSF) are environmentally friendly insects whose larvae can be raised on household organic waste and used as chicken feed. It is easy to mass produce the larvae as they are fed on chicken, pig or fruit and vegetable waste. A 100 g of eggs can produce 2 kg of BSF larvae within 96 hours. The larvae are harvested during the 4th instar stage, then dried and ground. The larvae meal contains 44% high-quality crude protein and 35% fat, providing a concentrated energy source.
Justification	Protein is the most expensive component of chicken feed. Fish and soya meal are the preferred protein sources due to their amino-acid composition and low fibre content. However, their limited availability and higher costs have resulted in expensive and poor-quality feeds. BSF provides an alternative and cheaper source of protein, which when incorporated into chicken feeds, will reduce the cost of production and increase productivity in chicken. The amino-acid composition of BSF meal is excellent for chicken feeding and has resulted in a 24% increase in egg production.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, chicken multipliers and breeders, protein producers and feed manufacturers, researchers, partners, VMG and agripreneurs.
Approaches to be used in dissemination	• 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	• Hands on training and demonstration • Demand /market for Indigenous chicken is sustained • Design and implement an elaborate training curriculum • Creation of awareness
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology, demonstration and training, provide start-up BSF kits • ICIPE – provide start-up BSF Kits and part of core training team • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers

2.4.1 TIMP name	Black Soldier -Ffly Larvae Meal (BSF): Alternative Protein Ssource
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Kiambu
Counties where TIMPs will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels. • Women's triple roles limit the amount of time available for training. • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools) • Establishment of BSF demonstration centres • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Reliable markets for indigenous chicken products and stable prices • Remove waste from the environment by using it to produce high quality protein hence reduce GHG production and point pollution • Policy on utilization of insect protein for food and feed is implemented
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 40,000 for a greenhouse and BSF start-up kit.
Estimated returns	200 Kg of BSF Protein worth KES 14,000 is produced from the unit per month. In a year the returns will be KES 168,000 and since the kit can be used for 5 years the total revenue would amount to KES 840,000
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to education, skills and knowledge on the technology • Women may have inadequate access to productive resources such as credit, inputs, land and capital • Women may have limited access to education, training and extension services
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for youth males in rearing the black soldier flies and sell them to local farmers
VMG issues and concerns in dissemination, adoption and	• VMGs may also have limited access to finances to acquire the required inputs

2.4.1 TIMP name	Black Soldier -Ffly Larvae Meal (BSF): Alternative Protein Ssource
scaling up	• 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 • VMGs have limited access to markets since they may not travel to distant markets due to disability
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in rearing the black soldier flies and sell them to local farmers
E: Case studies/profiles of success stories	
Success stories	To be documented
Application guidelines for users	Sumbule, E. K., Ambula, M. K., Osuga, I. M., Changeh, J. G., Mwangi, D. M., Subramanian, S. & Tanga, C. M. (2021). Cost-effectiveness of black soldier fly larvae meal as substitute of fishmeal in diets for layer chicks and growers. *Sustainability*, *13*(11), 6074. Link; https://doi.org/10.3390/su13116074
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires Validation; 3. Requires further Research)	• Ready for upscaling in the chicken value chain. • More research needed on extraction of fat from BSF for enhanced crude protein. Further research required on use of other substrates and other insects
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: David M. Mwangi, Ann M. Wachira, Peter Alaru Evans Ilatsia, Okitoi L, Peter Alaru, M Githinji, Tobias K'Oloo, Sophie Miyumo, Ochieng Ouko, Victor Ngaira, C. M. Tanga
Partner organizations	ICIPE

Gaps:

1. Need to evaluate different substrates depending on the locality
2. Need to exploit utilization of other insects, e.g., silkworm pupae, earthworms
3. Establishment of a demonstration unit for Black Soldier Fly production
4. Development, validation and dissemination of affordable feed rations developed using Black Soldier Fly larvae and other alternative protein sources in chicken and pigs
5. Consumer preferences and organoleptic tests

2.4.2 New Feed Additive Technologies

2.4.2 TIMP name	New Feed Additive Technologies
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	The high cost of feed, which constitutes 80-90% of total chicken production costs, and the poor utilization of feeds by chickens.
What is it? (TIMP description)	These are technologies classified as feed additives that optimize the ingredient usage and unlock hidden nutrients in feed. (Examples of feed additives include enzymes, Pre-biotics and Probiotics). Probiotics are living organisms that add to the good microorganisms in the gut of chicken, while prebiotics are plant fibres that feed the good microorganisms in the gut of chicken. Enzymes, such as phytase break down phytates, and other anti-nutritional factors in plant-based feedstuffs. They also degrade non-starch polysaccharides (NSPs) in crop by-products.
Justification	• Feed accounts for 70% of the cost of production of chicken. Feed additives ensure that a higher proportion of nutrients in the feed are utilized. It also encourages the use of low-cost ingredients and protects the environment by reducing the amount of nutrients present in manure. • Commonly used additives include enzymes such as phytases, carbohydrases (xylanase, β-glucanase, and amylase), and proteases. Optimizing feed formulations will be the key to future success—allowing chicken nutritionists to formulate less-expensive diets and get the most out of each kg of feed.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Small, medium and large-scale chicken farmers using their own eggs for hatching, and agripreneurs.
Approaches to be used in dissemination	• 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	Availability of the products in local agrovets
Partners/stakeholders for scaling up	• KALRO – source of technology • KU part of the core training team and will be involved in the research required

2.4.2 TIMP name	New Feed Additive Technologies
	• County Governments to mobilize farmers and provide follow up extension services • Local agrovets to avail the technology for sale
C: Current situation and future scaling up	
Counties where already promoted if any	Machakos, Kiambu
Counties where TIMP will be upscaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Limited Knowledge on use of feed additives in chicken feeds • Limited stocks of additives in shops
Suggestions for addressing the challenges	• Enhance awareness creation about the technology • Link up with manufactures of feed additives
Lessons learned in upscaling	• There is need to sensitize farmers on availability of the TIMP to enable extended utilization
Social, environmental, policy and market conditions necessary	• Demand for chicken products and high quality feeds continues to be high. • Available reliable markets for indigenous chicken products will increase the demand for high-quality feeds to nourish the chickens • Social acceptability of feed additives in feed after buy-in by the farming community • Environmentally friendly as feed additives increase efficient utilization of feeds • Policy framework to provide training through county government extension service
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not determined
Estimated returns	
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information and knowledge on the technology • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during implementation of the TIMP • Women may have less access to production resources such as land, capital, labour and credit • Women may have less access to training and extension services, which can lead to a knowledge gap on the technology
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances

2.4.2 TIMP name	New Feed Additive Technologies
VMG issues and concerns in dissemination, adoption and scaling up	• 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 • VMGs have limited access to markets since they may not travel to distant markets due to disability
VMG related opportunities	• Affirmative action and hustler fund opportunities exist for VMGs to acquire the necessary credit
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires Validation; 3. Requires further Research)	• Ready for upscaling in the chicken value chain. • Requires Validation in wider counties • Further development to include other components
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Ludovicus Okitoi, Ann M. Wachira, Peter Alaru Evans Ilatsia, Peter Alaru, Tobias K'Oloo, Sophie Miyumo, Ochieng Ouko, Victor Ngaira, C. M. Tanga
Partner organizations	Kenyatta University

Gaps:

1. Need to evaluate use of additives in chicken feeding and chicken health advisories
2. Evaluate levels of supplementation of additives
3. Evaluate the methods of using additives in chicken feeding

2.4.3 Cockroach Meal Alternative Protein Source

2.4.3 TIMP name	Cockroach Meal; Alternative Protein Feed for Chicken
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• High cost of protein sources for chicken feeds. • Limited availability of alternative protein sources for chicken feeds to replace the preferred proteins (fish and soya meal) which are plagued by high cost and unavailability.

2.4.3 TIMP name	Cockroach Meal; Alternative Protein Feed for Chicken
What is it? (TIMP description)	Cockroach meal is a high-quality protein souce for chicken feeds, containing approximately 56-58% crude protein and 7-15 % fat. Through large-scale cultivation of cockroaches, followed by drying and crushing, cockroach meal may be made available for use in replacing 50% of fishmeal in a grower diets. At 2% inclusion in chicken feeds, birds have an increased survival rate of 5% and similar growth performance as those fed on fish meal. Cockroach may be easily multiplied in mass in a fabricated container while feeding them on cheap substrates such as kitchen, cereal-crop and agro-industrial wastes.
Justification	Protein is the most expensive component of chicken feed. Fish and soya meal are the preferred protein sources due to their amino-acid composition and low fibre content. However, their unavailability and higher prices have resulted in expensive and poor-quality feeds. Cockroach meal provides an alternative and cheaper source of protein, which when incorporated into chicken feeds will reduce costa and increase productivity. The amino-acid composition of cockroach meal is suitable for chicken feeding and has resulted in similar growth performance compared to diets containing fishmeal.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, chicken breeders and multipliers input suppliers and feed manufacturers, processors, extension officers, researchers, partners, VMG and agripreneurs.
Approaches to be used in dissemination	• 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	• Hands on training and demonstration • Demand /market for indigenous chicken is sustained • Design and implement an elaborate training curriculum • Creation of awareness
Partners/stakeholders for scaling up and their roles	• Extension service providers (public and private) to train farmers on feed formulation using cockroach meal • KALRO – technology development and fine tuning, ToT, backstopping and monitor implementation source of technology, provide start-up cockroaches kits and training • AKEFEMA to promote the use of the technology by its members • ICIPE – to refine on mass rearing technology

2.4.3 TIMP name	Cockroach Meal; Alternative Protein Feed for Chicken
	• County governments to mobilize farmers and provide follow up extension services • Farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be upscaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Negative perception • Some training channels are difficult to use due to low literacy levels • Women's triple roles limit the amount of time available for training • Inadequate extension publications
Suggestions for addressing the challenges	• Promotion/creating awareness on the nutritive value of cockroach meal • More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Lessons learned in upscaling if any	• Indigenous chicken value actors could benefit from using cockroach meal as a replacement of expensive fishmeal in chicken feed production
Social, environmental, policy and market conditions necessary for development and upscaling	• Reliable markets for indigenous chicken products and stable prices • Socially acceptable especially when cockroaches are used to remove waste from the environment to produce high quality protein. • Use of cockroach meal stand to reduce GHG production and environmental pollution. • Laws and policy on utilization of insect protein for food and feed is implemented
Basic costs of the TIMP	1 kg of cockroach meal about KES 65
Estimated returns when using the TIMP	Not determined
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to training on this technology • Women may have inadequate access to productive resources such as credit, inputs, land and capital • Women may have limited access to education, training and extension services

2.4.3 TIMP name	Cockroach Meal; Alternative Protein Feed for Chicken
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for youth males in rearing cockroaches and sell them to local farmers
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may also 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 fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in rearing cockroaches and sell them to local farmers
Cultural concerns	Negative Perceptions of cockroach meal by farmers
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Need for training on how to establish cockroach multiplication/production unit
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO; Ngaira Victor, Peter Alaru, Evans Illatsia, Ann Wachira, Joseph Munyasi, L. Okitoi, Tobias K'Oloo, Ochieng Ouko, Robert Ouko
Partner organizations	Ripple Effect (Send a Cow), County Governments

Gaps:

1. Need to evaluate different substrates depending on the locality
2. Need to exploit utilization of other species of insects e.g. silkworm
3. Establishment of a demonstration unit for cockroach production
4. Validation and dissemination of affordable feed rations developed using cockroach meal as an alternative protein source in chicken
5. Farmers perception and acceptability of cockroach as alternative feed
6. Explore the antimicrobial amino peptide in cockroaches for use in chicken health management

2.4.4 KALRO Chicken Feed Formulation (KAPOFF)

2.4.4 TIMP name	**Kalro Chicken Feed Formulation (KAPOFF) - Mobile application**
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	• High cost of feeds and Low level of access to extension services • Lack of information on least cost formulae • Lack of information on various available formulations
What is it? (TIMP description)	This is a mobile application operating on the Android operating system. It comes pre-populated with an Ingredients Library that is based on the average analytical values for each feedstuff in the country. It is also pre-populated with nutrient requirements of various categories (Layers, Exotic Broiler, Indigenous Broiler, Dual Purpose, Indigenous Layers and Breeder chicken) of chickens. It is an application with not more than 5 steps to formulate least cost feed rations. The mobile application uses linear programming method available in MS Excel tool Solver of MS office. KAPOFF is designed to generate diets for various categories of chicken at different age levels while considering the nutritional levels and limits for each bird.
Justification	Feed costs account for about 80-90% of the production costs in chicken farming.. There is need to lower feed costs by utilizing cheap, locally available feedstuffs so that farmers can achieve profitability. Additionally, there is a need to ensure the formulation of quality feed for indigenous chicken to enhance feed efficience. However, there are limited tools available to aid in the formulation of high-quality,cost-effective feeds. The application is intended for use by chicken farmers and extensionists to help them in formulating high-quality poulty feeds at lowest cost using locally available ingredients.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Small, medium and large-scale farmers; inputs providers, extension personnel, service providers and agripreneurs.
Approaches to be used in dissemination	• 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

2.4.4 TIMP name	Kalro Chicken Feed Formulation (KAPOFF) - Mobile application
Critical/essential factors for successful promotion	• Availability and ability to use smart phone • Internet access
Partners/stakeholders for scaling up and their roles	• KALRO – technology development and hosting • Kibabi University- technology development • Mobile service providers to provide smart phones • County Governments to mobilize the farmers and provide follow up extension services • Inputs providers-to stock and sell feed ingredients to farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Kitui, Busia and Kakamega. Over 10,000 users have already downloaded the app.
Counties where the TIMP will be upscaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Limited internet access in remote areas • Limited access to smart phones
Suggestions for addressing the challenges	• Enhance awareness creation about the technology • Link up with mobile service providers to provide smart phones and internet access
Lessons learned in upscaling if any	• There is need to sensitize farmers on availability of the TIMP to enable extended utilization
Social, environmental, policy and market conditions necessary	• Demand for least cost high-quality feeds continues being high. Available reliable markets for indigenous chicken products will increase the demand for the least cost high-quality feeds to feed the chickens • Social acceptability of least cost high-quality feed made from locally available feedstuffs after buy-in by the farming community • Environmentally friendly as least cost high-quality feeds are efficiently utilized. • Policy framework needed to provide training through county government extension service • Include features in the TIMP to make it more attractive to the youth; who are the major users.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Free application Cost of android phone Cost of internet
Estimated returns	None
Gender issues and concerns in development, dissemination adoption and scaling up	Easily disseminated to both gender

2.4.4 TIMP name	Kalro Chicken Feed Formulation (KAPOFF) - Mobile application
Gender related opportunities	The TIMP is gender friendly
VMG issues and concerns in development, dissemination adoption and scaling up	It can be easily carried out by VMGs The uptake by VMG is still low hence the need for promotion
VMG related opportunities	VMG can use the TIMP easily without worrying of cost implications
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	Have a smart phone and internet access
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO; Ngaira Victor, Peter Alaru, Evans Illatsia, Ann Wachira, Joseph Munyasi, L. Okitoi, Tobias K'Oloo, Ochieng Ouko, Robert Ouko
Partner organizations	Ripple Effect (Send a Cow), County Governments

2.4.5 Sorghum based layer diets

2.4.5 TIMP name	Sorghum Based Layer Diets
Category (i.e. technology, innovation or management practice)	Technology
A: Description	
Problem to be addressed.	Low production in indigenous chicken and high cost of feeds due to inadequate diversification
What is it? (TIMP description)	A layer diet that uses sorghum as the major energy source instead of maize, thus lowering the total cost of chicken feed. Sorghum is a drought-tolerant crop that ensures a constant feed supply at a cheaper cost. Its low sensitivity to mycotoxins, along with a diversified micronutrient profile of iron and zinc, makes it a beneficial alternative for chicken feed formulation.
Justification	Diversifying energy sources in chicken feed is a strategic approach with numerous arguments for cost reduction, feed-food competition, and overall production efficiency. The entire cost of chicken feed may be greatly decreased by using locally accessible and cost-effective alternative foods such as sorghum, making chicken farming more economically viable. This diversity also reduces rivalry for feed components between human and animals, contributing to both food security

2.4.5 TIMP name	Sorghum Based Layer Diets
	and making the sector more robust to price shifts in global commodity markets. Furthermore, it supports sustainability and local economic development while mitigating the hazards associated with overreliance on a single energy source, thus benefiting both the chicken production and society.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Feed manufacturers, Farmers women, youth, and VMGs, processors (value addition), traders, consumers; researchers, development partners and agripreneurs
Approaches to be used in dissemination	• 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	• Sustained favorable market for Indigenous Chicken products. • Validation trials demonstrating that sorghum can provide adequate and balanced nutrition for chickens are essential. • Creating awareness among chicken farmers, feed manufacturers, and other stakeholders about the benefits and safety of using sorghum in chicken feed • Promoting local sorghum production and processing and establishment of reliable supply chains. • Chicken feed formulations on a least cost basis • Capacity building stakeholders on sorghum processing, storage, and feed formulation
Partners/stakeholders for scaling up and their roles	• National and County governments – policies and regulations regarding cassava-based chicken feed; mobilize and train • Researchers – to improve the technology, provide training • Faith-based organizations, NGOs e.t.c. – mobilize and train farmers • Feed manufacturers – to avail the feed and provide the components • Development partners – take up the technology and avail it to farmers as a tool for poverty alleviation, food, and nutrition security as well as income generation
C: Current situation and future scaling up	
Counties where already Promoted if any	Kakamega
Counties where TIMPs will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho,

2.4.5 TIMP name	Sorghum Based Layer Diets
	Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Low literacy, skills, and knowledge about chicken farming. • Limited information sharing through digital networks. • Lack of a commercial orientation in traditional farming practices. • The high cost of inputs, coupled with fluctuating market prices. • Disorganized marketing channels.
Suggestions for addressing the challenges in upscaling if any	• Enhance knowledge sharing through hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • Enhance information sharing via digital networks. • Promote commercialization through aggregation. • Promote use of locally available feed ingredients for quality feeds • Formulate policies to reduce input costs. • Streamline market outlets (primary, secondary and tertiary markets)
Lessons learned in upscaling if any	• Practical skills and knowledge enhance upscaling of TIMPs • Continuous capacity building of end users/beneficiaries
Social, environmental, policy and market conditions necessary for development and upscaling	• Willingness to adopt sorghum-based feeds by the farmers • Continuous improvement of sorghum production and processing to match market demand • Reliable market channels and stable prices for sorghum and chicken products • Increase sorghum inclusion in chicken feeds through PPP with feed manufacturers • Policy and regulations on the use of sorghum in chicken feed
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Sorghum– KES. 45 per kg • Layer feed ration with sorghum cost – KES 65 per kg
Estimated returns	• 20% lower feed cost compared to conventional
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to education, information and knowledge on the technology • Women may have less access to production resources such as land, capital, labour and credit • 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 fund opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required inputs

2.4.5 TIMP name	Sorghum Based Layer Diets
	• 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 • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain affordable maize-based feeds for chickens
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories	
Application guidelines for users	Wachira, A., Mwangi, M., Nyingi, D., Minyattah, E., Muriuki, W. (2023). Diversifying Energy and Protein Sources for Poultry Feeds in Kenya. Science Research. 11(5): 104-110 https://www.sciencepublishinggroup.com/article/10.11648.j.sr.20231105.12
F: Status of TIMPs readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	• Ready for upscaling • Further research is required to develop profit margins when substituting maize for sorghum
G: Contacts	
Contacts	Institute Director KALRO Non-Ruminant Research Institute P.O. Box 169-50100 Kakamega Kalro.Kakamega@kalro.org; kalropoultrykakamega@kalro.org or kalropoultrykakamega@ gmail.com;
Lead organization and scientists	KALRO NRI KAKAMEGA; Drs. Joseph Munyasi & Ann Wachira,
Partner organizations	KALRO NRI (Kakamega, Naivasha & Msabaha), KelCoP, NAVCDP, FAO Kenya, KCIC, Biovision Kenya, County Governments of sorghum growing regions

Gaps:

1. Nutritional profiling and composition of different varieties of cassava, especially their energy content, protein, fiber, and potential anti-nutritional factors.
2. Protocols for large scale processing of sorghum to minimize antinutritional compounds such as tanins.
3. Feed formulations expertise in balancing various ingredients to meet the specific

nutritional needs of chicken at different growth stages.

4. Encouraging sorghum production and ensuring a consistent supply.
5. Capacity building farmers, feed producers, and chicken professionals on the proper use of sorghum in chicken feed.
6. Creating awareness among chicken farmers, feed manufacturers, and other stakeholders about the benefits of using sorghum in chicken feed
7. Research and development infrastructure to assess the environmental impact of sorghum cultivation and processing, such as land use and water usage, is essential to promote sustainable practices.

2.4.6 Cassava Based Layer Diets

2.4.6 TIMP name	**Cassava Based Layer Diets**
Category (i.e. technology, innovation or management practice)	Technology
A: Description	
Problem to be addressed.	Low productivity in chicken and high cost of production
What is it? (TIMP description)	A layer diet that incorporates dry cassava chips as the primary energy source, replacing maize. Dry cassava tubers provide energy levels similar to maize (16.8 MJ/kg DM compared to 18.7 MJ/kg DM). They also contain essential nutrients, including vitamins C and B6, as well as potassium and manganese, which are beneficial for the health and development of chickens when included in their feed.
ustification	Diversifying energy sources in chicken feed is a strategic approach that contributes to reduced costs, mitigates feed-food competition, and enhances overall productivity. High competition for maize between human and chicken feed results in high prices for chicken feed. By incorporating locally available and cost-effective alternative ingredients such as cassava chips, the overall cost of chicken feed can be significantly reduced, making chicken production more economically sustainable.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Feed manufacturers, Farmers women, youth, and VMGs, processors (value addition), traders, consumers; researchers, development partners and agripreneurs
Approaches to be used in dissemination	• 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

2.4.6 TIMP name	Cassava Based Layer Diets
Critical/essential factors for successful promotion	• Willingness to substitute maize with cassava • Sustained favorable market for Indigenous Chickens products. • Results from validation trials demonstrating that cassava can provide adequate and balanced nutrition for chickens are essential. • Creating awareness among chicken farmers, feed manufacturers, and other stakeholders about the benefits and safety of using cassava in chicken feed • Chicken feed formulations on a least cost basis • Capacity building stakeholders on cassava processing, storage, and feed formulation
Partners/stakeholders for scaling up and their roles	• National and County governments – policies and regulations regarding cassava-based chicken feed; mobilize and train • Researchers – to improve the technology, provide training • Faith-based organizations, NGOs e.t.c. – mobilize and train farmers • Feed manufacturers – to avail the feed and provide the components • Development partners – take up the technology and avail it to farmers as a tool for poverty alleviation, food, and nutrition security as well as income generation.
C: Current situation and future scaling up	
Counties where already Promoted if any	Kakamega; Busia
Counties where TIMPs will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Low literacy, skills, and knowledge about chicken farming. • Limited information sharing through digital networks. • Lack of a commercial orientation in traditional farming practices. • The high cost of inputs, coupled with fluctuating market prices.
Suggestions for addressing the challenges in upscaling if any	• Enhance knowledge sharing through hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • Enhance information sharing via digital networks. • Promote commercialization through aggregation. • Promote use of locally available feed ingredients for quality feeds • Formulate policies to reduce input costs.

2.4.6 TIMP name	Cassava Based Layer Diets
	• Streamline market outlets (primary, secondary and tertiary markets)
Lessons learned in upscaling if any	• Practical skills and knowledge enhance upscaling of TIMPs • Continuous capacity building of end users/beneficiaries
Social, environmental, Policy and market conditions necessary for development and upscaling	• Willingness to adopt cassava-based feeds by the farmer • Increase cassava inclusion in chicken feeds through Private-Public Partnership (PPP) with feed manufacturers • Policy and regulations on the use of cassava in chicken feed • Reliable markets for chicken products • Continuous improvement of cassava production and processing to match market demand • Reliable market channels and stable prices for cassava and chicken products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Dry cassava chips – KES.25 per Kg • Layer feed ration with cassava cost – KES.75 per Kg compared to KES.80/kg of maize-based ration
Estimated returns	• 5% increase in egg production compared to conventional diets
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to education, information and knowledge on the technology • Women may have less access to production resources such as land, capital, labour and credit • Different gender groups play different roles in chicken production • 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 fund opportunities exist for women and youths to acquire the required finances • Involvement of different gender groups in provision of services along the TIMP • Cassava is often grown by women hence enhancing their role in chicken value chain production
VMG issues and concerns in dissemination, adoption and scaling up	• 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 • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain affordable maize-based feeds for chicken
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Cassava is a climate smart crop hence VMGs can engage in

2.4.6 TIMP name	Cassava Based Layer Diets
	the TIMP through provision of cassava as an input
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	http://www.sciencepublishinggroup.com/j/sr doi: 10.11648/j.sr.20231105.12
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 Non-Ruminant Research Institute P.O. Box 169-50100 Kakamega Kalro.Kakamega@kalro.org; Kakamega.poultry@kalro.org kalropoultrykakamega@gmail.com;
Lead organization and scientists	KALRO NRI KAKAMEGA; Drs. Joseph Munyasi & Ann Wachira,
Partner organizations	KALRO NRI (**Kakamega, Naivasha & Msabaha**), KelCoP, NAVCDP FAO Kenya, KCIC, Biovision Kenya, County Governments of Cassava growing regions

Gaps:

1. Nutritional profiling and composition of different varieties of Kenyan cassava tubers
2. Identify cassava varieties for large scale processing and develop incentives for local cassava production
3. Develop cost-effective feed formulations to meet performance targets.
4. Capacity building farmers, feed producers, and chicken professionals on the proper use of cassava in chicken feed.

2.4.7 Affordable Maize-Based Feed Ration for Growers

2.4.7 TIMP name	Affordable Maize-based Feed Ration for Growers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low growth rates due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a maize-based feed ration for growing birds (8-19 weeks of age). The formulated ration has 70% maize, 3% sunflower seed cake, 15% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 5% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for growers), 0.05% DL-methionine,

2.4.7 TIMP name	Affordable Maize-based Feed Ration for Growers
	0.10% L-Lysine HCl, 0.006% coccidiostat and 0.244% toxin binder. The ration provides all the nutritional requirements for growing birds to attain optimum growth rates to reach the expected live weights at maturity.
Justification	Poor nutrition is a major problem that contributes to the low growth rates in chickens. The expected live weights at maturity can be attained through use of commercial compounded feeds which are expensive and sometimes of questionable nutritional quality. The solution to the problem of low growth rates is to mix affordable and high-quality feed rations and provide these rations to growing chickens preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds enables female birds to attain the expected live weight (approx. 1,600 grams/bird) at the point of laying eggs.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs
Approaches to be used in dissemination	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable market for Indigenous chicken products is sustained.
Partners/stakeholders for scaling up and their roles	• KALRO – technology fine tuning, ToT, backstopping and monitor implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for

2.4.7 TIMP name	Affordable Maize-based Feed Ration for Growers
	training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practical sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately. Hence, there is a need to ensure that the TIMPs being disseminated are ready.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers on handling of the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients for use in ration mixing. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The maize-based feed ration cost KES 47.27 per kg, while commercial compounded feed cost KES 52.00 per kg.
Estimated returns when using the TIMP	Feeding 100 growing female birds on the maize-based feed ration cost KES 217/day compared to KES 351/day when fed on commercial compounded feed. This translates to a saving of KES 134/day, or KES 10,336 over the 8-19 weeks growing period, when using the maize-based feed ration instead of the commercial compounded feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information and knowledge on chicken production. • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women may have less access to production resources such as land, capital, labour and credit. • Women may have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The maize-based feed ration technology may not be adopted if it increases the work burden for women, who often juggle multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable maize-based feed rations to other farmers. • Affirmative action and hustler fund opportunities exist for women and youths to acquire the requiredfinances for chicken production.

2.4.7 TIMP name	Affordable Maize-based Feed Ration for Growers
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs may have limited access to education, training and extension services on chicken production. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs may have limited access to ration ingredients and chicken products markets since they may not travel to distant markets due to disability. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain affordable maize-based feed rations for growing Improved Indigenous chickens.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	NARIGP-funded farmer groups in Embu county and KCSAP-funded farmer groups in Tharaka Nithi county.
Application guidelines for users	Innocent Kariuki, Moses Lang'at, Geoffrey Ngae, Salome Nyaga, and Elias Kamau (2023). Feed Rations for Improved Indigenous Chicken Breeds under Intensive/Semi-intensive Production Systems in Semi-arid Kenya. Paper presented at the 1st KALRO scientific conference, 27th to 31st March 2023, KALRO Headquarters, Nairobi, 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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Government of Tharaka Nithi

2.4.8 Affordable Maize/Maize Germ-Based Feed Ration for Growers

2.4.8 TIMP name	**Affordable Maize/Maize Germ-Based Feed Ration for Growers**
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low growth rates due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a maize/maize germ-based feed ration for growing birds (8-19 weeks of age). The formulated ration has 50% maize, 20% maize germ, 1% wheat bran, 2% sunflower seed cake, 15% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 5% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for growers), 0.05% DL-methionine, 0.10% L-Lysine HCl, 0.006% coccidiostat and 0.244% toxin binder. The ration provides all the nutritional requirements for growing birds to attain optimum growth rates to reach the expected live weights at maturity.
Justification	Poor nutrition is a major problem that contributes to the low growth rates in chickens. The expected live weights at maturity can be attained through use of commercial compounded feeds which are expensive and sometimes of questionable nutritional quality. The solution to the problem of low growth rates is to mix affordable and high quality feed rations and feed these rations to growing chickens preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds enables female birds to attain the expected live weight (approx. 1,600 grams/bird) at the point of laying eggs.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Availability of high-quality feed ingredients for ration mixing. • Favorable market for Indigenous chicken products is sustained.
Partners/stakeholders for scaling up and their roles	• KALRO – technology fine tuning, ToT, backstopping and monitor implementation.

2.4.8 TIMP name	Affordable Maize/Maize Germ-Based Feed Ration for Growers
	• County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practical sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately. Hence, there is a need to ensure that the TIMPs being disseminated are ready.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers on handling of the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients for use in ration mixing. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The maize/maize germ-based ration cost 47.17 KES per kg, while commercial compounded feed cost KES 52.00 per kg.
Estimated returns when using the TIMP	Feeding 100 growing female birds on the maize-based feed ration cost KES 239/day compared to KES 351/day when fed on commercial compounded feed. This translates to a saving of KES 112/day, or KES 8,628 over the 8-19 weeks growing period, when using the maize/maize germ-based feed ration instead of the commercial compounded feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production.

2.4.8 TIMP name	Affordable Maize/Maize Germ-Based Feed Ration for Growers
	• The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The maize/maize germ-based feed ration technology may not be adopted if it increases the work burden for women who often juggle multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable maize germ feed rations to other farmers. • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required inputs for ration mixing. • VMGs may have limited access to education, training and extension services on chicken production. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs may have limited access to ration ingredients and chicken products markets since they may not travel to distant markets due to disability. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain the mixing of affordable maize/maize germ-based feed ration for growing Improved Indigenous chickens.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	NARIGP-funded farmer groups in Embu county and KCSAP-funded farmer groups in Tharaka Nithi county.
Application guidelines for users	Innocent Kariuki, Moses Lang'at, Geoffrey Ngae, Salome Nyaga, and Elias Kamau (2023). Feed Rations for Improved Indigenous Chicken Breeds under Intensive/Semi-intensive Production Systems in Semi-arid Kenya. Paper presented at the 1st KALRO scientific conference, 27th to 31st March 2023, KALRO Headquarters, Nairobi, Kenya.

2.4.8 TIMP name	Affordable Maize/Maize Germ-Based Feed Ration for Growers
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Government of Tharaka Nithi

2.4.9 Affordable Sorghum-based Feed Ration for Growers

2.4.9 TIMP name	Affordable Sorghum-based Feed Ration for Growers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low growth rates due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a sorghum-based feed ration for growing birds (8-19 weeks of age). The formulated ration has 60% sorghum, 6% maize, 4% wheat bran, 3% sunflower seed cake, 15% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 5% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for growers), 0.05% DL-methionine, 0.10% L-Lysine HCl, 0.006% coccidiostat and 0.244% toxin binder. The ration provides all the nutritional requirements for growing birds to attain optimum growth rates to reach the expected live weights at maturity.
Justification	Poor nutrition is a major problem that contributes to the low growth rates in chickens. The expected live weights at maturity can be attained through use of commercial compounded feeds, which are expensive. The solution to the problem of low growth rates is mixing of affordable and high quality feed ingredients and feeding the rations to growing chickens preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds will lead to female birds attaining the expected live weight (approx. 1,600 grams/bird) at the point of laying eggs.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers.
Approaches to be used in dissemination	• Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station

2.4.9 TIMP name	Affordable Sorghum-based Feed Ration for Growers
	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable market for Indigenous chicken products is sustained.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practical sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately, hence the need to make sure that the TIMP being disseminated is readily available.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers to handle the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients for use in ration mixing. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The sorghum-based ration cost KES 50.07 per kg, while commercial compounded feed cost KES 52.00 per kg.

2.4.9 TIMP name	Affordable Sorghum-based Feed Ration for Growers
Estimated returns when using the TIMP	Feeding 100 growing female birds on the sorghum-based feed ration cost KES 236/day compared to KES 351/day when fed on commercially compounded feed. This translates to a saving of KES 115/day, or KES 8,861 over the 8-19 weeks growing period, when using the sorghum-based feed ration instead of the commercially compounded feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production. • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The sorghum-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable sorghum-based feed rations to other farmers. • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs are often excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs have limited access to ration ingredients and chicken product markets since they may not travel to distant markets. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain mixing of affordable sorghum-based feed ration for growing Improved Indigenous chicken.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous	NARIGP-funded farmer groups in Embu county and KCSAP-

2.4.9 TIMP name	Affordable Sorghum-based Feed Ration for Growers
similar projects	funded farmer groups in Tharaka Nithi county successfully reduced the cost of production by compounding their own poultry feeds using this technology.
Application guidelines for users	Innocent Kariuki, Moses Lang'at, Geoffrey Ngae, Salome Nyaga, and Elias Kamau (2023). Feed Rations for Improved Indigenous Chicken Breeds under Intensive/Semi-intensive Production Systems in Semi-arid Kenya. Paper presented at the 1st KALRO scientific conference, 27th to 31st March 2023, KALRO Headquarters, Nairobi, 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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Government of Tharaka Nithi

2.4.10 Affordable Sorghum/Maize germ-based Ration for Growers

2.4.10 TIMP name	Affordable Sorghum/Maize germ-based Ration for Growers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low growth rates due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a sorghum/maize germ-based ration for growing birds (8-19 weeks of age). The formulated ration has 50% sorghum, 20% maize germ, 1% wheat bran, 2% sunflower seed cake, 15% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 5% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for growers), 0.05% DL-methionine, 0.10% L-Lysine HCl, 0.006% coccidiostat and 0.244% toxin binder. The ration provides all the nutritional requirements for growing birds to attain optimum growth rates to reach the expected live weights at maturity.
Justification	Poor nutrition is a major problem that contributes to the low growth rates in chickens. The expected live weights at maturity can be attained through use of commercial compounded feeds, which are expensive. The solution to the problem of low growth rates is mixing of affordable and high-quality feed ingredients and feeding the rations to growing chickens preferably under intensive/semi-intensive production systems. Provision of proper

2.4.10 TIMP name	Affordable Sorghum/Maize germ-based Ration for Growers
	nutrition to the birds will lead to female birds attaining the expected live weight (approx. 1,600 grams/bird) at the point of laying eggs.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable and sustainable market for Indigenous chicken products.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practical sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately, hence the need to make sure that

2.4.10 TIMP name	Affordable Sorghum/Maize germ-based Ration for Growers
	the TIMP being disseminated is readily available.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers to handle the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients for use in ration mixing. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The sorghum/maize germ-based ration cost KES 49.67 per kg, while commercial compounded feed cost KES 52.00 per kg.
Estimated returns when using the TIMP	Feeding 100 female growing birds on the sorghum/maize germ-based ration cost KES 277/day compared to KES 351/day when fed on commercially compounded feed. This translates to a saving of KES 74/day, or KES 5,748 over the 8-19 weeks growing period, when using the sorghum/maize germ-based feed ration instead of the commercially compounded feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The sorghum/maize germ-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable maize-based feed rations to other farmers. • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs are often excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of

2.4.10 TIMP name	Affordable Sorghum/Maize germ-based Ration for Growers
	awareness on chicken production. • VMGs have limited access to ration ingredients and chicken product markets since they may not travel to distant markets. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain mixing of affordable sorghum/maize germ-based feed ration for growing Improved Indigenous chickens.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	NARIGP-funded farmer groups in Embu county and KCSAP-funded farmer groups in Tharaka Nithi county successfully reduced the cost of production by compounding their own poultry feeds using this technology.
Application guidelines for users	Innocent Kariuki, Moses Lang'at, Geoffrey Ngae, Salome Nyaga, and Elias Kamau (2023). Feed Rations for Improved Indigenous Chicken Breeds under Intensive/Semi-intensive Production Systems in Semi-arid Kenya. Paper presented at the 1st KALRO scientific conference, 27th to 31st March 2023, KALRO Headquarters, Nairobi, 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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Government of Tharaka Nithi

2.4.11 Affordable Maize/Sorghum-based Feed Ration for Growers

2.4.11 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Growers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	

2.4.11 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Growers
Problem to be addressed	Low growth rates due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a maize/sorghum-based feed ration for growing birds (8-19 weeks of age). The formulated ration contained 35% maize, 30% sorghum, 5% wheat bran, 3% sunflower seed cake, 15% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 5% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for growers), 0.05% DL-methionine, 0.10% L-Lysine HCl, 0.006% coccidiostat and 0.244% toxin binder. The ration provides all the nutritional requirements for growing birds to attain optimum growth rates to reach the expected live weights at maturity.
Justification	Poor nutrition is a major problem that contributes to the low growth rates in chickens. The expected live weights at maturity can be attained through use of commercial compounded feeds, which are expensive. The solution to the problem of low growth rates is mixing of affordable and high quality feed ingredients and feeding the rations to growing chicken preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds will lead to female birds attaining the expected live weight (approx. 1,600 grams/bird) at the point of laying eggs.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable and sustainable market for Indigenous chicken products.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale,

2.4.11 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Growers
	Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practical sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately, hence the need to make sure that the TIMPS being disseminated are readily available.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers of ways of handling the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients for use in ration mixing. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The maize/sorghum-based feed ration cost KES 48.52 per kg, while commercial compounded feed cost KES 52.00 per kg.
Estimated returns when using the TIMP	Feeding 100 growing female birds on the maize/sorghum-based feed ration cost KES 252/day compared to KES 351/day when fed on commercially compounded feed. This translates to a saving of KES 99/day, or KES 7,601 over the 8-19 weeks growing period, when using the maize/sorghum-based feed ration instead of the commercially compounded feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The maize/sorghum-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable

2.4.11 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Growers
	maize/sorghum-based feed rations to other farmers. • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs are often excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs have limited access to ration ingredients and chicken product markets since they may not travel to distant markets. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain the mixing of affordable maize/sorghum-based feed ration for growing Improved Indigenous chickens.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	NARIGP-funded farmer groups in Embu county and KCSAP-funded farmer groups in Tharaka Nithi county successfully reduced the cost of production by compounding their own poultry feeds using this technology.
Application guidelines for users	Innocent Kariuki, Moses Lang'at, Geoffrey Ngae, Salome Nyaga, and Elias Kamau (2023). Feed Rations for Improved Indigenous Chicken Breeds under Intensive/Semi-intensive Production Systems in Semi-arid Kenya. Paper presented at the 1st KALRO scientific conference, 27th to 31st March 2023, KALRO Headquarters, Nairobi, 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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Government of Tharaka Nithi

2.4.12 Affordable Maize-based Feed Ration for Layers

2.4.12 TIMP name	Affordable Maize-based Feed Ration for Layers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low egg production due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a maize-based feed ration for laying birds (19-68 weeks of age). The formulated ration has 59% maize, 5% sunflower seed cake, 20% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 9% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for layers), 0.05% DL-methionine, 0.10% L-Lysine HCl, and 0.25% toxin binder. The ration provides all the nutritional requirements for laying birds to attain optimum egg production.
Justification	Poor nutrition is a major problem that contributes to the low egg production in chickens. The expected egg production/laying percent can be attained through use of commercial layers feeds, which are expensive. The solution to the problem of low egg production is mixing of affordable and high-quality feed ingredients and feeding the rations to laying chicken preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds will lead to production of 250-280 eggs per hen per year.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable and sustainable market for Indigenous chicken.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	

2.4.12 TIMP name	Affordable Maize-based Feed Ration for Layers
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practical sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately, hence the need to make sure that the TIMPS being disseminated are readily available.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers of ways of handling the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The maize-based feed ration cost KES 51.06 per kg, while the commercial layers feed cost KES 67.00 per kg.
Estimated returns when using the TIMP	Feeding 100 laying birds on the maize-based feed ration cost KES 706/day compared to KES 1225/day when fed on commercial layers feed. This translates to a saving of KES 519/day, or KES 189,321 over a 365-day laying period, when using the maize-based feed ration instead of the commercial layers feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production. • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production.

2.4.12 TIMP name	Affordable Maize-based Feed Ration for Layers
	• The maize-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable maize-based feed rations to other farmers. • Affirmative action and hustler fund opportunities exist for women and youth to acquire the required finances for chicken production.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs are often excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs have limited access to ration ingredients and chicken products markets since they may not travel to distant markets due to disability. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain affordable maize-based feed rations for growing Improved Indigenous chickens.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	KALRO/Korea Partnership for Innovation of Agriculture (KOPIA)-funded project farmer groups in Embu and Tharaka Nithi counties successfully reduced the cost of production by compounding their own poultry feeds using this technology.
Application guidelines for users	Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi and David Lelgut (2022). Booklet "High-quality, low-cost feed rations for laying hens". © KALRO/RDA, 2022. ISBN 978-9914-40-900-0 High-Quality, Low-Cost Rations A and B for Increased Egg Production in Embu and Tharaka Nithi Counties – Documentary available on DVD Chicken Feed Mixed for Laying Hens – Documentary Available in YouTube https: //www.youtube.com/watch?v=Hirnr4IYAEI
F: Status of TIMP readiness (1. Ready for upscaling; 2.	Ready for upscaling

2.4.12 TIMP name	Affordable Maize-based Feed Ration for Layers
Requires validation; 3. Requires further research)	
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant-Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Governments of Embu and Tharaka Nithi

2.4.13 Affordable Maize/Maize germ-based Feed Ration for Layers

2.4.13 TIMP name	Affordable Maize/Maize germ-based Feed Ration for Layers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low egg production due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a maize/maize germ-based feed ration for laying birds (19-68 weeks of age). The formulated ration has 39% maize, 20% maize germ, 5% wheat bran, 5% sunflower seed cake, 15% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 9% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for layers), 0.05% DL-methionine, 0.10% L-Lysine HCl, and 0.25% toxin binder. The ration provides all the nutritional requirements for laying birds to attain optimum egg production.
Justification	Poor nutrition is a major problem that contributes to the low egg production in chicken. The expected egg production/laying percent can be attained through use of commercial layers feeds, which are expensive. The solution to the problem of low egg production is mixing of affordable and high-quality feed ingredients and feeding the rations to laying chickens preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds will lead to production of 250-280 eggs per hen per year.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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

2.4.13 TIMP name	Affordable Maize/Maize germ-based Feed Ration for Layers
	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable and sustainable market for Indigenous chicken.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practical sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately, hHence the need to make sure that the TIMPS being disseminated are ready for use.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers of ways of handling the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The maize/maize germ-based feed ration cost KES 46.31 per kg, while the commercial layer feed cost KES 67.00 per kg.
Estimated returns when using the TIMP	Feeding 100 laying birds on the maize/maize germ-based feed ration cost KES 672/day compared to KES 1225/day when fed on commercial layers' feed. This translates to a saving of KES 552/day, or KES 201,579 over a 365-day laying period, when

2.4.13 TIMP name	Affordable Maize/Maize germ-based Feed Ration for Layers
	using the maize/maize germ-based feed ration instead of the commercial layers' feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production. • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The maize/maize germ-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youth in the mixing and sale of high quality and affordable maize/maize germ-based feed rations to other farmers. • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs may have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs may be excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain mixing of affordable maize/maize germ-based feed rations for laying Improved Indigenous chicken.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	KALRO/Korea Partnership for Innovation of Agriculture (KOPIA)-funded farmer groups in Embu and Tharaka Nithi counties successfully reduced the cost of production by compounding their own poultry feeds using this technology.
Application guidelines for users	Innocent Kariuki, Moses Lang'at, Geoffrey Ngae, Salome Nyaga, Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas

2.4.13 TIMP name	Affordable Maize/Maize germ-based Feed Ration for Layers
	Mwangi and David Lelgut (2022). Booklet "High-quality, low-cost feed rations for laying hens". © KALRO/RDA, 2022. ISBN 978-9914-40-900-0 High-Quality, Low-Cost Rations A and B for Increased Egg Production in Embu and Tharaka Nithi Counties – Documentary available on DVD Chicken Feed Mixed for Laying Hens – Documentary Available on YouTube https: //www.youtube.com/watch?v=Hirnr4IYAEI Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi, David Lelgut, John Wanjii, Zipporah Marei, Alice Kanyotu, Alex Munyi, Stephen Musyoka, Salome Nyaga, Ernest Maragara, Kennedy Micheu, Viodorer Kangai and Samson Nzioka (2022). Types and Assessment of Quality of Ingredients for Mixing Feed Rations for Laying Chickens. Pamphlet © KALRO/RDA, 2022. Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi, David Lelgut, John Wanjii, Zipporah Marei, Alice Kanyotu, Alex Munyi, Stephen Musyoka, Salome Nyaga, Ernest Maragara, Kennedy Micheu, Viodorer Kangai and Samson Nzioka (2022). Steps in Mixing High-Quality, Low-Cost Feed Rations for Laying Hens. Pamphlet © KALRO/RDA, 2022.
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Governments of Embu and Tharaka Nithi

2.4.14 Affordable Sorghum-based Feed Ration for Layers

2.4.14 TIMP name	Affordable Sorghum-based Feed Ration for Layers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	

2.4.14 TIMP name	Affordable Sorghum-based Feed Ration for Layers
Problem to be addressed	Low egg production due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a sorghum-based feed ration for laying birds (19-68 weeks of age). The formulated ration has 50% sorghum, 9% wheat bran, 5% sunflower seed cake, 20% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 9% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for layers), 0.05% DL-methionine, 0.10% L-Lysine HCl, and 0.25% toxin binder.
Justification	Poor nutrition is a major problem that contributes to the low egg production in chicken. The expected egg production/laying percentage can be attained through use of commercial layers' feeds, which are expensive. The solution to the problem of low egg production is mixing of affordable and high quality feed ingredients and feeding the rations to laying chickens preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds will lead to production of 250-280 eggs per hen per year.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable and sustainable market for Indigenous chicken.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers.

2.4.14 TIMP name	Affordable Sorghum-based Feed Ration for Layers
	• Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practicals sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	Farmers easily get fatigued when a technology does not produce the expected results immediately hence the need to make sure that the disseminated TIMPS are readily available.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers on ways of handling the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The sorghum-based feed ration cost KES 53.11 per kg, while the commercial layer feed cost KES 67.00 per kg.
Estimated returns when using the TIMP	Feeding 100 laying birds on the sorghum-based feed ration cost KES 654/day compared to KES 1225/day when fed on commercial layers feed. This translates to a saving of KES 570/day, or KES 208,188 over a 365-day laying period, when using the sorghum-based feed ration instead of the commercial layers feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production. • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The sorghum-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.

2.4.14 TIMP name	Affordable Sorghum-based Feed Ration for Layers
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable sorghum-based feed rations to other farmers. • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs often get excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs have limited access to ration ingredients and chicken products markets since they may not travel to distant markets. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain mixing of affordable sorghum-based feed rations for laying Improved Indigenous chickens.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	KALRO/Korea Partnership for Innovation of Agriculture (KOPIA)-funded farmer groups in Embu and Tharaka Nithi counties increased the profitability of their chicken enterprises by using this feed ration.
Application guidelines for users	Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi and David Lelgut (2022). Booklet "High-quality, low-cost feed rations for laying hens". © KALRO/RDA, 2022. ISBN 978-9914-40-900-0 High-Quality, Low-Cost Rations A and B for Increased Egg Production in Embu and Tharaka Nithi Counties – Documentary available on DVD Chicken Feed Mixed for Laying Hens – Documentary Available in YouTube https: //www.youtube.com/watch?v=Hirnr4IYAEI Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi, David Lelgut, John Wanjii, Zipporah Marei, Alice Kanyotu, Alex Munyi, Stephen Musyoka, Salome Nyaga, Ernest Maragara, Kennedy Micheu, Viodorer Kangai and Samson Nzioka (2022). Types and Assessment of Quality of Ingredients

2.4.14 TIMP name	Affordable Sorghum-based Feed Ration for Layers
	for Mixing Feed Rations for Laying Chickens. Pamphlet © KALRO/RDA, 2022.
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Governments of Embu and Tharaka Nithi

2.4.15 Affordable Sorghum/Maize germ-based Feed Ration for Layers

2.4.15 TIMP name	Affordable Sorghum/Maize germ-based Feed Ration for Layers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low egg production due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a sorghum/maize germ-based feed ration for laying birds (19-68 weeks of age). The formulated ration has 39% sorghum, 20% maize germ, 5% wheat bran, 5% sunflower seed cake, 15% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 9% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for layers), 0.05% DL-methionine, 0.10% L-Lysine HCl, and 0.25% toxin binder. The ration provides all the nutritional requirements for laying birds to attain optimum egg production.
Justification	Poor nutrition is a major problem that contributes to the low egg production in chicken. The expected egg production/laying percent can be attained through use of commercial layers feeds which are expensive. The solution to the problem of low egg production is mixing of affordable and high-quality feed rations and feeding the rations to laying chickens preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds will lead to production of 250-280 eggs per hen per year.

2.4.15 TIMP name	Affordable Sorghum/Maize germ-based Feed Ration for Layers
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable and sustainable market for Indigenous chicken.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Embu, Tharaka Nithi, Meru
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practicals sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	• Farmers easily get fatigued when a technology does not produce the expected results immediately hence the need to make sure that the disseminated TIMPs are readily available.
Social, environmental, policy and market conditions	• Acceptance by farmers on ways of handling the ingredients used in ration mixing.

2.4.15 TIMP name	Affordable Sorghum/Maize germ-based Feed Ration for Layers
necessary for development and upscaling	• Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The sorghum/maize germ-based feed ration cost KES 48.26 per kg, while the commercial layer feed cost KES 67.00 per kg.
Estimated returns when using the TIMP	Feeding 100 laying birds on the sorghum/maize germ-based feed ration cost KES 684/day compared to KES 1225/day when fed on commercial layers feed. This translates to a saving of KES 541/day, or KES 197,480 over a 365-day laying period, when using the sorghum/maize germ-based feed ration instead of the commercial layers feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production. • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production. • The sorghum/maize germ-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable sorghum/maize germ-based feed rations to other farmers. • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs often get excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs have limited access to ration ingredients and chicken products markets since they may not travel to distant markets. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and

2.4.15 TIMP name	Affordable Sorghum/Maize germ-based Feed Ration for Layers
	sustain mixing of affordable sorghum/maize germ-based feed rations for laying Improved Indigenous chicken.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	KALRO/Korea Partnership for Innovation of Agriculture (KOPIA)-funded farmers in Embu and Tharaka Nithi counties increased the profitability of their chicken enterprises by using this feed ration.
Application guidelines for users	Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi and David Lelgut (2022). Booklet "High quality, low cost feed rations for laying hens". © KALRO/RDA, 2022. ISBN 978-9914-40-900-0  Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi, David Lelgut, John Wanjii, Zipporah Marei, Alice Kanyotu, Alex Munyi, Stephen Musyoka, Salome Nyaga, Ernest Maragara, Kennedy Micheu, Viodorer Kangai and Samson Nzioka (2022). Types and Assessment of Quality of Ingredients for Mixing Feed Rations for Laying Chickens. Pamphlet © KALRO/RDA, 2022. Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi, David Lelgut, John Wanjii, Zipporah Marei, Alice Kanyotu, Alex Munyi, Stephen Musyoka, Salome Nyaga, Ernest Maragara, Kennedy Micheu, Viodorer Kangai and Samson Nzioka (2022). High quality low cost feed rations for laying hens. Pamphlet © KALRO/RDA, 2022.
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Governments of Embu and Tharaka Nithi

2.4.16 Affordable Maize/Sorghum-based Feed Ration for Layers

2.4.16 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Layers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low egg production due to poor nutrition and feeding practices.
What is it? (TIMP description)	This is a maize/sorghum-based feed ration for laying birds (19-68 weeks of age). The formulated ration has 29% maize, 25% sorghum, 5% wheat bran, 5% sunflower seed cake, 20% soya bean meal, 5% shrimp meal, 1% dicalcium phosphate, 9% limestone, 0.35% iodized salt, 0.25% vitamin/mineral premix (for layers), 0.05% DL-methionine, 0.10% L-Lysine HCl, and 0.25% toxin binder. The ration provides all the nutritional requirements for laying birds to attain optimum egg production.
Justification	Poor nutrition is a major problem that contributes to the low egg production in chicken. The expected egg production/laying percentage can be attained through use of commercial layers feeds which are expensive. The solution to the problem of low egg production is mixing of affordable and high-quality feed ingredients and feeding the rations to laying chickens preferably under intensive/semi-intensive production systems. Provision of proper nutrition to the birds will lead to production of 250-280 eggs per hen per year.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, feed manufacturers, extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Availability of high quality feed ingredients for ration mixing. • Favorable and sustainable market for Indigenous chicken.
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to provide extension services. • Chicken farmer groups to mobilize farmers.
C: Current situation and future scaling up	
Counties where already	Kiambu, Embu, Tharaka Nithi, Meru

2.4.16 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Layers
promoted if any	
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Murang'a, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels of farmers. • Women's triple roles limit the amount of time available for training. • Inadequate number of extension officers.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (e.g. in Farmer field schools). • More practicals sessions and the use of visual aids during training. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	• Farmers easily get fatigued when a technology does not produce the expected results immediately. Therefore, the need to make sure that the disseminated TIMPS are readily available.
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance by farmers on handling of the ingredients used in ration mixing. • Availability of good soils and climatic conditions to grow some of the feed ingredients. • Policy and regulations in place that guarantee the quality of feed ingredients. • Existence of reliable markets for indigenous chicken products and stable prices.
Basic costs of the TIMP	The maize/sorghum-based feed ration cost KES 52.06 per kg, while the commercial layer feed cost KES 67.00 per kg.
Estimated returns when using the TIMP	Feeding 100 laying birds on the maize/sorghum-based feed ration cost KES 700/day compared to KES 1225/day when fed on commercial layers feed. This translates to a saving of KES 524/day, or KES 191,399 over a 365-day laying period, when using the maize/sorghum-based feed ration instead of the commercial layers feed.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Cultural concerns	None
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to information and knowledge on chicken production. • The lower literacy rates among women can pose challenges in accessing and understanding training materials and keeping accurate records during chicken production. • Women have less access to production resources such as land, capital, labour and credit. • Women have less access to training and extension services, which can lead to a knowledge gap in chicken production.

2.4.16 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Layers
	• The maize/sorghum-based feed ration technology may not be adopted if it increases the work burden for women who often have multiple responsibilities.
Gender related opportunities	• Business opportunities exist for women and youths in the mixing and sale of high quality and affordable maize/sorghum-based feed rations to other farmers. • Affirmative action and hustler funds opportunities exist for women and youths to acquire the required finances for chicken production.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to finances to acquire the required ingredients for ration mixing. • VMGs have limited access to education, training and extension services on chicken production. • Due to their social status, VMGs often get excluded from decision making in development and dissemination activities related to chicken production. • There is low adoption by the VMGs due to lack of awareness on chicken production. • VMGs have limited access to ration ingredients and chicken products' markets since they may not travel to distant markets. • Some VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain mixing of affordable maize/sorghum-based feed rations for laying Improved Indigenous chickens.
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit for chicken production. • Employment opportunities exist for women and youth in the mixing and sale of high quality and affordable feed rations to other farmers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	KALRO/Korea Partnership for Innovation of Agriculture (KOPIA)-funded project farmer groups in Embu and Tharaka Nithi counties did increase profitability of their poultry business by using this tecnology.
Application guidelines for users	Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi and David Lelgut (2022). Booklet "High-quality, low-cost feed rations for laying hens". © KALRO/RDA, 2022. ISBN 978-9914-40-900-0 High-Quality, Low-Cost Rations A and B for Increased Egg Production in Embu and Tharaka Nithi Counties – Documentary available on DVD Chicken Feed Mixed for Laying Hens – Documentary Available in YouTube https: //www.youtube.com/watch?v=Hirnr4IYAEI Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas

2.4.16 TIMP name	Affordable Maize/Sorghum-based Feed Ration for Layers
	Mwangi, David Lelgut, John Wanjii, Zipporah Marei, Alice Kanyotu, Alex Munyi, Stephen Musyoka, Salome Nyaga, Ernest Maragara, Kennedy Micheu, Viodorer Kangai and Samson Nzioka (2022). Types and Assessment of Quality of Ingredients for Mixing Feed Rations for Laying Chickens. Pamphlet © KALRO/RDA, 2022. Innocent Kariuki, Geoffrey Ngae, Moses Lang`at, Nicholas Mwangi, David Lelgut, John Wanjii, Zipporah Marei, Alice Kanyotu, Alex Munyi, Stephen Musyoka, Salome Nyaga, Ernest Maragara, Kennedy Micheu, Viodorer Kangai and Samson Nzioka (2022). Steps in Mixing High-Quality, Low-Cost Feed Rations for Laying Hens. Pamphlet © KALRO/RDA, 2022.
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	Innocent Kariuki, Moses Lang'at & Elias Kamau. KALRO
Partner organizations	Livestock Offices, County Governments of Embu and Tharaka Nithi

2.4.17 Moringa Leaf meal-based feed

2.4.17 TIMP name	Moringa leaf meal for chicken feeds
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	• Low quality of indigenous chicken eggs in Kenya • Inadequate supply of quality feed
What is it? (TIMP description)	Moringa leaf meal (MOLM) is a rich source of proteins, vitamins, minerals and ox carotenoids used in place of soybean meal to improve the quality of chicken eggs. Its inclusion at 20-40 percent enzyme-treated in diets of laying hens improves the egg weight, yolk weight, albumin height, and yolk colour and shell thickness.     *MOLM* *0% MOLM* *20% MOLM* *40 MOLM*

2.4.17 TIMP name	Moringa leaf meal for chicken feeds
	The egg yolk's yellow colour is enhanced as the level of MOLM in diet is increased in the laying chicken's diets, thus improving on quality and attracting more consumers. Besides, this, the cost effective Moringa leaf meal is a likely substitute to the costly soybean meal.
Justification	Protein is the most expensive component of poultry feed. Soya meal is the preferred protein sources due to its amino-acid composition and low fibre content. However, high cost of soya beans meal has resulted in expensive feeds. Moringa provides an alternative and cheaper source of protein, which when incorporated into chicken feeds will reduce the cost of production, increase productivity, and enhance egg quality in chicken.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, chicken multipliers and breeders, protein producers and feed manufacturers, researchers, partners, VMG and agripreneurs
Approaches to be used in dissemination	• 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	• Hands-on training and demonstrations • Demand /market for Indigenous chicken is sustained • Creation of awareness
Partners/stakeholders for scaling up and their roles	• KALRO to fine-tune technology, ToT, backstopping and monitoring implementation. • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted	Nakuru
Counties where TIMPS will be disseminated	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels. • Women's triple roles limit the amount of time available for

2.4.17 TIMP name	Moringa leaf meal for chicken feeds
	training. • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools) • Establishment of Moringa oleifera demonstration centres • More practicals sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Reliable markets for indigenous chicken products and stable prices • Policy and regulatory interventions which encourage use
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be determined
Estimated returns	To be determined
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to education, skills and knowledge on the technology • Women have inadequate access to productive resources such as credit, inputs, land and capital • Women have limited access to education, training and extension services.
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youth to acquire the required finances • Employment opportunities exist for male youth in production of MOLM and selling them to local farmers
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may also 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 • VMGs have limited access to markets as since they may not travel to distant markets
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in production of Moringa oleifera and selling them to local farmers
E: Case studies/profiles of success stories	
Success stories	To be documented
Application guidelines for users	Muremera C.N., Ambula M.K., King'ori A.M., Ilatsia E.D. and Alaru P.A.O (2022). Effect of feeding enzyme-treated Moringa (M. oleifera) leaf meal based-diets on egg quality of improved indigenous layer chicken in Kenya. International Journal of

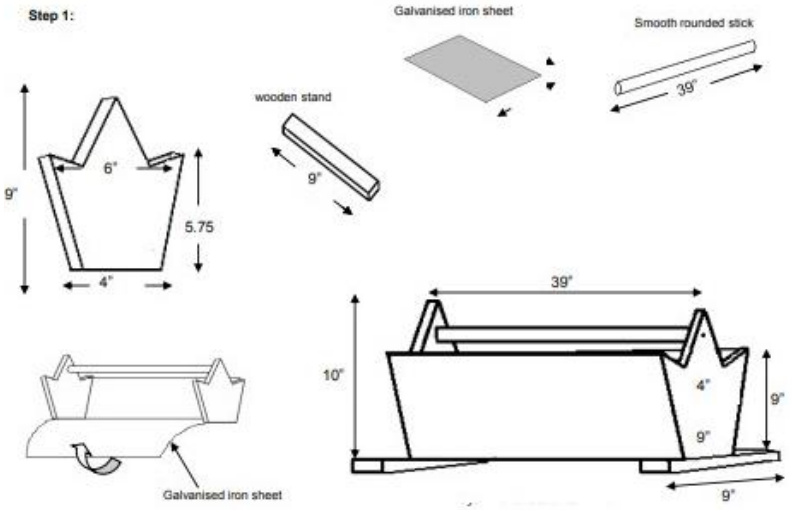
2.4.17 TIMP name	Moringa leaf meal for chicken feeds
	Veterinary Sciences and Animal Husbandry; 7(5): 43-48. doi https://doi.org/10.22271/veterinary.2022.v7.i5a.443
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires Validation; 3. Requires further Research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru, PAO., Ilatsia, ED., CN Muremera, Adongo, AO., Okitoi L., K'Oloo, T., Ochieng, VO., Ngaira VM., Ouko, RO.
Partner organizations	Egerton University: Ambula, MK., King'ori, AM.,

Gaps:

1. Consumer preferences and organoleptic tests of meat from chicken fed on MOLM

2.4.18 KALRO Naivasha long feed trough

2.4.18 TIMP name	KALRO Naivasha Long Feed Trough
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Feed wastage and losses incurred when inappropriate feeding equipment is used.
What is it? (TIMP description)	KALRO Naivasha Long Feeder is a one-meter-long chicken feeding equipment made from locally available materials such as wood and galvanized flat iron sheet. It features a spinning stick handle to discourage bird perching and includes stabilizers on both ends to prevent tipping. This feeder comes in three sizes suitable for chicks, growing, and adult chickens. For best results, it is recommended to use one Naivasha long feed trough for every 20 birds, providing 10 cm of feeding space per bird.

2.4.18 TIMP name	KALRO Naivasha Long Feed Trough
	HOW TO MAKE A NAIVASHA LONG FEED TROUGH **Materials** Materials / size / Quantity Galvanized flat iron sheets — 8"x 4" — 1 Timber — 6"x1" 18ft long — 1 2"x2" 12ft long — 1 Smoothened round stick — 31ft long — 1 Nails — 1" — 20; 2" — 6; 3" — 2  **Step 1:** 
Justification	Feed wastage and contamination pose significant challenges for chicken farmers, leading to increased production costs. Approximately 20% of feed is lost due to spillage during feeding, highlighting the need for more efficient feeding practices and solutions to reduce these losses.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Small-scale, medium and large-scale chicken farmers, local artisans (*Jua Kali artisans*), VMGs, extension officers, researchers and agripreneurs
Approaches to be used in dissemination	• 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	• Develop a PPP model to enhance branding, fabrication, and taking the feeder into the chicken equipment market • Favorable Market for Indigenous chicken is sustained to increase and maintain demand.
Partners/stakeholders for scaling	• KALRO to be the designer of the feed troughs

2.4.18 TIMP name	KALRO Naivasha Long Feed Trough
up and their roles	• County governments to mobilize farmers and follow up extension services • Chicken farmer groups to mobilize farmers and stocking of the feeder • Local *Jua Kali* artisans to mass-produce the Naivasha Long feeder.
C: Current situation and future scaling up	
Counties where already Promoted if any	Nakuru county (Naivasha sub-county), Kisumu, Kakamega, Bungoma Homabay, Siaya and Laikipia
Counties where TIMPS will be up scaled	All the 47 counties in the country
Challenges in Dissemination	• Inadequate extension agents familiar with local dialects of target areas • Low levels of information dissemination use due to low literacy levels in the society. • Women's many roles limit the amount of time available for knowledge/information sharing. • Limited information sharing via digital network
Suggestions for addressing the challenges	• Use vernacular local radio stations to promote the technology in local languages for respective counties • Improve hands-on training, visual aids and real-life experience learning in Farmer Field Schools and Pastoral Field Schools. • To enhance women's participation, training sessions should be done in close proximity to their homes. • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling (if any)	• Need to sensitize the farmers and extension agents on the benefits and hence increase demand for the Naivasha long feeder • This is a business opportunity for youth and VMGs
Social, environmental, policy and market conditions necessary	• Reliable markets for indigenous chicken products and stable prices • Harmonize trade regulations between the County Governments to enable easy flow of the chicken products • Zero- rate taxes on construction materials
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 800 per Naivasha long feeder
Estimated returns	KES 54,000 at current feed prices for a cycle of 12 months in production.
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to education, skills and knowledge on the technology • Women have inadequate access to finances to acquire the construction material for the feeders as well as other farm inputs • Women have less access to productive resources such as land, implements and inputs for adopting and scaling the

2.4.18 TIMP name	KALRO Naivasha Long Feed Trough
	technology. • Women have limited access to education, training and extension services • Some cultures may limit women participation in fabricating this technology
Gender related opportunities	• Business opportunities for men and male youth exists in fabricating the Naivasha long feed trough and sell to chicken farmers • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may also have limited access to resources such as credit, and land required for the technology • VMGs have limited access to education, training and extension services. • Due to their social status, VMGs often get excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness. • VMGs have limited access to markets as since they may not travel to distant markets
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Business opportunities for male youth exists in fabricating the Naivasha long feed trough and selling to chicken farmers
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers who adopted this technology have reported substantial reduction in feed losses
Application guidelines for users	• Put the feeder in upright position • Always fill the feeder to full • The round stick handle should spin to discourage bird perching. • KALRO Chicken Training Manual
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	(KALRO NRI); Wachira A., Mwangi D. M., Munyasi J.; Ilatsia E., Alaru P., Okitoi L., K'Oloo T and Ouko O.
Partner organizations	

Gaps:

1. Dissemination of the technology to rural farmers and local artisans.
2. Mass production of the feeder and availing in local market outlets.

2.5 Animal Health

2.5.1 Thermostable Newcastle Disease vaccines

2.5.1 TIMP name	**Thermostable Newcastle Disease vaccine (AVIVAX-I2)**
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Reduced productivity due to high mortality of chickens from Newcastle disease outbreaks. • Strict requirements for cold chain maintenance in vaccine handling, which limits vaccination coverage
What is it? (TIMP description)	This is a live, thermostable vaccine developed from Australian I-2 Newcastle disease virus strain. The vaccine is produced and marketed by KEVEVAPI under the trade name AVIVAX-I2®. It protects chicken against Newcastle disease. The vaccine is efficacious if stored at 28°C for at least 12 weeks. At 4-8 ° C, it can be stored for nearly a year and retains its efficacy. This vaccine is administered intranasally, intraocularly or in drinking water.  ***Thermostable Newcastle disease vaccine, 100 doses***
Justification	Outbreak of Newcastle disease causes mortality of up to 80-100% in chicken. Breakdown of cold chain results in vaccine failure. There is low vaccination coverage due to limited availability of existing ND vaccines that require refrigeration/cold chain. Availability of AVIVAX-12, which does not require strict cold chain, enables effective control of ND thus reducing losses of chicken.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken farmers, extension agents, service providers, researchers, agrovets and agripreneurs.

2.5.1 TIMP name	Thermostable Newcastle Disease vaccine (AVIVAX-I2)
Approaches to be used in dissemination	• 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	• Increased accessibility to AVIVAX-12 vaccine through local agrovets • Veterinary Medicine Directorate (VMD) should step up its crackdown on counterfeit vaccine products. • Develop and provide extension and promotion materials
Partners/stakeholders for scaling up and their roles	• KALRO as a source of technology, carry out training on vaccine use and research • KEVEVAPI to manufacture and distribute the AVIVAX-I2 in sufficient quantities • County governments to mobilize farmers and provide capacity building on use of AVIVAX-I2 • Chicken farmer groups to mobilize village chicken vaccinators for capacity building on use of AVIVAX-12.
C: Current situation and future scaling up	
Counties where already promoted if any	Busia, Machakos and Nakuru County
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels. • Women's triple roles limit the amount of time available for training. • Limited information sharing via digital network
Recommendations for addressing the challenges	• More hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • More practicals sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Lessons learned in up scaling if any	• The vaccine prevents massive losses when used to vaccinate chicken • With a little training, farmers can easily handle and use the vaccine for vaccinating their chicken flocks
Social, environmental, policy	• Acceptability of the farmers to use the vaccine

2.5.1 TIMP name	Thermostable Newcastle Disease vaccine (AVIVAX-I2)
and market conditions necessary for development and up scaling	• Need of policy to regulate importation/manufacture of Newcastle disease vaccines • Need of conducive policy to regulate importation of chicken and chicken products and to create sustained market for local products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of 100 doses of AVIVAX-I2 is KES 200.00, hence the cost per dose is KES 2.00
Estimated returns	• 80% return on investment • ND is a deadly disease causing 100% mortality in chicken. AVIVAX-I2 confers over 60% direct immunity against ND
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited knowledge of Indigenous chicken diseases due to lack of access to agricultural information and extension services • Women, who usually own small flocks do not have the financial capacity to purchase the minimum vaccine packaging of 100 doses • Women have limited access to education and training
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • Employment opportunities for youth exist in vaccinating chicken
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have less access to indigenous chicken disease information and knowledge • VMGs may also have limited access to finances to buy the vaccine • VMGs have limited access to education, training and extension services • There is low level of vaccination coverage in remote areas where the indigenous people live mainly due to lack of awareness • 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 opportunities exist for VMGs to acquire the required credit • Employment opportunities for VMGs in vaccinating chicken
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Thermostable I-2 ND vaccine has provided 100% protection of housed chickens and 89% protection to unhoused chickens against ND as has been reported in Nakuru County Brief on the I-2 ND Vaccine_ livelyhood docs.pdf (kalro.org), As well as Nambale and Teso South in Busia County and in Farmer groups in Mwala and Yatta Machakos Counties

2.5.1 TIMP name	Thermostable Newcastle Disease vaccine (AVIVAX-I2)
	(KSCAP report: EDT-AR2_Ogali_July2021-June2022 reviewed-Mugambi.pdf (kalro.org)
Application guidelines for users	Available in a leaflet or online from KEVEVAPI (https://kevevapi.or.ke) Ogali, I.N, Muleke C.I., Mungube E.O., and Githinji J. Validation of climate smart disease control technologies for enhanced productivity of Indigenous chicken. KCSAP Technical Report
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 VSRI-Muguga North P.O Box 32-00902, Kikuyu Email: director.vsri@kalro.org Tel: 020-2524616
Lead organization and scientists	KALRO; Irene Ogali, Erick Mungube, Jones Mutua, Ann Wachira, David M. Mwangi, Evans Ilatsia, Peter Alaru, Ochieng Ouko, Tobias K'Oloo and Sophie Miyumo

Gaps:

1. Creating awareness to encourage adoption, particularly in rural and ASAL areas
2. Revising guidelines based on new information

2.5.2 Live Gumboro Vaccine

2.5.2 TIMP name	Live Gumboro Vaccine
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low productivity due to high incidence of infectious bursal disease (IBD) vaccine failures. Reported high mortality rates in IBD vaccinated chicken flocks
What is it? (TIMP description)	This vaccine is formulated from the M.B. virus strain and is a live attenuated vaccine used to protect chicken against infectious bursal disease (IBD)/Gumboro disease. The M.B. strain is derived from a very virulent strain of IBDV (vVIBDV). The vaccine's attenuation level enables it to successfully protect against Gumboro disease without lowering the bird's immunity. The vaccine protects chicks from 10-12 days of age. It is thus suitable for use in Indigenous chicken.
Justification	Infectious bursal disease (IBD) results in 70% mortality in unvaccinated chicks and growers. Vaccination is key in controlling of the disease. However, reports of vaccination failures in chicken vaccinated against IBD using the existing IBD vaccine are rampant in Kenya. This is attributed to antigenic

2.5.2 TIMP name	Live Gumboro Vaccine
	differences between vaccine and circulating viral strains since all IBD vaccines in the country are imported. Since their introduction in Kenya, the safety and efficacy of the available IBD vaccines remains a major area of concern and may negatively affect the control of IBD in Kenya. It is important to identify a vaccine that is efficacious for use in the country. The M.B vaccine although imported has shown good protection against incompatible IBD viral field strains and may be thus suitable for use in Kenya.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken farmers, veterinarians, extension agents, service providers, researchers, agrovets and agripreneurs
Approaches to be used in dissemination	• 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	• Sustainable supply of the vaccine • Provide enabling regulations for distribution and use of the vaccine
Partners/stakeholders for scaling up their roles and stage of involvement	• KALRO will carry out training on vaccine use and research on sustainable vaccine delivery and socio-economic and policy implications of the vaccine • County government and private extension service providers will train farmers on use of the vaccine through farm visits. They will also offer advice and collect information on the uptake of the vaccine • KEVEVAPI will provide backstopping on vaccine quality issues • Agro-dealers and vaccine importers (Bimeda Ltd), distributors and stockists will distribute the vaccine to the farmers • DVS will provide backstopping on chicken health issues
C: Current situation and future scaling up	
Counties already promoted if any	Busia and Machakos counties
Counties where TIMP will be upscaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi

2.5.2 TIMP name	Live Gumboro Vaccine
Challenges in dissemination	• Inadequate vaccine distribution channels/ networks in rural areas • High dosage packaging of the vaccine for individual flocks • Cold-chain requirement of the vaccine • Inadequate knowledge on the use of the vaccine • Inadequate vaccine access for individual farmers
Suggestions for addressing the challenges	• Lobby authorities to facility electricity connectivity in rural areas • Sensitization of farmers about the vaccine • Capacity building of farmers and service providers on importance and use of the vaccine • Aggregate farmers into groups for ease of access to the vaccine • Collaboration with county government in supply of the vaccine
Lessons learned for upscaling if any	• Collaboration of local partners leads to successful uptake of the IBD vaccine • Demonstration of the cost and benefit analysis enhances uptake of technologies
Social, environmental, policy and market conditions necessary	• Acceptability of the vaccine in control of IBD in chicken including IC • Need for policy to regulate importation of vaccines for IBD control in Kenya • Conducive policy environment to support local vaccine development • Favourable temperature conditions for storage and transportation of the vaccine
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs of the TIMPs	KES 7 per bird (100 doses of the vaccine costs KES 350 at most two vaccination per bird are sufficient to fully protect the bird)
Estimated returns when using the TIMP	• KES 600 per bird (Once vaccinated a bird is fully protected and can attain market weight and be sold at KES 800, this will translate to KES 600 after reduction of cost of production)
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited knowledge of chicken diseases due to lack of access to agricultural information and extension services • Women, who usually own small flocks do not have the financial capacity to purchase the minimum vaccine packaging of 100 doses • Women have limited access to education and training
Gender related opportunities	• Affirmative action opportunities exist for women and youth to acquire the required credit • Employment opportunities for youth exist in vaccinating chicken

2.5.2 TIMP name	Live Gumboro Vaccine
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have less access to chicken disease information and knowledge • VMGs may also have limited access to finances to buy the vaccine • VMGs have limited access to education, training and extension services • There is low level of vaccination coverage in remote areas where the indigenous people live mainly due to lack of awareness • 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 opportunities exist for VMGs to acquire the required credit • Employment opportunities for VMGs exist in vaccinating the chicken.
E: Case studies/profiles of success stories	
Success stories	In Nambale and Teso South in Busia County and in Farmer groups in Mwala and Yatta Machakos Counties the vaccine protected 70% of vaccinated chicks and boosted the chick survival by 50%. (KSCAP report: EDT-AR2_Ogali_July2021-June2022 reviewed-Mugambi.pdf (kalro.org)
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires validation; 3. Requires further research)	Ready for upscaling
Application guidelines for users	https://www.bimeda.co.ke/media/k2/attachments/Gumboro-disease-virus-Data_Sheet.pdf Ogali, I.N, Muleke C.I., Mungube E.O., and Githinji J. (2022) Validation of climate smart disease control technologies for enhanced productivity of Indigenous chicken. KCSAP Technical Report
G: Contacts	
Contacts	Institute Director, KALRO VSRI-Muguga North P.O Box 32-00902, Kikuyu Email: director.vsri@kalro.org Tel: 020-2524616
Lead organization and scientists	KALRO-VSRI, Muguga: Dr Irene Ogali, Dr Erick Mungube, Dr Jane Githinji, Prof Charles M
Partner organizations	Egerton University, MoAL through Directorate of Veterinary Services, KEVEVAPI, County Governments

Gaps:

1. Conduct validation studies on the Gumboro vaccine against different viral strains
2. Conduct socio-economic studies on profitability and willingness to pay

2.5.3 Bivalent Newcastle disease and Gumboro vaccine

2.5.3 TIMP name	Bivalent Newcastle disease and Gumboro vaccine
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low productivity in chicken due to high mortalities and incidence of Newcastle and infectious bursal (Gumboro) diseases
What is it? (TIMP description)	This is an inactivated combined vaccine to control Newcastle disease and infectious bursal disease in chicken. The vaccine targets indigenous chicken less than 3 months of age and breeder stock. It is administered through one booster vaccination, 14-18 days apart.
Justification	Newcastle Disease (ND) and infectious bursal disease (IBD) cause huge economic losses in chicken through reduced productivity, high mortality and high costs of treatment. Vaccination is the main method of control for the two diseases. This vaccine addresses the mismatch between marketed vaccines and local disease-causing strains, which results in vaccination failures, unexpected losses in vaccinated chicken flocks and discourages farmers from using vaccines to control ND and IBD. The vaccine is also a bivalent, with combined targeting of two key chicken diseases. It is therefore advantageous as it reduces the cost of vaccination and controls two diseases with a single vaccination. This reduces stress attributed to vaccination in chicken thus improving their performance. The vaccine confers prolonged immunity following one booster vaccination.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken farmers, Farmer producer groups, commercial breeders, Animal health service providers, Extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Functional working relations/MOU between KALRO and KEVEVAPI for large-scale vaccine production

2.5.3 TIMP name	Bivalent Newcastle disease and Gumboro vaccine
	• Incorporation of animal health product regulators (VMD, DVS, NACOSTI, the Kenya Veterinary Board (KVB) into the vaccine development and commercialization process • Registration of the vaccine with the Veterinary Medicine Directorate (VMD) and other regional regulatory bodies for its use in Kenya and the region • Functional and effective vaccine distribution channels
Partners/stakeholders for scaling up, their roles and stage of involvement.	• Extension service providers (Public and private) will offer advice and collect information on the uptake of the vaccine. They will also ensure proper use of the vaccine • County Governments- promote and create awareness on the advantages of the vaccine • DVS and VMD-Policy and regulation on use of the vaccine • Farmers and farmer groups- will spread information on the vaccine and provide their chicken for vaccination • KALRO-Technology development, train trainers and provide technical backstopping during validation and dissemination of the vaccine • KEVEVAPI- will produce the vaccine and ensure quality assurance and distribution • Vaccine stockists-ensure distribution and availability
C: Current situation and future scaling up	
Counties already promoted if any	None.
Counties where TIMP will be upscaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Limited skills on the use of the vaccine • Inadequate information on the vaccine • Inadequate vaccine distribution network • Inadequate vaccine access for individual farmers
Suggestions for addressing the challenges	• Document and disseminate information on the vaccine • Train farmers and service providers on the use of the vaccine • Aggregate farmers into groups for ease of access to the vaccine • Collaboration with county government in supply of the vaccine
Lessons learned for upscaling if any	• None yet
Social, environmental, policy and market conditions necessary for development and upscaling	• Awareness and Acceptability of the locally formulated bivalent vaccine in control of ND and IBD in Kenya and the East African Region • Available market for poultry and poultry products • Favourable policy regulation on the use and importation of chicken vaccines

2.5.3 TIMP name	Bivalent Newcastle disease and Gumboro vaccine
	• Favourable climatic conditions for sustainable development of the poultry industry • Favourable temperature conditions for storage and transportation of the vaccine
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs of the TIMPs	100 doses of the vaccine cost about KES 350
Estimated returns	• Value of birds saved from mortality and savings from production losses (In on-station trials the vaccine was able to reduce disease and death in 86% of chicken challenged with IBD)
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited knowledge of chicken diseases due to lack of access to agricultural information and extension services • Women, who usually own small flocks do not have the financial capacity to purchase the minimum vaccine packaging of 100 doses • Women have limited access to education and training
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • Employment opportunities for youth exist in vaccinating chicken
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have less access to chicken disease information and knowledge • VMGs may also have limited access to finances to buy the vaccine • VMGs have limited access to education, training and extension services • There is low level of vaccination coverage in remote areas where the indigenous people live mainly due to lack of awareness • 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 opportunities exist for VMGs to acquire the required credit • Employment opportunities for VMGs exist in vaccinating the birds.
E: Case studies/profiles of success stories	
Success stories	None yet
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires validation; 3. Requires further research)	Requires validation
Application guidelines for users	KSCAP report: Ogali, I.N, Orwe, M., Mungube E.O., Lutta H. and Githinji J. (2022) Development and testing of Bivalent vaccine against Newcastle disease and Infectious

2.5.3 TIMP name	Bivalent Newcastle disease and Gumboro vaccine
	bursal disease. KCSAP Technical Report
G: Contacts	
Contacts	Institute Director, KALRO VSRI-Muguga North P.O Box 32-00902, Kikuyu Email: director.vsri@kalro.org Tel: 020-2524616
Lead organization and scientists	KALRO-VSRI, Muguga: Dr Irene Ogali, Dr Erick Mungube, Dr Harrison Lutta
Partner organizations	KEVEVAPI, MoAL through Directorate of Veterinary Services, VMD, PANVAC, FAO, GalvMED, County Governments

Gaps:

1. Undertake studies to determine dose levels and when boosting needs to be done
2. Conduct validation studies on the bivalent vaccine
3. Conduct socio-economic studies on profitability and willingness to pay.

2.5.4 Monovalent Newcastle disease vaccine

2.5.4 TIMP name	Monovalent Newcastle disease vaccine
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low productivity and profitability of chicken due to losses because of high incidence of Newcastle disease
What is it? (TIMP description)	This is an inactivated vaccine to control Newcastle disease. The vaccine targets chicken of all ages and is for boosting immunity after vaccination with live vaccines such as the KEVAVAPI-marketed thermostable Newcastle disease vaccine (Avivax-I-2®). The vaccine is administered 12-18 weeks after the live vaccine is given .
Justification	Newcastle Disease (ND) causes huge economic losses in poultry through reduced productivity and high mortality. The mismatch between the available vaccines and local disease-causing viruses reduces the effectiveness of vaccination, resulting in unexpected losses in vaccinated chicken flocks. This vaccine enhances vaccine effectiveness since it is matched to disease-causing Newcastle disease virus in Kenya and the East African region. The vaccine can be applied together with available live vaccines to confer longer immunity and reduce the need for booster vaccination.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken farmers, Farmer producer groups, commercial breeders, Animal health service providers, Extension agents, researchers and agripreneurs.
Approaches to be used in dissemination	• Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP)

2.5.4 TIMP name	Monovalent Newcastle disease vaccine
	• 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	• Functional working relations/MOU between KALRO and KEVEVAPI for large-scale vaccine production • Registration of the vaccine with the Veterinary Medicine Directorate (VMD) and other regional regulatory bodies for its use in Kenya and the region • Functional and effective vaccine distribution channels
Partners/stakeholders for scaling up their roles and stage of involvement	• Extension service providers (Public and private) will offer advice and collect information on the uptake of the vaccine. They will also ensure proper use of the vaccine • County Governments will promote and create awareness on the advantages of the vaccine • DVS and VMD will guide on policy and regulation on use of the vaccine • Farmers and farmer groups will spread information on the vaccine and provide their chicken for vaccination • KALRO will lead in technology development, train trainers and provide technical backstopping during validation and dissemination of the vaccine • KEVEVAPI will produce the vaccine and ensure quality assurance and distribution • Vaccine stockists will ensure distribution and availability
C: Current situation and future scaling up	
Counties already promoted if any	None.
Counties where TIMP will be upscaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Lack of information on the vaccine • Inadequate knowledge on the use of the vaccine • Inadequate vaccine distribution network • Inadequate vaccine access for individual farmers
Suggestions for addressing the challenges	• Document and avail information on the use of the vaccine • Train farmers and service providers in use of the vaccine • Aggregate farmers into groups for ease of access to the vaccine • Collaboration with county government in supply of the vaccine

2.5.4 TIMP name	Monovalent Newcastle disease vaccine
Lessons learned for upscaling if any	• None.
Social, environmental, policy and market conditions necessary	• Awareness and acceptability of the vaccine in control of ND in Kenya and the East African region • Sustained market for poultry and poultry products • Favourable policy regulation on the use and importation of chicken vaccines • Favourable climatic conditions for sustainable development of poultry value chain in Kenya and East African region • Favourable temperature conditions for storage and transportation of the vaccine
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs of the TIMPs	KES 3.50 per bird
Estimated returns when using the TIMP	Value of birds saved from mortality and savings from production losses (In on-station trials the vaccine protected 92% of chicks from disease)
Cultural concerns	• None
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited knowledge of chicken diseases due to lack of access to agricultural information and extension services • Women, who usually own small flocks do not have the financial capacity to purchase the minimum vaccine packaging of 100 doses • Women have limited access to education and training
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • Employment opportunities for youth exist in vaccinating chicken
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have less access to chicken disease information and knowledge • VMGs may also have limited access to finances to buy the vaccine • VMGs have limited access to education, training and extension services • There is low level of vaccination coverage in remote areas where the indigenous people live mainly due to lack of awareness • 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 opportunities exist for VMGs to acquire the required credit • Employment opportunities for VMGs exist in vaccinating the birds
E: Case studies/profiles of success stories	
Success stories	
F: Status of TIMP Readiness (1. Ready for up scaling; 2.	Requires validation

2.5.4 TIMP name	Monovalent Newcastle disease vaccine
Requires validation; 3. Requires further research)	
Application guidelines for users	KSCAP report: Ogali, I.N, Orwe, M., Mungube E.O., Lutta H. and Githinji J. (2022) Development and testing of Bivalent vaccine against Newcastle disease and Infectious bursal disease. KCSAP Technical Report
G: Contacts	
Contacts	Institute Director, KALRO VSRI-Muguga North P.O Box 32-00902, Kikuyu Email: director.vsri@kalro.org Tel: 020-2524616
Lead organization and scientists	KALRO-VSRI, Muguga North: Dr. Irene Ogali, Orwe M., Dr. Erick Mungube, Dr. Harrison Lutta and Githinji J.

Gaps:

1. Undertake studies to determine dose levels and when boosting needs to be done
2. Conduct validation studies on the ND vaccine
3. Conduct socio-economic studies on profitability and willingness to pay.

2.5.5 Monovalent Gumboro (IBD) vaccine

2.5.5. TIMP name	Monovalent Gumboro vaccine
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	• Low productivity due to high mortality of up to 80% in chicks caused by Gumboro (infectious bursal) disease outbreak. • Reported high incidence of existing vaccine failure
What is it? (TIMP description)	This is an inactivated IBD vaccine formulated from local circulating viral strains collected from disease hotspots in Kenya. The vaccine may be applied to chicks from the age of 10-12 days in areas where IBD is common and can be used to boost the immunity of the breeding stock. It is also suitable for use in Indigenous chicken.
Justification	Infectious bursal disease (IBD) results in up to 80% mortality in unvaccinated chicks and growers. Vaccination is key in controlling of the disease. However, reports of vaccination failures in chicken vaccinated against IBD using the existing IBD vaccine are rampant in Kenya. This is attributed to antigenic differences between the currently marketted vaccine and the circulating viral strains since all IBD vaccines in the country are imported. The inactivated IBD vaccine made from local virus strains will give better protection rates and minimize mortalities of chicken during outbreaks.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken producers (farmers), producer groups,

2.5.5. TIMP name	Monovalent Gumboro vaccine
	veterinary staff, extension officers, researchers, vaccine producers and agripreneurs
Approaches to be used in dissemination	• 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	• Successful registration of the vaccine • Sustainable supply of the vaccine to ensure vaccine availability. • Enabling regulations for distribution and utilization of the vaccine
Partners/stakeholders for scaling up and their roles	• KALRO will spearhead vaccine development and carry out training on vaccine use and research on sustainable vaccine delivery and socio-economic and policy implications of the vaccine • County government and private extension service providers will train farmers on use of the vaccine through farm visits. They will also offer advice and collect information on the uptake of the vaccine • KEVEVAPI will manufacture vaccine and provide backstopping on vaccine quality issues • Agro-dealers, vaccine distributors and stockists will distribute the vaccine to the farmers • Directorate of Veterinary Services (DVS) will provide backstopping on chicken health issues
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMP will be up scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Inadequate vaccine distribution channels/ networks in rural areas • Lack of awareness about the vaccine • Inadequate knowledge and information on the use of the vaccine • Inadequate extension services
Suggestions for addressing the challenges	• Sensitization of farmers and service providers about the vaccine

2.5.5. TIMP name	Monovalent Gumboro vaccine
	• Document and publish information on the use of the vaccine • Train farmers and service providers on the use of the vaccine • Aggregate farmers into groups for ease of access to the vaccine • Collaboration with county government in supply of the vaccine
Lessons learned in upscaling	• None yet
Social, environmental, policy and market conditions necessary	• Social acceptability of the vaccine in control of IBD • Favorable regulatory framework for vaccine manufacture and use in Kenya • Appropriate vaccine dose packaging to suit the needs of the small-scale chicken keepers with small flock sizes • Affordable pricing policy to allow access by small-scale chicken keepers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 3.50/= per bird (100 doses of the vaccine costs 350/-) • KES 7/-per bird is required for two vaccinations per year for sufficient protection.
Estimated returns	800/- per bird (Once vaccinated a bird is fully protected and can attain market weight and be sold at 800/-, this will translate to 800/- after subtracting the cost of production).
Gender issues and concerns in development, dissemination adoption and scaling up	• Women and youth have limited knowledge of chicken diseases due to lack of access to agricultural information and extension services • Women, who usually own small flocks do not have the financial capacity to purchase the minimum vaccine packaging of 100 doses • Women have limited access to education and training
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit • Employment opportunities for youth exist in vaccinating chicken
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs have less access to agricultural information and knowledge • VMGs may also have limited access to finances to buy the vaccine • VMGs have limited access to education, training and extension services • There is low level of vaccination coverage in remote areas where the indigenous people live mainly due to lack of awareness • 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 opportunities exist for VMGs to acquire the required credit

2.5.5. TIMP name	Monovalent Gumboro vaccine
	• Employment opportunities for VMGs exist in vaccination exercises
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Ogali, I., Mungube, E.O. and Lutta H.O. 2022. Development and testing of a bivalent vaccine against Newcastle disease and Infectious bursal disease in Indigenous chicken End of KCSAP Project report. 31st December 2022.
F: Status of TIMPS readiness (1. Ready for upscaling; 2: validation; 3. Requires further Research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO VSRI-Muguga North P.O Box 32-00902, Kikuyu Email: director.vsri@kalro.org Tel: 020-2524616
Lead organization and scientists	KALRO-VSRI, Muguga: Dr. Irene Ogali, KALRO Headquarters Dr. Erick Mungube; BiORI Muguga: Harrison Lutta
Partner organizations	Directorate of Veterinary Services, KEVEVAPI, County Governments

Gaps:

1. Undertake studies to determine dose levels and when boosting needs to be done
2. Conduct validation studies on the Gumboro vaccine
3. Conduct socio-economic studies on profitability and willingness to pay

2.5.6 *Aloe secundiflora* Herbal Extract (ASHE)

2.5.6 TIMP name	*Aloe secundiflora* Herbal Extract (ASHE)
Category (i.e. technology, innovation or management practice	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Low chicken productivity, profitability and quality due to internal parasitism • Anthelmintic residues in chicken and chicken products
What is it? (TIMP description)	*Aloe secundiflora* is a crude herbal extract (ASHE) used to inhibit hatching of helminth eggs and coccidian oocytes. The extract is prepared from freshly harvested leaves of *Aloe secundiflora*, chopped to extract gel. The gel is freeze dried (lyophilization) at -80°C for 24 hours in a freeze drier before it is transferred to the vacuum chamber for a duration of 18 hours to produce powder. The vacuum dried powder is weighed and packed in 30-gram plastic containers then labelled.

2.5.6 TIMP name	***Aloe secundiflora* Herbal Extract (ASHE)**
	
Justification	Herbal plants offer safe and cost-effective alternative medicine for parasite control to enhance productivity in chicken under free-range system. Use of *Aloe secundiflora* reduces the need for chemical anthelmintics which may cause contamination of eggs and meat. There is need to strengthen capacity of farmers and other stakeholders to improve and sustain chicken productivity through use of safe ASHE
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMPs	Chicken farmers, Animal health service providers, Extension agents, farmer groups, researchers and agripreneurs.
Approaches to be used in dissemination	• 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	• Sustainable supply of Aloe secundiflora • Registration (VMD) and patenting (KIPI) of the product • Policy guidelines on use of herbal extracts in helminth control • Awareness creation on use of herbal extracts for helminth control • Good working relationship and incorporation of DVS and County Governments in development and promotion of the Aloe extracts
Partners/stakeholders for scaling up and their roles	• Extension service providers (public and private) – to train farmers on use of ASHE and monitor implementation • Egerton University– technology development and fine tuning, ToT, backstopping and monitor implementation

2.5.6 TIMP name	*Aloe secundiflora* Herbal Extract (ASHE)
	• KALRO – technology development and fine tuning • County Government- Extension and sustainability of ASHE • Agrovets -Marketing and distribution of ASHE
C: Current situation and future scaling up	
Counties where already promoted if any	Machakos and Busia
Counties where TIMP will be upscaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Inadequate information on the use of Aloe extracts • Inadequate supply of the Aloe *secundiflora* • Low awareness on the use of Aloe extracts in helminth control
Suggestions for addressing the challenges	• Training on ASHE production and use • Contract farming for production of Aloe secundiflora • Sensitization on the use of Aloe *secundiflora* as an anthelminthic • Training farmers on the correct administration of Aloe *secundiflora* • Documentation of ASHE and knowledge sharing • Conservation and establishment of botanical gardens for Aloe *secundiflora*
Lessons learned in upscaling if any	• Need to use freshly harvested leaves for optimal gel production • Need to have proper taxonomic identification of the right species of Aloe • Need to ensure chopping, freeze- and vacuum-drying is done following standard operating procedures (SoPs) • Need to have a standby generator for the production of the ASHE powder
Social, environmental, policy and market conditions necessary for development and upscaling	• Acceptance of ASHE for helminth control • Need for policy guidelines on anthelmintic use (in view of Animal disease Act (CAP 364) as enforced by DVS) • Need for cost-benefit analysis to establish profitability associated with using ASHE • Need to formulate policy to enforce environmental conservation of endangered Aloe species. • ASHE is a safe medicinal plant extract
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs of the TIMP	KES 150 (30 grams) to deworm 50 birds
Estimated returns when using the TIMP	KES 1,500 per hen per production cycle
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women may have less access to agricultural information, technology and knowledge • Women may have less access to finances

2.5.6 TIMP name	*Aloe secundiflora* Herbal Extract (ASHE)
	• Women have limited access to education and extension services • Women may have limited access to productive resources such as land and other inputs • Due to time constraints women may not have time to attend training activities far away from their homes
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required credit • Employment opportunities exist for youths and women in growing Aloe *secundiflora* for sale
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge • 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 fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for VMGs in growing Aloe *secundiflora* for sale
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Refer KSCAP Report: Ogali, N.I, Muleke C.I., Mungube E.O., and Githinji J. Validation of climate smart disease control technologies for enhanced productivity of Indigenous chicken. KCSAP Technical Report
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Requires further research
G: Contacts	
Contacts	Egerton University, P.O. Box 536-20115 Egerton, Kenya
Lead organization and scientists	Egerton University-Prof. Charles Muleke Inyagwa (0722912661, charles.muleke@egerton.ac.ke); Prof. Bockline Bebe (072185399) bbebe@egerton.ac.ke
Partner organizations	KALRO VSRI, Muguga, DVS, Pharmaceuticals

Gaps:

1. There is need to conduct Phyto-chemical analysis and stability testing
2. Socio-economic studies to establish cost of the technology and profitability
3. The technology requires further on-farm validation and scaling-up

2.5.7 Mobile-phone chicken disease reporting tool

2.5.7. TIMP name	Mobile-phone chicken disease reporting tool
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low productivity due to losses arising from failure to report chicken disease in a timely manner leading to outbreaks and huge mortalities.
What is it? (TIMP description)	This is a hybrid mobile-based ICT system comprising of KukuAfya rekod mobile application and KukuAfya rekod SMS/USSD code platforms. The short messaging service is used for real-time reporting of diseases and disease symptoms in sick chicken as well as chicken deaths to the nearest veterinary authorities. The tool is loaded on to the phones of veterinary authorities in a given area such that any farmer who reports diseases or deaths in their flock relays the message to the veterinary authorities in real time. The farmer, and even flock size, is then traced, using the phone number the farmer used for reporting the incidence, to the location. After receiving the report, the veterinary authorities can directly communicate with the concerned farmer through a phone call and provide an advisory or in extreme circumstances visit the farm for a detailed assessment before prescribing intervention(s). 
Justification	Chicken diseases reduce chicken productivity thus negatively affecting food, nutrition and income security of households. The changing climate is likely to increase incidences of diseases in chicken, which will further affect livelihoods. Timely detection, reporting and response is critical as this will help farmers to quickly cope with disease challenges in their chicken flocks. The chicken diseases reporting APP/USSD system enables farmers to make real time disease and mortality reports in a cost-effective

2.5.7. TIMP name	Mobile-phone chicken disease reporting tool
	and convenient manner to the nearest veterinary authorities from the comfort of their homes. The APP is a form of e-extension and its adoption will enhance chicken disease surveillance.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmer producer groups, chicken keepers, chicken traders, chicken breeders, input suppliers, livestock extension workers and agripreneurs.
Approaches to be used in dissemination	• 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	• Ownership of any type mobile phone • Availability of network (3G works) coverage • Airtime for data bundles • Subscription with mobile provider for the USSD service
Partners/stakeholders for scaling up their roles and stage of involvement	• Roles of partners • County government livestock staff will train farmers on the different disease symptoms needed for reporting. • Sub-county veterinary/livestock Officers, the recipients of the disease and mortality reports for timely response. • KALRO Veterinary Scientists are the inventors of the chicken disease and mortality reporting system to conduct cross-checking with farmers to ensure any reported incidence gets attended, hosting information on diseases and mortalities reported and analyzing seasonal and spatially trends on chicken disease outbreaks. • Farmer groups and individual chicken keepers to ensure that information on their chicken flocks, disease incidence and mortalities are reported as and when they occur in a timely manner. • Mobile phone service providers (Safaricom, Airtel) –to provide mobile services for reporting • Chicken traders to ensure that they report disease outbreaks and mortalities in the live bird markets and if possible, assist to trace origin of the diseases. • Licensed input suppliers to provide information on volumes of antibiotics and vaccines sales and the identity of the clients (names, contacts, their location, syndromes in their chicken flocks and when the product were purchased).
C: Current situation and future scaling up	
Counties already promoted if	Busia and Machakos

2.5.7. TIMP name	Mobile-phone chicken disease reporting tool
any	
Counties where TIMP will be up-scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Inadequate/unavailability of mobile phone network connectivity • Not all chicken keepers have mobile phones • Inadequate knowledge on use of android phones on which the mobile APP runs • Expensive subscriptions to mobile network service providers • Possibility for abuse especially in case the system was to get hacked
Suggestions for addressing the challenges	• Lobby Communication Authority to have widespread mobile phone network connectivity (apply Universal Access Fund to supply farmers with an initial 10,000 phones) • Lobby authorities to provide low-cost phones for the population • Encourage chicken keepers to seek the help of youths in their households who are technology savvy to enable them familiarize with operations of the ICT disease reporting system • Encourage farmers to register and use a common phone (for those sharing the same household) which is enabled with disease reporting system to cut costs • Encourage farmers to frequently log in to update the data on flock size dynamics
Lessons learned for upscaling if any	• The ICT-based mobile system encourages reporting of disease outbreaks in chicken flocks thus reducing underreporting. • The ICT-based mobile system of reporting encourages real time reporting of diseases thus improving disease surveillance. • The ICT-based mobile system enables chicken keepers to interact directly with the veterinary experts thus reducing chances of quacks who misdiagnose diseases. • When farmers have a reliable disease reporting method, the misuse of antimicrobials is reduced. • There is need for back-up database in counties for safe data storage and for ease of traceability.
Social, environmental, policy and market conditions necessary	• The APP, being an ICT product, is bound to be acceptable by men, women and youths as a reliable tool for reporting • The use of the ICT mobile-based system for disease and mortality reporting has the potential of reducing use

2.5.7. TIMP name	Mobile-phone chicken disease reporting tool
	unnecessary travel and thus lower use of fossil fuels and mitigation of GHGs, which is healthy for the environment. • There may be need for policy and regulatory framework to guide and streamline use of mobile-based ICT tools in disease reporting. • Need to integrate the disease reporting APP in the existing Kenya animal bio-surveillance system (KABs) used by DVS for disease reporting • Markets of chicken and their products are likely to absorb the extra products occasioned by improved flock sizes and productivity.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs of the TIMPs	KES 20 is the minimum cost for purchasing airtime for the mobile based ICT tool
Estimated returns when using the TIMP	Savings on loss of production and death following prompt reporting and treatment
Gender issues and concerns in development, dissemination adoption and scaling up	• The youth because of familiarity with android phone features are likely to apply the APP compared with the older farmers • Women may have less access to finances to buy a smart phone and the required data • Women have limited access to education, training and extension services • Due to the high illiteracy levels among women, they might not be able to discern the messages on the APP • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required credit • Employment opportunities exist among the youth in disseminating technology, knowledge and information through the app • The use of the mobile-based ICT tool offers opportunities in enhancing food, nutrition and income security by enhancing chicken productivity
VMG issues and concerns in development, dissemination, adoption and scaling up	• The use of the innovation may pose challenges to persons with visual impairment • VMGs have less access to agricultural information, technology and knowledge • VMGs may also have limited access to finances to buy a smart phone and the required data • 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

2.5.7. TIMP name	Mobile-phone chicken disease reporting tool
VMG related opportunities	• Affirmative action and hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist among the VMGs disseminating technology, knowledge and information through the app
E: Case studies/profiles of success stories	
Success stories	Validated on farmers in Busia and Machakos who were quite receptive but because of cost considerations had a short time to work with the mobile-based ICT tool
F: Status of TIMP Readiness (1. Ready for up scaling; 2. Requires validation; 3. Requires further research)	Requires validation
Application guidelines for users	Ogali, I., Mungube, E.O., Githinji J and Muleke, C.I. 2022. Validating climate smart disease control technologies for enhanced adaptation and productivity of indigenous chicken. End of KCSAP Project report. 31st December 2022.
G: Contacts	
Contacts	Institute Director, KALRO VSRI Muguga P.O Box 32-00902-Kikuyu email: Director.vsri@kalro.org Tel: 020 – 2524616
Lead organization and scientists	KALRO Headquarters: Dr Erick Mungube and Mr Albert Agoya and KALRO VSRI Muguga, Dr Irene Ogali
Partner organizations	MoALF&C through DVS Kabete, Busia and Machakos County Veterinary Services, Private farm input Stockists /Agro-vets and Chicken traders

Gaps:

1. The mobile-phone disease reporting tool still requires validation before full roll out
2. Socio-economic studies including acceptability, willingness to pay and profitability are required

2.5.8 Biosecurity Practices

2.5.8 TIMP name	Biosecurity Practices
Category (i.e. technology, innovation or management practice)	Management practices
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low chicken productivity, profitability and quality due infectious disease outbreaks resulting from poor biosecurity practices.
What is it? (TIMP description)	Biosecurity practices are a set of measures, including foot baths, isolation of sick birds, and disinfection of chicken houses, aimed at preventing disease-causing agents from entering or leaving the farm. These practices extend along the indigenous chicken value chain, including slaughter facilities, and those hatching own eggs, to improve productivity of

2.5.8 TIMP name	Biosecurity Practices
	indigenous chicken and reduce the risk of infectious diseases.  ***Foot and vehicle bath at the entry of a chicken unit***
Justification	Disease outbreaks lead to high chicken mortality hence disease outbreaks leading to loss of revenue by farmers. Implementation of appropriate biosecurity measures reduce the risk of zoonotic diseases and increase productivity of indigenous chicken.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Small, medium and large-scale indigenous chicken farmers, • Researchers • Extension service providers • Input service providers/agrodealers • Output market players – Buyers • Agripreneurs
Approaches to be used in dissemination	• 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	• Willingness of the farmers to adopt the practice
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology and training • Research institutions - part of the technical training team • County Governments –to mobilize farmers and provide follow up extension services • Input service providers – to avail the inputs • Chicken buyers – to absorb increased productivity of chicken meat and eggs
C: Current situation and future scaling up	
Counties where already promoted if any	All the 47 Counties in Kenya
Counties where TIMP will be	All Indigenous Chicken-rearing counties including the

2.5.8 TIMP name	Biosecurity Practices
up scaled	following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Availability of extension agents to train farmers and enforce biosecurity measures • Availability of labour required for use in implementation of bio security measures • Some training channels are difficult to use due to low literacy levels. • Limited information sharing via digital network
Recommendations for addressing the challenges	• More hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Lessons learned in up scaling if any	• Capacity building of the stakeholders in the IC value chain is important in the success of biosecurity implementation.
Social, environmental, policy and market conditions necessary for development and up scaling	• Willingness of the farmers to adopt the biosecurity practices • Appropriate environmental waste disposal arising from the IC enterprises • Policy environment to enable the up-scaling of the TIMP • The market to absorb the extra increase in chicken productivity.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 1500 per foot bath • KES 300 per month for disinfectant • KES 1,000 per protective clothing
Estimated returns	• Savings on disease treatment cost • Savings on loss of production due to disease • Value of the birds saved from mortality
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women may have less access to agricultural information, technology and knowledge on improved biosecurity practices • Women and youth may have limited access to education, training and extension services on improved biosecurity practices • Women and youth may have less access to production resources such as land, capital, labour and credit • 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 fund opportunities exist for women and youths to acquire the required finances • Proper application of biosecurity practices will lead to

2.5.8 TIMP name	Biosecurity Practices
	improved health of the various gender categories due to consumption of clean health products
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to education, training and extension services on biosecurity • VMGs may have less access to agricultural information, technology and knowledge on biosecurity. • High illiteracy level of the VMGs may make them unable to read the dissemination documents and other materials.
VMG related opportunities	• Employment opportunities for youths exist in performing biosecurity tasks. • Proper application of the biosecurity practices will lead to improved health of the various gender categories due to consumption of clean health products.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Alaru P A.O., Wangui G., Ouko V.O. & Miano D. Indigenous Chicken Biosecurity Indigenous-Chicken-Biosecurity.pdf (kalro.org)
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO/KU/EGERTON; Prof. Charles Muleke, Irene Ogali, Eric Mungube and Wilfred Mutisya
Partner organizations	County governments, Kenyatta University, Egerton University

Gaps:

1. Need to evaluate different production systems including scavenging and non-scavenging birds to determine the effect of biosecurity practices on presence of disease agents on the farm

2.6 Manure management

2.6.1 Integrated Chicken Manure Management for Crop and Dairy Production (Revision)

2.6.1 TIMP name	Integrated Chicken Manure Management for Crop and Dairy Production
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	

2.6.1 TIMP name	Integrated Chicken Manure Management for Crop and Dairy Production
Problem addressed:	Low productivity resulting from environmental degradation caused by increased GHG emissions, water pollution, and land degradation characterized by declining soil fertility, low yields, increased soil moisture stress, increased soil erosion, and poor soil health.
What is it? (TIMP description)	Chicken do not utilize all the nutrients in their feed and chicken manure is a rich source of the 13 essential nutrients for plant growth. These include Nitrogen, Phosphorus, and Potassium among others. Integrated manure management (IMM) is the optimal, site- specific handling of chicken manure from collection, through treatment and storage up to application to crops (and aquaculture). Chicken manure as a source of non-protein nitrogen (NPN) in dairy cattle.
Justification	Decline in soil fertility in smallholder system inhibits agricultural development on farms. It is estimated that soils lose 22 kg/ha nitrogen, 2.5 kg/ha phosphorus, and 15 kg/ha potassium annually. Manure plays an essential role in the nutrient cycle where crops grow on land to feed livestock, which in return feeds the land through their manure. Recycling the (macro and micro) nutrients in manure reduces the need for additional fertilizer purchase. Chicken manure enhances soil fertility and soil health that leads to increased agricultural productivity, improved soil structure and biodiversity. Given the acute poverty and limited access to mineral fertilizers, manure has the potential to provide the limiting nutrients, and improving the soil health. Nitrogen is a major component in dairy production and ingredients are expensive and can be replaced with chicken manure but the manure has to be managed.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Crop, dairy farmers, farmer groups, public and private extension service and agripreneurs.
Approaches to be used in dissemination	• 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	• Training on chicken feeding, management and use of chicken manure as a fertilizer and as a feed • Model demonstration plots using cereal crops • Changing the mindset on feeding of chicken waste to cattle

2.6.1 TIMP name	Integrated Chicken Manure Management for Crop and Dairy Production
Partners/stakeholders for scaling up and their roles	KALRO – source of technology County governments – to mobilize farmers and provide follow up extension services
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be upscaled	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi.
Challenges in dissemination	• Some knowledge and information sharing channels are difficult to use due to low literacy levels. • Women's many roles limit the amount of time available for training. • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information (in Farmer field Schools, Pastoral field schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Lessons learned in upscaling	• Demand for manure is increasing due to increased awareness of the immense benefits of the manure.
Social, environmental, policy and market conditions necessary	• Applying chicken manure to soils is widely accepted as it saves on purchase of synthetic fertilizer, increases crop yield and saves water. • Though manure may harbour pathogens which can cause disease, its curing through controlled decomposition makes it usable and environmentally friendly. • Increased farmer awareness on the benefits of good quality manure has pushed up demand of the manure thus providing a ready market for it. • Policy direction and regulation may assist in increasing uptake of the management practice on a wider scale in the country
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	2 tons of chicken waste per acre cost KES 6,000
Estimated returns	KES 6,000 per acre. Application of 2 bags of NPK per acre produces the same amount of maize as 2 tons of chicken manure but at a lower price.
Gender issues and concerns in development, dissemination adoption and	• It is labour intensive in terms of handling and application hence a disadvantage to women • Change of mindset on the use on use of manure for dairy

2.6.1 TIMP name	Integrated Chicken Manure Management for Crop and Dairy Production
scaling up	cattle • Women may have less access to training on this technology • Women may have inadequate access to productive resources such as credit, inputs, land and capital • Women may have limited access to education, training and extension services
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances • Employment opportunities exist for youth males in acquiring equipment to collect and sell them to local farmers • Manure is locally available for farm households with chicken
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may also 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 a lack of awareness • It is labour-intensive in terms of handling and application, hence a disadvantage for VMGs • Lack of manure since they are resource poor and might only have small flocks
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youth males in integrated manure management practices for local farmers • Manure is locally available for farm households with chicken
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	Poultry Production Manual
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org;

2.6.1 TIMP name	Integrated Chicken Manure Management for Crop and Dairy Production
	kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO; Alaru, P.A.O., Ngaira V.M., Illatsia, E.D., Adongo, A.O., Wachira, A.M., Munyasi, J.W., Okitoi, L., Tobias K'Oloo, Ochieng, V.O., Ouko, R.O., Sanda, I., Mwangi, D.M., Wachira, A. M.
Partner organizations	County governments, Kenyatta University, Egerton University

Gaps:

1. Need to determine the pathogens and nutrients contained in chicken manure produced from different production systems.

2.7 Postharvest and Value Addition of Kenya Indigenous Chicken

2.7.1 Hygienic Handling of Table Eggs

2.7.1. TIMP name	Hygienic Handling of Table Eggs
Category (i.e. technology, innovation or management practice)	**Management practice**
A: Description of the technology, innovation or management practice	
Problem addressed	Low returns due to poor handling and storage of eggs at the household level, which exposes fresh eggs to mechanical damage. This too leads to microbial degradation and poor-quality products.
What is it? (TIMP description)	Hygienic handling of table eggs is a set of recommended practices designed to maintain cleanliness and prevent contamination from collection through to storage and preservation, ensuring that eggs remain in excellent condition throughout the entire handling period.
Justification	In Kenya, consumers generally prefer indigenous chicken eggs and pay premium prices compared to the other eggs due to the perception that they taste better, are more nutritious and possess superior health benefits. Proper handling and storage of table eggs are therefore key to realizing the expected high quality of eggs and ensuring consumer safety against foodborne diseases such as salmonellosis.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, protein producers and hospitality industry, chicken, meat processors and agripreneurs.
Approaches to be used in dissemination	• 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

2.7.1. TIMP name	Hygienic Handling of Table Eggs
Critical/essential factors for successful promotion	• Favourable market for Indigenous chicken and their products is sustained • Design and implement an elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology and training • Egerton University (Food Science Department)-Training on Good Manufacturing practices and HACCP • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers • Players in the hospitality industry to mobile hoteliers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi.
Challenges in dissemination	• Sanitary and phytosanitary conditions in rural set areas • Waste management of offal during evisceration. • Lack of seed money for SMEs startups for processing the product • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Capacity building on hygienic handling for women groups would accelerate social acceptance within the communities • Sound waste management in abattoirs, strict adherence to KEB standards would ensure the activities are environmentally friendly. • Policy supporting the establishment of processing facilities • Markets to absorb additional chicken and chicken products resulting from increased productivity.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	-
Estimated returns	-
Gender issues and concerns in dissemination, adoption and scaling up	• 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, labour and credit • Women may have less access to training and extension services, which can lead to a knowledge gap in improved

2.7.1. TIMP name	Hygienic Handling of Table Eggs
	nutrition through the technology
Gender related opportunities	• Employment opportunities exist for youths 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	• 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	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the management practice
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	Bell D.D & Weaver W.D (2002). Commercial chicken meat and egg production (5th edition).
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

Gaps:

1. Further research required on sanitary and phytosanitary conditions along the supply chain of chicken meat products and processing.

2.7.2 Chicken egg value added products

2.7.2.1 Pasteurized eggs

2.7.2.1 TIMP name	Pasteurized Eggs
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Low price for mixed chicken products in niche urban markets.

2.7.2.1 TIMP name	Pasteurized Eggs
What is it? (TIMP description)	Pasteurized eggs are fresh table eggs that undergo heat treatment to extend their shelf life. In this process, the shell eggs are dipped in 2 warm water baths with temperatures of 54.4 and 60 °C for about 5 hours and in a 7.2°C cold water bath for about an hour. The pasteurization process is completed when the eggs emerge from the third (cold water) bath. The pasteurized egg can be dried for longer shelf life. The eggs are then packaged and delivered to the market.
Justification	Pasteurization reduces high postharvest losses of fresh table eggs due to the short shelf life of raw eggs. The process kills microbes that cause diseases and food spoilage, such as avian salmonella, thereby improving the safety and quality of eggs sold in market outlets for a longer period
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, protein producers and hospitality industry, chicken, meat processors and agripreneurs.
Approaches to be used in dissemination	• 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	• Favourable market for premium Indigenous chicken products is sustained • Design and implement an elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology, provide start-up BSF kits and training • Egerton University part of core training team • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Sanitary and phytosanitary conditions along supply chain • Waste management of by-products.

2.7.2.1 TIMP name	Pasteurized Eggs
	• Market for premium IC products to upper markets such as supermarkets • Lack of seed money for SMEs startups for processing the product
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• It is necessary to introduce new chicken products that give farmers avenues of earning more from their enterprise if they are socially acceptable. • Policy interventions in food processing and handling stand a chance to broaden market for IC products • Availability of reliable markets for indigenous chicken products and stable prices • Need for removal of waste from the environment by using it to produce high quality protein hence reduce GHG production and point pollution.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	
Estimated returns	
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital, labour and credit • 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	• Employment opportunities exist for youths in implementing the technology • 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	• 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	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the technology
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	Bell D.D & Weaver W.D (2002). Commercial chicken meat and egg production (5th edition).

2.7.2.1 TIMP name	Pasteurized Eggs
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

2.7.2.2 Pickled eggs

2.7.2.2 TIMP name	Pickled Eggs
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Low incomes due to low prices for mixed chicken meat in niche urban markets.
What is it? (TIMP description)	Pickled eggs are hardboiled eggs that have been shelled and preserved in an air-tight glass container filled with vinegar or brine. They have a shelf life of 3-4 months when refrigerated, but must be consumed within seven days once the container is opened.  Pickled Eggs
Justification	Pickled eggs are a good source of protein and can be a healthy snack option. The vinegar solution used in pickling helps increase stomach acid production, which aids digestion and prevents constipation. Alternatively, the acidity can be reduced by rinsing pickled eggs in portable water before reheating for consumption. Increasing the shelf life of eggs will provide eggs to the market over extended period leading to increased income

2.7.2.2 TIMP name	Pickled Eggs
	and mitigating the effects of food and nutrition insecurity at household level.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, mat processors, hospitality industry and agripreneurs.
Approaches to be used in dissemination	• 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	• Favourable market for premium Indigenous chicken egg products is sustained • Design and implement an elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology and training • Egerton University part of core training team • County governments to mobilize farmers, stakeholders and provide follow up extension services • Chicken farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Sanitary and phytosanitary conditions along supply chain • Waste management for of offal's and other by-products. • Market for deboned meat is still confined to upper markets such as supermarkets • Lack of seed money for SMEs startups for processing the product
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions	• Reliable markets for indigenous chicken products and stable prices

2.7.2.2 TIMP name	Pickled Eggs
necessary	• Remove waste from the environment by using it to produce high quality protein hence reduce GHG production and point pollution.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	
Estimated returns	
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital, labour and credit • 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	• Employment opportunities exist for youths in implementing the technology • 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	• 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	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the technology
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	Bell D.D & Weaver W.D (2002). Commercial chicken meat and egg production (5th edition).
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organizationand scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

2.7.2.3 Egg powder

2.7.2.5 TIMP name	Egg powder
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Low incomes due to the perishability and limited number of whole eggs that can be transported to potential markets, arising from their delicate, bulky, and fragile nature.
What is it? (TIMP description)	Egg powder is a dehydrated product produced by spray drying whole eggs, egg yolks, or egg whites. The eggs are preheated to 60°C, then sprayed into a drying chamber through which air between 121 and 149°C is passing. 1 kg of whole egg powder is equal to 80 average-sized fresh eggs. Dried eggs can last for 24 months in a cool dry place and up to 10 years under refrigeration.
Justification	Egg powder is less bulky, more durable, and has a longer shelf life, making it easier to transport and store. This not only reduces postharvest losses but also expands market opportunities, ultimately increasing the farmer's income. Further, whole egg powder is a ready and easy to use ingredient which results in less time and resources. Drying eggs reduces moisture content by weight 67% to 2% thus cost-effective form of eggs for transportation, storage and recipe formulation. Advantage of egg powders is their risk-free nature; it lowers the number of *Salmonella* by 10 000-fold during drying which ensures a safe end product. Longer shelf life in comparison to liquid eggs or shell eggs makes egg powder the best choice for the food factories. Besides, egg powder preserves all nutritional and functional properties of shell eggs.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, protein producers and hospitality industry, chicken and meat processors, agripreneurs.
Approaches to be used in dissemination	• 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

Egg-white-powder (Albumen)	*Egg yolk powder*	*Whole Egg Powder*

2.7.2.5 TIMP name	Egg powder
	• 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	• Favorable market for Indigenous chicken and their products is sustained • Design and implement an elaborate training curriculum
Partners/stakeholder for scaling up and their roles	• KALRO – source of technology and training • Egerton University (Food Science Department)-Training on Good Manufacturing practices and HACCP • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers • Players of the hospitality industry to mobile hoteliers
C: Current situation and future scaling up	
Counties where already promoted	None
Counties where TIMPS will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi.
Challenges in dissemination	• Sanitary conditions in rural set areas • Waste management of egg shells. • Lack of seed money for SMEs startups for processing the product • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Capacity building on hygienic handling for women groups would accelerate social acceptance within the communities • Sound waste management in abattoirs, strict adherence to KEB standards would ensure the activities are environmentally friendly. • Policy supporting establishment of processing facilities. • Markets to absorb additional chicken and chicken products resulting from increased productivity
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	

2.7.2.5 TIMP name	Egg powder
Estimated returns	To be determined
Gender issues and concerns in dissemination, adoption and scaling up	• 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, labour and credit • 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	• Employment opportunities exist for youths 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	• 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	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the management practice
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	Bell D.D & Weaver W.D (2002). Commercial chicken meat and egg production (5th edition).
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Peter Alaru, Ann M. Wachira, David M. Mwangi Evans Ilatsia, Peter Alaru, Ngaira Victor, Tobias K'Oloo, Sophie Miyumo, Ochieng Ouko, Amos Adongo, Wayua F.O.
Partner organizations	Egerton University

Gaps:

1. Further research required on sanitary and phytosanitary conditions along the supply chain of chicken egg products and processing of egg powder.
2. Cost Benefit Analysis of finished products

2.7.3 Processing of Fresh Chicken Meat

2.7.3 TIMP name	Processing of Fresh Chicken Meat
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Low incomes resulting from high carcass loss due to poor handling and storage, which exposes fresh meat to microbial degradation and poor-quality products.
What is it? (TIMP description)	Good manufacturing practices for chicken meat processing starts with the collection of healthy birds and continue through humane slaughter, de-feathering, evisceration and appropriate storage of dressed fresh carcasses. This ensures production of quality and safe chicken meat products. 
Justification	Consumers generally prefer indigenous chickens and pay premium prices compared to the other chickens due to the perception that they taste better, are more nutritious and have health benefits. Proper handling and storage improve the keeping quality of meat ensuring consumer safety against foodborne contaminants and offering quality value-added meat products
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken Farmers, protein producers and hospitality industry, chicken meat processors, and agripreneurs
Approaches to be used in dissemination	• 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

2.7.3 TIMP name	Processing of Fresh Chicken Meat
	• .
Critical/essential factors for successful promotion	• Favourable market for Indigenous chicken is sustained • Design and implement an elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology and training • Egerton University (Food Science Department)-Training on Good Manufacturing practices and HACCP • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers • Players of the hospitality industry to mobile hoteliers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi.
Challenges in dissemination	• Sanitary and phytosanitary conditions in rural set areas • Waste management of offal during evisceration. • Lack of seed money for SMEs startups for processing the product • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Capacity building on hygienic handling for women groups • Waste management in abattoirs, and strict adherence to KEB standards. • Processing facilities be established as commercial startups for hustlers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	-
Estimated returns	-
Gender issues and concerns in dissemination, adoption and scaling up	• 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, labour and credit • 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	• Employment opportunities exist for youths in implementing the management practice

2.7.3 TIMP name	Processing of Fresh Chicken Meat
	• 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	• 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	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the management practice
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	1. Hui, Y. H. (2010). *Handbook of Poultry Science and Technology, Primary processing* (Vol. 1). John Wiley & Sons. 2. Barbut, S. (2015). *The science of poultry and meat processing*.
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Ready for upscaling in the chicken value chain.
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	KALRO Non-Ruminant Research

Gaps:

1. Cost Benefit Analysis of the training.
2. Packaging the recipes into leaflets/brochures
3. Sanitary and phytosanitary conditions along the supply chain of chicken meat products and processing.

2.7.4 Chicken meat value-added products:

2.7.4.1 Dressed Chicken

2.7.4.1. TIMP name	Dressed chicken
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Low incomes due to high pre and postharvest losses along the chicken meat value chain
What is it? (TIMP description)	This refers to a chicken that has been prepared for sale or consumption. This entails slaughtering, bleeding, de-feathering, eviscerating, and cleaning to remove inedible parts such as feathers, viscera, and blood while retaining the edible meat for human consumption. The entrails, neck, and tail are removed from the chicken, and excess fat is trimmed and discarded. The chicken is then cleaned inside and out using cold portable water.
Justification	Dressing the chicken helps to clean out the feed from their crops and intestines, resulting in a carcass that keeps longer and is of better quality, leading to increased incomes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken Farmers, protein producers and hospitality industry players, butchers, chicken meat vendors in wet markets, and agripreneurs.
Approaches to be used in dissemination	• 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	• Favourable market for Indigenous chicken is sustained • Demonstration on practical use of the recipe, • Involvement of the private sector, • Willingness to pay for value added meat product by consumers • Design and implement an elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology, recipe and training • Egerton University– Be part of core training team • County governments- Farmers mobilsation and follow up extension services • Chicken farmer groups to mobilize farmers

2.7.4.1. TIMP name	Dressed chicken
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Some training channels are difficult to use due to low literacy levels. • Women's triple roles limit the amount of time available for training. • Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Reliable markets for indigenous chicken products and stable prices • Remove waste from the environment by using it to produce high-quality protein, thereby reducing GHG production and point pollution • Policy on utilization, quality and safety concerns implemented
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	
Estimated returns	
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital, labour and credit • 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	• Employment opportunities exist for youths in implementing the technology • 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	• 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

2.7.4.1. TIMP name	Dressed chicken
	• There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	• Affirmative action and Hustler fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the technology
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	1. Hui, Y. H. (2010). *Handbook of Poultry Science and Technology*, *Primary processing* (Vol. 1). John Wiley & Sons. 2. Barbut, S. (2015). *The science of poultry and meat processing*.
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Recipes and available and may require validation.
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

Gaps:

1. Need to evaluate different recipes depending on the locality
2. Consumer preferences and organoleptic tests

2.7.4.2 De-skinned chicken

2.7.4.2 TIMP name	De-skinned chicken
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Reduced incomes due to low demand for meat products with high saturated fatty acids. Chicken fat is mostly stored under the skin hence makes unskinned chicken meat less desirable by health-conscious consumers.
What is it? (TIMP description)	Dressed chicken cuts whose skin has been trimmed off to remove saturated fatty acid is considered nutritionally healthy. The lean meat can be used in making other meat products.

2.7.4.2 TIMP name	De-skinned chicken
Justification	Deskinned chicken meat contains low levels of saturated fatty acids and, therefore, less bad cholesterol. Due to the increasing demand for healthy products, low-cholesterol meat has the potential to increase the income of chicken producers and processors.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken Farmers, protein producers, Meat processors (Butchers, meat vendors in groceries) and agripreneurs.
Approaches to be used in dissemination	• 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	• Favourable market for Indigenous chicken is sustained • Design and implement an elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO – source of technology and training • Egerton–part of core training team • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	All Indigenous Chicken-rearing counties including the following 27 NAVCD counties: Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi
Challenges in dissemination	• Limited information sharing via digital network
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community and value chain actors based on assessed needs
Social, environmental, policy and market conditions necessary	• Reliable markets for indigenous chicken products and stable prices

2.7.4.2 TIMP name	De-skinned chicken
	• Remove waste (skin and fat) from the environment by using it to produce high quality protein hence reduce GHG production and point pollution • Regulatory policy on quality and safety standards for de-skinned chicken meat
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	
Estimated returns	
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information and knowledge on the technology • Women may have less access to production resources such as land, capital, labour and credit • 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	• Employment opportunities exist for youths in implementing the technology • 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	• 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 fund opportunities exist for VMGs to acquire the required credit • Employment opportunities exist for youths in implementing the technology
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	1. Hui, Y. H. (2010). Handbook of Poultry Science and Technology, Primary processing (Vol. 1). John Wiley & Sons. 2. Barbut, S. (2015). The science of poultry and meat processing.
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Ready for upscaling in the chicken value chain.
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya

2.7.4.2 TIMP name	De-skinned chicken
	Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

Gaps:

1. Validation on good manufacturing practices using appropriate value chain actors

2.7.4.3 Deboned chicken

2.7.4.3 TIMP name	Deboned chicken
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Low incomes result from the low prices of mixed chicken meat in niche urban markets.
What is it? (TIMP description)	This is chicken meat with all bones separated from the meat. The deboned meat is then cut into parts that are packaged and marketted to special niche markets. The deboned meat can also be packed without cutting into parts since some markets required deboned whole chicken. 
Justification	There is increased demand for specialized chicken meat products in urban markets. Deboned chicken meat, one of the specialized products, is a popular ingredient in many recipes, especially those that require boneless chicken meat. Deboned meat cuts can be used in a variety of dishes, such as soups, stews, salads, and sandwiches among other recipes. Additionally, deboned whole chicken can be stuffed with braised vegetables such as kales, collards then roasted or grilled.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken Farmers, Meat processors, hospitality industry and agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP)

2.7.4.3 TIMP name	Deboned chicken
	• 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	• Favourable and sustainable market for premium deboned chicken meat • An elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO as the source of technology and training • Egerton University as part of core training team • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Less than optimum sanitary conditions along supply chain • Poor waste management of offals and other by-products. • Market for deboned meat is still confined to upper markets such as supermarkets • Lack of seed money for SMEs startups for processing the product
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Reliable markets for chicken products and stable prices • Remove waste (bones) from the environment by using it to produce high quality animal feeds hence reduce GHG production and point pollution.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not yet determined
Estimated returns	Not yet determined
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital, labour and credit

2.7.4.3 TIMP name	Deboned chicken
	• 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 opportunity exist for youths in deboning chicken • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	• 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 fund opportunities exist for VMGs to acquire the required credit • Employment opportunity exist for VMGs in meat processing.
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines forusers	1. Hui, Y. H. (2010). *Handbook of Poultry Science and Technology, Primary processing* (Vol. 1). John Wiley & Sons. 2. Barbut, S. (2015). *The science of poultry and meat processing*.
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

Gaps:

1. Cost Benefit Analysis
2. Validation on good manufacturing practices using appropriate value chain actors

2.7.4.4 Cuts of dressed chicken meat

2.7.4.4 TIMP name	Cuts of dressed chicken meat
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Low price for mixed chicken meat in niche urban markets.
What is it? (TIMP description)	Meat cuts are specialized parts cut from whole dressed chicken carcass with focus on varius muscles. This is a technology that adds value to chicken meat for better marketing. It offers different consumers options to access preferred cuts based on affordability.  Chicken meat cuts (source: esopralembrar.blogspot.com)
Justification	Traditionally chicken was marketted as whole in form of dressed or live birds. This limits the market potential for the chicken thus resulting in post-harvest losses in terms of lost income. With the increase in commercialization, chicken meat is widely purchased as cuts or in processed forms in urban markets. This technology will guide value chain actors to maximize income from premium meat cuts from indigenous chicken production start ups.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken Farmers, Meat processors, hospitality industry and agripreneurs
Approaches to be used in dissemination	• 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	• Favourable and sustainable market for premium cuts from chicken meat

2.7.4.4 TIMP name	Cuts of dressed chicken meat
	• An elaborate training curriculum
Partners/stakeholders for scaling up and their roles	• KALRO as a source of technology and training • Egerton University as part of the core training team • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• Less than optimum sanitary conditions along supply chain • Poor waste management of offals and other by-products. • Market for chicken meat cuts is still confined to upper markets such as supermarkets • Lack of seed money for SMEs startups for processing the product
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools) • More practical sessions and the use of visual aids during training • Develop tailored information sharing and training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Reliable markets and stable prices for chicken products • Remove waste from the environment by using it to produce high quality protein hence reduce GHG production
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not yet determined
Estimated returns	Not yet determined
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital, labour and credit • 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 opportunity exists for the youth in implementing the technology • Affirmative action and hustler fund opportunities exist for women and youth to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have limited access to education, training and extension services

2.7.4.4 TIMP name	Cuts of dressed chicken meat
	• 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 fund opportunities exist for VMGs to acquire the required credit • Employment opportunity exist for VMGs in chicken meat processing.
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	To be developed
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

Research Gap

1. Validation on good manufacturing practices using appropriate value chain actors
2. Cost Benefit Analysis

2.7.4.5 Chicken nuggets

2.7.4.5. TIMP name	Chicken nuggets
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem addressed	Low income due to carcass loss caused by poor handling and storage, which exposes fresh meat to microbial degradation and loss of quality. Additionally, raw chicken meat has a short shelf life, resulting in low sales and consequently, low incomes.
What is it? (TIMP description)	Chicken nuggets are small-sized uniform shaped pieces of chicken meat in the form of small chunks or strips. They are cuts from the thigh or breast muscles of a chicken coated with a mixture of wheat flour and other seasonings such as salt,

2.7.4.5. TIMP name	Chicken nuggets
	pepper or garlic powder. This gives them the signature golden brown color after frying in hot oil and the final product is a bite-sized piece of chicken meat with a crispy exterior and a tender succulent interior. 
Justification	Chicken nuggets are versatile and are utilized in various ways. They are eaten as snacks, appetizers or main course diet and they pair well with a variety of dipping sauces. Their preparation is easy, convenient and can be customized to individual liking. Homemade nuggets provide for healthier dietary options for all ages since they are prepared from lean cuts. They can also be a source of income when sold as a snack.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken Farmers, protein producers and hospitality industry, chicken meat processors, fast-food restaurants and agripreneurs.
Approaches to be used in dissemination	• 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	• Favorable and sustainable market. • An elaborate training on how to make the nuggets
Partners/stakeholders for scaling up and their roles	• KALRO as a source of technology and training • Egerton University (Food Science Department) for Training on Good Manufacturing practices and HACCP • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers • Players of the hospitality industry to mobile hoteliers

2.7.4.5. TIMP name	Chicken nuggets
C: Current situation and future scaling up	
Counties where already promoted	None
Counties where TIMPS will be disseminated	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Less than optimum sanitary conditions along supply chain in most rural areas • Poor waste management of offals and other by-products. • Lack of seed money for SMEs startups for processing the chicken meat • Limited information sharing on the innovation.
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Capacity building on hygienic handling of meat and meat products • Strict adherence to KEB standards. • Establishment of processing facilities
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not yet determined
Estimated returns	Not yet determined
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on the management practice • Women have less access to production resources such as land, capital, labour and credit • Women have less access to training and extension services, which can lead to a knowledge gap in improved nutrition through this technology
Gender related opportunities	• Employment opportunity exist for women and youth in implementing the management practice • Affirmative action and hustler fund opportunities exist for women and youth to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	• 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 fund opportunities exist for VMGs to acquire the required credit

2.7.4.5. TIMP name	Chicken nuggets
	• Employment opportunity exist for VMGs in processing of chicken nuggets
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	To be developed
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Requires validation.
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	KALRO Non-Ruminant Research

Research Gap

1. Validation on good manufacturing practices using appropriate value chain actors
2. Cost Benefit Analysis
3. Further research required on sanitary and phytosanitary conditions along the supply chain of chicken meat products and processing.

General Research Gap

1. Document the status of feather and its derived products along the Chicken industry value chain in Kenya

2.7.4.6 Grilled Chicken

2.7.2.4 TIMP name	Grilled Chicken
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Minimal incomes result from limited choices in the market for chicken enthusiasts seeking safe, convenient, and delicious ready-to-eat or takeout chicken meat.
What is it?(TIMP description)	Grilled chicken refers to chicken meat cooked over an open flame or on a grill, utilizing charcoal, gas, or electric grills to ensure thorough cooking. During this process, a smoky flavor and appealing grill marks are added, enhancing the taste and texture of the meat, making it a popular choice for both commercial restaurants and home kitchens. Moreover, grilling contributes

2.7.2.4 TIMP name	Grilled Chicken
	to food safety by eradicating harmful bacteria through precise cooking temperatures, making it a favored method among chicken enthusiasts for its culinary and safety benefits.    *Grilled chicken meat*
Justification	Rising desire for convenient, tasty, and zoonotic-disease-free ready-to-eat chicken meat has spurred interest in grilling as a practical solution. Grilling plays a pivotal role in ensuring food safety by eradicating harmful bacteria through proper cooking temperatures, making it the preferred method for numerous chicken enthusiasts and also an avenue for increasing incomes for vendors.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken Farmers, hospitality industry, chicken meat processors, researchers, input suppliers and agripreneurs.
Approaches to be used in dissemination	• 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	• Favourable and sustained market for chicken meat • Availability of healthy live chicken of desired sizes
Partners/stakeholders for scaling up and their roles	• KALRO as a source of technology and training • Egerton University (Food Science Department) for training on Good Manufacturing practices and HACCP • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers • Players of the hospitality industry to mobilize hoteliers
C: Current situation and future scaling up	

2.7.2.4 TIMP name	Grilled Chicken
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Less than optimum sanitary conditions along supply chain in most rural areas • Poor waste management of offals and other by-products. Lack of seed money for SMEs startups for processing the chicken meat • Limited information sharing on grilling technology
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools) • More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Capacity building on hygienic handling of chicken meat • Waste management in abattoirs, strict adherence to KEBS standards. • Establishment of facilities for grilling
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not yet determined
Estimated returns	Not yet determined
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital, labour and credit • 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 opportunity exist for women and youths in implementing the technology • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	• 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 fund opportunities exist for VMGs to acquire the required credit

2.7.2.4 TIMP name	Grilled Chicken
	• Employment opportunity exist for VMGs in implementing the technology.
E: Case studies/profiles of success stories	
Success stories	Many hotels are leveraging on this technology, as there is a huge demand for grilled chicken.
Application guidelines for users	Bell D.D & Weaver W.D (2002). Commercial chicken meat and egg production (5th edition).
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires validation; 3. Requires further Research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

2.7.4.7 Chicken Marination

2.8.4.7 TIMP name	Chicken Marination
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Meager incomes arising from the low annual per capita consumption of chicken meat due to the limited number of chicken meat recipes.
What is it? (TIMP description)	Chicken marination is the exposure of meat to acidic, enzymatic or oil-based marinade, like vinegar, wine, citrus juice, and tomatoes 30-45 minutes before cooking. Chicken marination infuses flavour into the meat, resulting in a juicy and flavoured product. It also tenderizes and infuses extra moisture to chicken meat before cooking. Marination also helps to make leaner cuts less dry and makes tougher pieces of meat more succulent.    Marinated chicken meat

2.8.4.7 TIMP name	Chicken Marination
Justification	Chicken meat consumers in Kenya have a preference for products prepared differently due to the perception that they are attractive, taste better, nutritious and have health benefits. Chicken marination thus responds to the need to diversify into more chicken meat products to attract specific niches and market segments, thereby increasing the incomes of chicken vendors.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Chicken Farmers, hospitality industry and chicken meat processors and agripreneurs.
Approaches to be used in dissemination	• 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	• Favourable and sustainable market for chicken • Availability of healthy live chicken of desired sizes • Knowledge on the marination process
Partners/stakeholders for scaling up and their roles	• KALRO as a source of technology and training • Egerton University (Food Science Department) for training on Good Manufacturing practices and HACCP • County governments to mobilize farmers and provide follow up extension services • Chicken farmer groups to mobilize farmers • Players of the hospitality industry to mobile hoteliers
C: Current situation and future scaling up	
Counties where already promoted	Kakamega, Nairobi, Bungoma and Mombasa
Counties where TIMPS will be disseminated	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi.
Challenges in dissemination	• Less than optimum sanitary conditions along supply chain in most rural areas • Poor waste management of offals and other by-products. Lack of seed money for SMEs startups for processing the product • Limited information sharing on how to marinate chicken meat
Suggestions for addressing the challenges	• More hands-on knowledge/information sharing (in Farmer field Schools, Pastoral field schools)

2.8.4.7 TIMP name	Chicken Marination
	• More practical sessions and the use of visual aids during training • Develop tailored training models specific to each community based on assessed needs
Social, environmental, policy and market conditions necessary	• Capacity building on hygienic handling of chicken meat • Waste management in abattoirs, strict adherence to KEB standards. • Knowledge on margination of the chicken meat.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not yet determined
Estimated returns	Not yet determined
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to information and knowledge on the technology • Women have less access to production resources such as land, capital, labour and credit • 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 opportunity exist for women and youths in implementing the management practice • Affirmative action and hustler fund opportunities exist for women and youths to acquire the required finances
VMG issues and concerns in dissemination, adoption and scaling up	• 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 fund opportunities exist for VMGs to acquire the required credit • Employment opportunity exist for VMGs in implementing the technology
E: Case studies/profiles of success stories	
Success stories	Not yet documented
Application guidelines for users	A trainer's manual and brochure is to be developed before training is initiated.
F: Status of TIMPS readiness (1. Ready for upscaling; 2: Requires Validation; 3. Requires further Research)	Requires validation
G: Contacts	
Contacts	Institute Director, KALRO-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and	KALRO: Alaru P.A.O, Adongo A.O, Wachira A.M, Mutisya

2.8.4.7 TIMP name	Chicken Marination
scientists	W.M., Ilatsia E D., Ngaira V, K'Oloo T.O, Ouko V.O., Wayua F.O, Ouko R. & Okitoi L.O.
Partner organizations	Egerton University

2.8 Agribusiness

2.8.1 Records and Records Keeping

2.8.1 TIMP name	Records and Record Keeping
Category (i.e. technology, innovation or management practice)	Management practice
A: Description	
Problem to be addressed	Low productivity due to inadequate record keeping in indigenous chicken enterprise
What is description it? (TIMP)	This management practice entails collecting relevant information that aids the farmer to keep track of activities such as breeding, production, disease management as well financial records such as sales and expenditure. Records enables farmers to make informed decisions on their enterprises
Justification	Keeping good records can enable the farmers to make a comparison of feed consumption patterns over time and see how improvements can be made in the face of ongoing challenges on the farm. The farmer can also monitor the health history of his or her birds, their vaccination and medication programs as well as the bio-security program within the farm. These will enable the farmers to keep track of input supplies as well as improve efficiency in production in a chicken production enterprise.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, women, youth and VMGs, processors, traders, consumers; private multipliers; researchers and agripreneurs
Approaches to be used in dissemination	• 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	• Willingness of the farmers to pick up the TIMP • Favourable market for IC is sustained • Production of dissemination materials in different languages

2.8.1 TIMP name	Records and Record Keeping
	• Develop a Public Private Partnership model to improve chick availability • Availability of funding to produce dissemination materials
Partners/stakeholders for scaling up and their roles	• 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 - 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, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi and any other interested county
Challenges in dissemination	• Some information channels are difficult to use due to low literacy levels – language barrier. • Women's many roles limit the amount of time available for them to look for information. • Limited information sharing via digital network
Suggestions for addressing the challenges in upscaling if any	• Enhance knowledge sharing through hands-on training/ experiences (in Farmer field Schools, Pastoral field schools) • Publish dissemination materials in local languages • Engage women more through practical sessions and extensive use of visual aids during training regularly in areas near them • Develop tailored training models specific to each community based on assessed needs.
Lessons learned in upscaling if any	• The TIMP is yet to be upscaled
Social, environmental, policy and market conditions necessary for development and upscaling	• Reliable markets channels and stable prices • Consider the different gender needs of the farming households • Conducive policies for chicken production
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not yet determined
Estimated returns	Not yet determined
Gender issues and concerns in development, dissemination, adoption and scaling	• High illiteracy levels of women leading to lack of record keeping and poor record keeping. • Women have limited access to education, training and extension services • In some farming communities' women have limited decision-making power as men dominate decisions at the household and community levels

2.8.1 TIMP name	Records and Record Keeping
	• Women have less access to production resources such as land, capital, extension services and credit
Gender related opportunities	• Affirmative action and hustler fund opportunities exist for women and youths to access the required credit • Employment opportunities exist for youths in conducting business analytical services • Chicken commercialization may lead to women empowerment due to increased income and financial independence
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs have limited access to training and extension services • VMGs have limited access to markets since they may not travel to distant markets • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • VMG adoption is low due to a lack of awareness
VMG related opportunities	• Affirmative action and hustler fund opportunities exist for women and youth to access the required credit • Employment opportunities exist for learned VMGs especially the youth in carrying conducting business analytical services
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Proper housing, feeds and feeding, strict biosecurity procedures for disease prevention, adherence to vaccination guidelines and record keeping
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-Non-Ruminant Research Institute, P.O. Box 169-50100, Kakamega, Kenya Email; kalro.kakamega@kalro.org; kalropoultrykakamega@kalro.org;
Lead organization and scientists	KALRO NRI; Scolastica Wambua, Tobias K'Oloo, and Peter Alaru
Partner organizations and their roles	KALRO , Producer organizations, County Governments

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

2.8.2 Marketing of Chicken Products

2.8.2 TIMP name	Marketing of Chicken Products
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Low earnings from indigenous chicken enterprise due to insufficient knowledge and information on marketing of chicken products and inputs
What is it? (TIMP description)	This management practice is designed to equip farmers with essential information, skills, and knowledge to excel in the competitive chicken production enterprise. Farmers will gain a deep understanding of efficient markets, market channels and dynamics, and key linkages within the chicken 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 chicken production and sales, ultimately promoting a thriving and prosperous chicken business, transitioning from subsistence to commercial venture.
Justification	Chicken reareing is maily done by women due to the low capital and small size of land required. In order to successfully transition from subsistence to commercial chicken production, farmers must possess essential business skills, a critical prerequisite for effective enterprise management and maximizing earnings. Additionally, a pressing need exists for enhancing their skills in marketing chicken products, while understanding the complexity of product price determination. Often, chicken farmers grapple with low prices for their products, dissuading them from fully realizing the potential of chicken farming. Unorganized chicken markets further compound this issue, disrupting the seamless flow of products from the farmer. To address these challenges, it is crucial to bridge the business skills gap and equip farmers with the tools and knowledge to improve their chicken production enterprises. By doing so, we empower chicken farmers to not only thrive but to unlock the full potential of the chicken value chain, ultimately enhancing their financial resilience and promoting a more prosperous chicken industry.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Smallholder chicken farmers, agripreneurs and other players in the chicken value chain
Approaches used in dissemination	• • Farmer Field and Business School (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station

2.8.2 TIMP name	Marketing of Chicken Products
	• 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	• Enabling regulatory framework with friendly regulations, legislation, and policies that support and facilitate marketing of chicken and chicken products. • Inclusive value chain integration incorporating all stakeholders along the chicken value chain • Designing training programs tailored to the specific needs, knowledge levels, and constraints of the target farmers, ensuring the content is relevant and accessible. • Well trained facilitators who are knowledgeable in chicken marketing and possess effective training and communication skills. • Provide farmers with access to essential resources, including market information, market linkages, and financial support to 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 to encourage the formation of farmer producer organizations and cooperatives to collectively sell their products hence improving their bargaining power • Supportive Organizations to collaborate with agricultural and chicken production groups, NGOs, and extension services to strengthen the marketing capacities of farmers
Partners/stakeholders for scaling up and their roles	• Extension service providers (public and private): to train farmers and give timely information on markets • County governments: to link farmers with markets • KALRO: to develop and fine tune technology, ToT, backstopping and monitor implementation • Farmer groups: to adopt and utilize technologies, innovations, management practices and related information.
C: Current situation and future scaling up	
Counties where already promoted if any	N/A
Counties where TIMP will be upscaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi and any other interested county

2.8.2 TIMP name	Marketing of Chicken Products
Challenges in dissemination	• Varying education levels of the farmers • Poor and fluctuating market prices. • Limited access to markets, • Insufficient market information, • Lack of marketing skills and inability to make informed marketing decisions among farmers. • Farmers lack comprehensive knowledge of the ever-evolving chicken markets
Recommendations for addressing the challenges	• Enhanced Marketing Skills: Provide comprehensive training to equip farmers with the marketing skills • Formation of Farmers' Groups to enhance their bargaining power in the market. • Capacity Building of Chain Actors to enhance market efficiency and fairness. • Customized Training: Tailor training materials to suit farmers with varying levels of education.
Lessons learned	• Tailored marketing strategies are important as "one-size-fits-all" marketing strategies may not work for all farmers. • Real-time price indices enable farmers to make informed decisions about when and where to sell their chicken products, ultimately maximizing their returns. • Continuous market research is crucial to understand the evolving preferences of consumers and the dynamics of the chicken market. • 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	• Conducive policy and regulatory framework for competitive markets, food safety, labeling, and quality. • Farmers' ability to produce and market their chicken and chicken products. • Consider cultural norms and social structures that may influence marketing practices. • Ensure gender equity in training programs. • An existing market demand for chicken products and consumer preferences.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	chicken marketing information will be available for free from the identified Lead farmer in their locality
Estimated returns	It is expected that farmers utilizing this information will experience increased market access and participation resulting in sustainable and economically viable chicken production enterprises.
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to production resources such as land, capital, extension services and credit • Though traditionally chicken is a women's enterprise, men appropriate it once it becomes commercially viable.

2.8.2 TIMP name	Marketing of Chicken Products
	• Women have less access to revenue accruing from chicken commercialization • Gender disparities in access and ownership of resources may affects participation in the enterprise • Women have less access to training and extension services, which can lead to a knowledge gap in modern chicken production and marketing practices. • Women have less access to markets as they often have multiple responsibilities. • Gender-based barriers may prevent women from entering certain markets or engaging in negotiations with buyers. • Some regions may restrict women from engaging in public or entrepreneurial activities, including marketing.
Gender related opportunities	• Employment opportunities exist for youth and women in hatching and selling day- and one month-old chicks • Entrepreneurial opportunities exist for women and youth in the retail sector of the enterprise • Employment opportunities exist for men in the management and administration of collection and processing centers. • Employment opportunities exist for men and male youth in feed formulation and marketing • Digital marketing opportunity exists especially for youth chicken producers and traders • Affirmative action and hustler fund opportunities exist for women and youth to access the required credit
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs may have limited access to land and livestock, which are fundamental resources for chicken 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 chicken and chicken products. • Some VMGs may challenged in reaching markets and transportation infrastructure. • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial enterprises
VMG related opportunities	• Business opportunities exist for learned VMGs on digital marketing • VMGs could form their marketing group or organization to help them with selling their products • Affirmative action and hustler fund opportunities exist for VMGs to access the required credit

2.8.2 TIMP name	Marketing of Chicken Products
E: Case studies/profiles of success stories	
Success stories	None
Application guidelines for users	Smart Marketing Manual (USAID) https://pdf.usaid.gov/pdf_docs/PA00MPMS.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 Chicken Research Institute Naivasha P.O Box 25-20117 Naivasha director.dri@kalro.org kalro.poultry@kalro.org
Lead organization and scientists	KALRO NRI; Scolastica Wambua, Tobias K'Oloo, and Peter Alaru
Partner organizations	Ministry of Agriculture Livestock and Fisheries, Kenya. Donors,

2.8.3 Economic analysis

2.8.3 TIMP name	Economic Analysis
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Loss of income resulting from a lack of knowledge about the profitability of their enterprise, stemming from insufficient skills in conducting a simple economic analysis of the chicken production enterprise.
What is it? (TIMP description)	This is an assessment that evaluates the economic viability of indigenous chicken enterprise using various economic analysis tools including gross margin calculations and cost-benefit analyses. It equips farmers with knowledge and ability to account for all factors of production, compute returns from product sales, and determine economically viable scales of production. Ultimately, this promotes a thriving and prosperous chicken business, transitioning from a subsistence to a commercial venture.
Justification	For farmers to successfully transition from subsistence to commercial chicken farming, it is essential for them to acquire agribusiness skills and use economic analysis for effective enterprise management. These enhanced skills will enable them to avoid making losses as they will be able to track all the costs

2.8.3 TIMP name	Economic Analysis
	incurred and sales realized in their chicken production enterprises.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Smallholder chicken farmers, Farmer groups, Indigenous chicken entrepreneurs, Extension service providers, NGOs, researchers and agripreneurs
Approaches used in dissemination	• 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	• Enabling regulatory framework characterized by friendly regulations, legislation, and policies that support chicken production as a business. • Designed tailor-made training programs to address specific needs of the target farmers and ensuring the content is relevant and accessible. • Well trained facilitators who are knowledgeable in chicken economic analysis and possess effective training and communication skills.
Partners/stakeholders for scaling up and their roles	• 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	Yet to be promoted
Counties where TIMP will be upscaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi and any other interested county
Challenges in dissemination	• Varying education levels of the farmers since some may have limited formal education. • Farmers may have low motivation due to poor market prices. • Lack of computational skills among farmers can impede their ability to do economic analysis

2.8.3 TIMP name	Economic Analysis
Recommendations for addressing the challenges	• Simplify economic analysis to make it easy to understand and apply • Capacity Building of farmers with a specific focus on economic analysis of chicken enterprises. • Customized Training: Tailor training materials to suit farmers with varying levels of education. • Practical sessions with farmers whereby they undertake the analysis with some guidance
Lessons learned	• 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 chicken 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	• Social • Farmers' ability to produce and market their chicken and chicken products • Farmers having access to training resources, such as training materials, instructors, and facilities. • Ensuring gender equity in training programs. • An existing demand for chicken products and consumer preferences. • Ensuring that the policy and regulatory framework supports commercial chicken production practices. • Ensuring that the policies and regulations related to market access, such as trade barriers or subsidies are favourable to access to local and international markets.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Kes. 0
Estimated returns	Farmers utilizing this information will estimate their costs of production, get ways of minimizing losses and venture in economically viable chicken production enterprises.
Gender issues and concerns in development, dissemination, adoption and scaling	• High illiteracy levels of women leading to lack of record keeping and poor record keeping. • Women and youth have limited access to education, training and extension services • Women and youth have less access to market to sell their chicken product • Women and youth have less access to production resources such as land, capital, extension services and credit • Traditionally chicken is a women's enterprise, however once commercialized, men tend to appropriate it

2.8.3 TIMP name	Economic Analysis
	• In some farming communities' women have limited decision-making power as men dominate decisions at the household level
Gender related opportunities	• Youth with entrepreneurial skills can carry out business analytical services as a paid undertaking • Commercialization can lead to women economic empowerment through increased income and financial independence • Women groups serve as an opportunity for training on economic analysis • Affirmative action and hustler fund opportunities exist for women and youths to access the required credit • Commercialization of chicken production offers women the opportunity to become entrepreneurs thereby contributing to economic growth.
VMG issues and concerns in development, dissemination adoption and scaling up	• VMGs often have restricted access to productive resources such as land, capital, and technology, which hinders their participation in commercial chicken farming. • VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial chicken enterprise • VMGs may have limited access to training, and extension services leaving them with inadequate knowledge and skills for chicken 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	• Affirmative action and hustler fund opportunities exist for VMGs to access 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	Narok Kuku Cooperative society
Application guidelines for users	Yet to be developed
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling
G: Contacts	

2.8.3 TIMP name	Economic Analysis
Contacts	Institute Director KALRO – Non-Ruminant Research Institute P.O. Box 169-50100 **Kakamega** Kalro.Kakamega@kalro.org; kalro.poultry@kalro.org
Lead organization and scientists	(KALRO NRI) S. Wambua, T.O. K'Oloo, P.A.O. Alaru, V.O. Ouko, V. Ngaira, A. Wachira and J. Munyasi
Partner organizations	Ministry of Agriculture Livestock and Fisheries, Kenya

Gaps:

1. There is need to do gross margin analysis for both indigenous and improved indigenous chicken under different production systems

2.8.4 Business planning

2.8.4 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	Low income because of not planning before starting a chicken business
What is it? (TIMP description)	A business plan is a blue print of a business's future, which shows the business goals and ways of achieving them. The plan describes a business, its products and services and strategies to achieve the set goals. A good business plan is a work in progress, that evolves with time and business owners or operators revisit regularly to make necessary changes.
Justification	In order for farmers to successfully transition from subsistence to commercial chicken farming, it is essential for them to acquire business-planning skills for effective enterprise management. A business plan gives a solid overview of what the farm is trying to accomplish, including production, operations, marketing, human resources and financial management. With a good business plan, a farmer can acquire credit from financial institutions for his enterprise
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Smallholder chicken farmers, farmer groups, Indigenous chicken entrepreneurs, extension service providers, NGOs, researchers and agripreneurs
Approaches used in dissemination	• 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

2.8.4 TIMP name	Business Planning
	• 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	• Enabling regulatory framework characterized by friendly regulations, legislation, and policies that support chicken production as a business. • Willing farmers/receptive farmers • Well trained facilitators who are knowledgeable in chicken business planning and who possess effective training and communication skills. • Supportive Organizations: Collaborate with agricultural and chicken production groups, NGOs, and extension services to strengthen the business planning capacities of farmers
Partners/stakeholders for scaling up and their roles	• 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	Yet to be promoted
Counties where TIMP will be up-scaled	Kilifi, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, Tharaka Nithi and any other interested county
Challenges in dissemination	• Varying education levels of the farmers since some may have limited formal education. • Language barriers
Recommendations for addressing the challenges	• Simplify business planning to make it easy to understand and apply • Capacity Building of farmers with a specific focus on business planning of chicken enterprises. • Customized Training: Tailor training materials to suit farmers with varying levels of education. • Practical sessions with farmers whereby they undertake the planning with some guidance
Lessons learned	• None
Social, environmental, policy and market conditions necessary for the success of the TIMP	• Ensure that farmers have access to socially acceptable training. • Ensure gender equity in training programs. • An existing demand for chicken products and consumer preferences.

2.8.4 TIMP name	Business Planning
	• Conducive policy and regulatory framework to enable farmers commercially venture into chicken production
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES10,000-50,000 depending on size of farm
Estimated returns	A profitable chicken production enterprise where the farmers track the performance and health of their business.
Gender issues and concerns in development, dissemination, adoption and scaling	• High illiteracy levels of women may lead to little understanding of business planning preparation • Women and youth have less access to production resources such as land, capital, extension services and credit hence they might not see the need to prepare a business plan • In some farming communities' women have limited decision-making power as men dominate decisions at the household level
Gender related opportunities	• Youths with entrepreneurial skills can prepare business plans for farmers at a fee • Commercialization can lead to women economic empowerment through increased income and financial independence • Through business planning women and youths will be able to acquire credit through the affirmative action and hustler funds to finance their enterprises
VMG issues and concerns in development, dissemination adoption and scaling up of the TIMP	• VMGs are more susceptible to economic shocks and disruptions, which can affect their ability to invest in and sustain commercial chicken 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 be able to 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	• VMGs with business skills can prepare business plans for farmers at a fee • Through business planning VMGs will be able to acquire credit through the affirmative action and hustler funds to finance their enterprises

2.8.4 TIMP name	Business Planning
	• 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	Smart Marketing Manual (USAID)
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling
G: Contacts	
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Lead organization and scientists	KALRO Non-Ruminant Research Institute S. Wambua, T.O. K'Oloo, P.A.O. Alaru, V.O. Ouko, V. Ngaira, A. Wachira and J. Munyasi
Partner organizations	Ministry of Agriculture Livestock and Fisheries, Kenya

Gaps:

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

2.9 Policy options and regulations

2.9 TIMP name	Policy options and regulations
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Decline in overall productivity leading to diminished incomes among households.
What is it? (TIMP description)	This management practice is the provision to farmers of a structured framework for operating legally when improving product quality, gaining market access, adopting sustainable practices, and advocating for their needs. By adhering to regulations and staying informed about relevant policies, farmers can enhance their economic prospects and contribute to the overall sustainability and success of the agricultural sector
Justification	• Training farmers on policies and regulations in the indigenous chicken sub-sector is paramount as it addresses a significant knowledge gap that hinders farmers from understanding and complying with critical legal requirements, which is crucial for the long-term sustainability of indigenous chicken production practices.

2.9 TIMP name	Policy options and regulations
	• Lack of awareness can lead to unintended violations, penalties, and legal challenges. • Compliance with stringent standards for indigenous chicken products' quality, hygiene, and safety is essential to safeguard consumers' health and enhance the reputation. • Access to local and international markets is often contingent on adherence to specific regulations, and without proper knowledge, farmers may miss out on lucrative market opportunities, limiting their income potential. • Government policies frequently offer financial incentives and support programs for smallholder indigenous chicken, and training is essential to help them access these opportunities, reduce production costs, and increase profitability. • Knowledge of policies empowers farmers to participate in shaping agricultural policies that benefit their sector, and ultimately contributes to economic empowerment and the overall success of chicken industry.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Indigenous chicken farmers, input providers, extension officers and agripreneurs,
Approaches used in dissemination	• 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	• Relevance of the training program – training programs tailored to the specific needs and challenges faced by smallholder indigenous chicken. • Accessibility – training materials and sessions should be easily accessible to smallholder farmers, including those in rural or remote areas. • Simplicity – training content should be presented in a clear and understandable manner • Participatory Learning – engage farmers actively through participatory learning methods, group discussions, case studies, and practical demonstrations to ensure better knowledge retention and application. • Inclusivity – consider the diverse needs of smallholder indigenous chicken, including women and youth, and design training programs that are inclusive and equitable.

2.9 TIMP name	Policy options and regulations
Partners/stakeholders for scaling up and their roles	• Extension service providers (County, NGOs, Farmer Based Organizations, Faith based organizations) – To train farmers on the TIMP • 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, Meru, Taita Taveta, Migori, Kiambu, Siaya, Kericho, Kakamega, Embu, Busia, Bungoma, Bomet, Muranga, Kisii, Uasin Gishu, Tana River, Kisumu, Nakuru, Kitui, Nandi, Kwale, Narok, Machakos, Makueni, Nyandarua, Vihiga, and Tharaka Nithi
Challenges in dissemination	• 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: Farmers come from diverse backgrounds, and one-size-fits-all training may not address the specific needs of different groups • Indigenous chicken farmers may be located in rural remote areas which are less accessible • Indigenous chicken 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	• Translate complex legal language into simple, farmer-friendly terms. Where possible, use local languages when necessary to ensure that policy documents are accessible and understandable • Tailor training programs to the specific needs, literacy levels and gender of different farmer groups. Specifically address the unique requirements of women, youth, and marginalized communities. • Illustrate policy concepts with practical, real-world examples that resonate with farmers and demonstrate the impact of compliance on their daily practices. • Incentives for adhering to policy guidelines • Mobile outreach through on-site visits and trainings • Trainers to be culturally sensitive and preferably understand the local language
Lessons learned	• Effective training on policies and regulations empowers farmers with the knowledge and tools needed to adhere to legal requirements, and make informed decisions that support the long-term success and economic well-being of their indigenous chicken enterprises.

2.9 TIMP name	Policy options and regulations
Social, environmental, policy and market conditions necessary	• Culturally-sensitive training program and engagement with the local community to foster trust and cooperation • Community involvement by engaging community leaders, elders, and influential persons • Policies should encourage and support sustainable and environmentally friendly farming practices. • Involvement in the development and review of policies related to indigenous chicken farming. • Have access to some level of education and relevant resources, • Clear, accessible, and farmer-friendly policies. • Rewarding markets on compliance and create opportunities for farmers to benefit from their adherence to regulations.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not yet determined
Estimated returns	Not yet determined
Gender issues and concerns in development, dissemination, adoption and scaling up	• Unequal access to training opportunities and resources by different gender groups • Unequal voices in policy discussions. • Gender differences in access to resources, decision-making power, and labor roles. • Time constraints faced by women due to household and caregiving responsibilities • Cultural norms and beliefs may discourage women from participating in public activities or interacting with unfamiliar individuals, including trainers.
Gender related opportunities	• Understanding policy options and regulations can lead to a deeper appreciation of the economic implications of regulatory compliance, potentially creating new business and career paths for men, women and youth as trainers. • This knowledge can also empower them to navigate the regulatory landscape effectively and seize economic opportunities within the context of policy and regulation. • Empowerment and active participation in decision-making • Enhanced income-generating activities leading to financial independence and reduced vulnerability. • Understanding policies and standards can lead to increased access to the markets and negotiated fair prices • Increased inclusion and recognition within the community and family structures.
VMG issues and concerns in development, dissemination adoption and scaling up	• Financial constraints, limited transportation, or physical accessibility issues. • Training content not being culturally sensitive accommodating the customs, beliefs, and practices of different marginalized groups to ensure that the training is relevant and respectful.

2.9 TIMP name	Policy options and regulations
	• VMGs have unique needs and challenges such as safety concerns. • Training programs not accommodating materials in accessible formats e.g. sign language interpreters, and physical facilities that are wheelchair-friendly. • VMGs have economic constraints that can prevent them from attending training programs, as they may not be able to afford travel costs. • Geographic isolation especially for rural and remote communities • Stigmatization and discrimination can deter individuals from participating in training programs, • Lack of community support.
VMG related opportunities	• VMGs gain awareness and a deeper understanding of relevant policies and regulations, which can help them to make informed decisions about their activities and rights. • Training equips VMGs with the knowledge and skills needed for active engagement in policy advocacy, allowing them to voice their concerns and influence policy decisions that affect their well-being. • Understanding and complying with regulations can protect VMGs from legal issues and ensure their activities align with the law, reducing the risk of penalties or discrimination. • Compliance with regulations can open doors to markets and economic opportunities, enabling VMGs to sell products or services that meet legal requirements and access better income prospects. • VMGs can identify entrepreneurial opportunities in the compliance and regulatory space, offering services related to quality control, product certification, or compliance consulting
E: Case studies/profiles of success stories	
Success stories	None so far
Application guidelines for users	- Technical bulletins
F: Status of TIMP readiness (1. Ready for upscaling; 2. Requires validation; 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Director General Kenya Agricultural and Livestock Research Organization (KALRO) P.O Box, 57811-00200 Nairobi Email: Director@kalro.org
Lead organization and scientists	KALRO Alice Murage, Elkana Nyambati, Peter Alaru
Partner organizations	Ministry of Agriculture Livestock and Fisheries, Kenya

Gaps:

1. Analysis of impact of policies on chicken value chain

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