

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



Minai J.M., Gimase J.M., Lubabali A.H., Kathurima C.W., Cheserek J.J., Mureithi L.W., Njeru N.D., Odeny D.A., Kimeu E.M., Mayoli R.N., Gichuru E.K., Mugo H.M., Luusa J.M., Njogu D., Alwora G.O., Ochieng B., Momanyi V., Mwangi H.W., Nyaga A.J.N., Wayua F.O., Wambua J.M., Amata R., Ndubi J.M., Kundu C.A., Nasirembe W.W., Nyaga W.E., Kirigua V.O. and Wasilwa L.A

3 | Page

JULY 2024

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.

© **Kenya Agricultural and Livestock Research Organization 2024**

All rights reserved. No part of this book may be reproduced, stored in database systems, transcribed in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without prior written permission of the publisher.

Published by

Kenya Agricultural and Livestock Research Organization

KALRO Secretariat

P O Box 57811-00200

Nairobi, KENYA

Email: director@kalro.org

Tel. No(s): +254-722206986/733333223

Compiled by: Minai J.M., Gimase J.M., Lubabali A.H., Kathurima C.W., Cheserek J.J., Mureithi L.W., Njeru N.D., Odeny D.A, Kimeu E.M., Mayoli R.N., Gichuru E.K., Mugo H.M., Luusa J.M., Njogu D., Alwora G.O., Ochieng B., Momanyi V., Mwangi H.W., Nyaga A.J.N., Wayua F.O., Wambua J.M., Otipa M.J., Amata R., Ndubi J.M., Kundu C.A., Nasirembe W.W., Nyaga W.E., Kirigua V.O., and Wasilwa L.A.

Editors: Nyabundi K.W., Mukundi K.T., Otipa M.J., Odeny D.A., Maina F.W. , Maina P. and Changwony D.

Editing and Publication Coordination: Kirigua V.O., Nyambati E.M. and Lung'aho C.

Design and layout: Nyaola E.A.

Formatting and Typesetting: Maweu, N.M.

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 Coffee 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 Coffee 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 US\$ 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 Coffee 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

1 Table of Contents

DISCLAIMER.....	II
FOREWORD.....	III
PREFACE.....	IV
TABLE OF CONTENTS	V
LIST OF TABLES	IX
2 DEFINITION OF TERMS FOR TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES	1
2.1 Definition of terms.....	1
2.2 Summary of Inventory of TIMPs in the Coffee Value Chain	1
2.3 Summary Status of TIMPs in the Coffee Value Chain.....	2
3 DETAILED COFFEE VALUE CHAIN	7
3.1 Improved Coffee Varieties	7
3.1.1 Batian variety	7
3.1.2 Ruiru 11 variety	10
3.1.3 SL28 variety	14
3.1.4 SL34 variety	17
3.1.5 K7 variety.....	20
3.1.6 Robusta variety	23
3.1.7 Arabusta Variety	26
3.1.8 Drought tolerant coffee variety	28
3.1.9 Dwarf pure line coffee variety	31
3.2 Coffee Seed System.....	33
3.2.1 Seed propagation.....	33
3.2.2 Vegetative propagation (VP)	36
3.2.3 Nursery management	39
3.2.4 Tissue culture propagation protocols	41
3.3 Good Agricultural Practices (GAPs) and Food Safety Management Systems	43
3.3.1 Good Agricultural Practices (GAPs) for Coffee	43
3.3.2 Food Safety Management System: Hazard Analysis Critical Control Points (HACCP) Plan for Coffee Value Chain in Kenya	46

3.3.3	Safe use of agrochemicals.....	49
3.4	Coffee Agronomic Management Practices	52
3.4.1	Coffee establishment.....	52
3.4.2	Intercropping in coffee.....	54
3.4.3	Shade in Coffee.....	57
3.4.4	Canopy management.....	60
3.4.5	Canopy management.....	62
3.5	Soil Fertility Management.....	65
3.5.1	Coffee Nutrition	65
3.5.2	Soil and leaf analysis.....	67
3.5.3	Rapid Soil Testing.....	70
3.5.4	Integrated Soil Fertility Management	73
3.5.5	Low-cost composting.....	75
3.6	Soil and Water Management	78
3.6.1	Bench Terraces.....	78
3.6.2	Grass strips.....	81
3.6.3	Mulching in coffee.....	83
3.7	Irrigation and Drainage Management	86
3.7.1	Cobalt Chloride moisture deficit kit.....	86
3.7.2	Sprinkler Irrigation in Coffee.....	88
3.7.3	Solar Irrigation Systems for smallholder farmers	91
3.7.4	Drip Irrigation Systems for smallholder farmers	93
3.8	Agroforestry Systems	97
3.8.1	Agroforestry for Soil Fertility	97
3.8.2	Windbreaks and live hedges	100
3.9	Coffee Crop Health.....	103
3.9.1	Integrated management of Coffee berry disease.....	103
3.9.2	Integrated management of Coffee leaf rust (<i>Hemileia vastatrix</i>) in coffee.....	107
3.9.3	Integrated management of Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>garcae</i>) in coffee.....	111
3.9.4	Integrated management of fusarium bark disease (<i>Fusarium stilboides</i>) in coffee	115
3.9.5	Integrated management of fusarium root disease (<i>Fusarium xylarioides</i> <i>Steyaert</i>) in coffee	119
3.9.6	Integrated management of Armillaria root rot (<i>Armillaria heimii</i>) in coffee.....	123

3.9.7	Integrated management of Damping off (<i>Rhizoctonia solani</i> and <i>Pythium</i> spp) in coffee.....	127
3.9.8	Integrated management of Root knot nematodes (<i>Meloidogyne</i> spp) in coffee.....	131
3.9.9	Integrated management of Coffee berry borer (<i>Hypothenemus hampei</i>) in coffee.....	135
3.9.10	Integrated management of Antestia bugs (<i>Antestiopsis</i> spp) in coffee	140
3.9.11	Integrated management of thrips (<i>Diarthrothrips coffeae</i>) in coffee.....	145
3.9.12	Integrated management of coffee leaf miner (<i>Leucoptera coffeina</i>) in coffee.....	149
3.9.13	Integrated management of Root Mealy bug (<i>Geococcus coffeae</i>) in coffee	154
3.9.14	Integrated management of Green scales (<i>Coccus viridis</i>) in coffee.....	158
3.9.15	Integrated management of White Stem Borer (<i>Xylotrechus quadripes</i>) in coffee	162
3.9.16	Integrated management of Yellow headed borer (<i>Dirphya nigricornis</i>) in coffee	167
3.9.17	Integrated management of Berry moth (<i>Hypothenemus hampei</i>) in coffee	171
3.10	Weed Management in Coffee.....	175
3.10.1	Integrated Weed Management (IWM) in Coffee	175
3.10.2	Mechanical control of Weeds	178
3.10.3	Cultural control of Weeds	180
3.10.4	Biological Control of Weeds.....	182
3.10.5	Cover cropping to control weeds	185
3.10.6	Chemical/ herbicide management of Weeds.....	188
3.11	Coffee Post Harvest Management	191
3.11.1	Factory layout guidelines	191
3.11.2	Manual selective coffee harvesting.....	193
3.11.3	Manual colour sorting	195
3.11.4	Mechanical Colour Sorting	197
3.11.5	Sorting by flotation	201
3.11.6	Disc Pulper.....	203
3.11.7	Drum Pulper.....	206
3.11.8	Fully-Washed Processing.....	209
3.11.9	Coffee Processing	211
3.11.10	Demucilager	214
3.11.11	Whole fruit processing procedure (naturals).....	217
3.11.12	Sun drying of fully washed coffee	219
3.11.13	Greenhouse Driers.....	223
3.11.14	Mechanical driers.....	226

3.11.15	2.11.15 Raised drying beds	228
3.11.16	Concrete drying surfaces.....	231
3.11.17	Multi Storey Raised Drying Beds	233
3.11.18	2.11.18 Storage Guidelines	236
3.11.19	Conditioning Bins	239
3.11.20	Coffee bagging.....	241
3.11.21	Green Bean Grading.....	244
3.11.22	Coffee Classification.....	247
3.11.23	Coffee Hulling.....	250
3.12	Coffee Value Addition.....	253
3.12.1	Coffee wine.....	253
3.12.2	2.12.2 Coffee Vinegar.....	255
3.12.3	Coffee Roasting.....	258
3.12.4	Coffee brewing.....	260
3.12.5	Coffee Packaging	263
3.12.6	Artistic murals from low grade coffees.....	266
3.12.7	Extraction of Caffeine	269
3.12.8	Coffee Husk Briquettes	271
3.12.9	Coffee Husk as a source of fuel	274
3.13	Mechanization of Coffee Production Activities	277
3.13.1	Bulldozer.....	277
3.13.2	Wheeled Excavator	279
3.13.3	Wheeled Tractor.....	282
3.13.4	Line level	285
3.13.5	Line level	287
3.13.6	Tractor Hole Drill.....	290
3.13.7	Back Pack weeder	293
3.13.8	Motorised Sprayer.....	296
3.13.9	Mechanical Coffee harvesting	298
3.13.10	Selective coffee harvesting machine.....	301
3.14	Coffee Farming Business and Marketing.....	303
3.14.1	Online Coffee Marketing	303
3.14.2	Central Coffee Auction System	306

3.14.3	Direct Sales System	308
3.14.4	Contract production model.....	310
3.14.5	Strategic planning.....	313
3.15	Agricultural Policy Options	315
3.15.1	County Integrated Development Plan	315
3.15.2	Policy Instruments related to coffee	318

LIST OF TABLES

Table 1:	Number of TIMPs identified in the Coffee Value Chain	1
Table 2:	Summary status of Coffee TIMPs	2
Table 3:	Inventory of Coffee TIMPs, Categories and Status.....	3

ACRONYMS

TIMPS	Technologies, innovations and management practices
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	The Kenya Climate-Smart Agriculture Project
CRI	Coffee Research Institute
PDO	The Project Development Objective
CSA	Climate Smart Agriculture
MoALD	Ministry of Agriculture and Livestock Development
IPR	Intellectual Property Rights
GAPS	Good agricultural practices
HACCP	Hazard Analysis Critical Control Points
BBC	Bacterial blight of coffee
ICT	Information Communication Technology
CBD	Coffee Berry Disease
CLR	Coffee Leaf Rust
FFBS	Farmer Field Business Schools
AIPs	Agricultural Innovation Platforms
AFA	Agriculture and Food Authority
KEPHIS	Kenya Plant Health Inspectorate Service
VMGs	Vulnerable and marginalized groups
ToT	Training of trainers
MSME	Medium, Small and Medium enterprise
CPP	Coffee Productivity Project
KCPA	Kenya Coffee Producers Association
KCTA	Kenya Coffee Traders Association
CMS	Coffee Management Services
SMS	Sustainable Management Services
KBCM	Kahawa Bora Coffee Millers
New KPCU	New Kenya Planters Cooperative Union

NGOs	Non-governmental Organizations
FFS	Farmer field Schools
VP	Vegetative propagation
ICM	Integrated Crop Management
IPM	Integrated Pest Management

2 DEFINITION OF TERMS FOR TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES

2.1 Definition of terms

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

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

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

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

2.2 Summary of Inventory of TIMPs in the Coffee Value Chain

The inventory process resulted in a total of **106 TIMPs** including 29 technologies, 19 innovations and 58 management practices distributed among the fifteen (15) sub-themes, as indicated in Table 1

Table 1: Number of TIMPs identified in the Coffee Value Chain

Commodity /VC	Sub-Theme	Technologies	Innovations	Management Practices
Coffee	Improved Coffee Varieties	9	0	0
Coffee	Coffee Seed System	2	1	1
Coffee	GAP and Food Safety	0	0	3
Coffee	Coffee Agronomic Management Practices	0	0	5
Coffee	Soil Fertility Management	1	1	3
Coffee	Soil and Water Management	0	0	3
Coffee	Irrigation and drainage management	3	1	0
Coffee	Agro-forestry systems	0	0	2
Coffee	Coffee Crop Health	0	0	17

Coffee	Weed management	1	0	5
Coffee	Post-harvest Management	2	8	13
Coffee	Coffee Value Addition	1	5	3
Coffee	Mechanization of Coffee Production Activities	8	1	0
Coffee	Coffee Business and Marketing	0	2	3
Coffee	Agricultural Policy Options	2	0	0
Overall Total		29	19	58

2.3 Summary Status of TIMPs in the Coffee Value Chain

The inventory process resulted in a total of 85 **TIMPs ready for upscaling**, 16 **require validation** and 5 **require further research** in the sub-themes, as indicated in Table 2.

Table 2: Summary status of Coffee TIMPs

Commodity /VC	Sub-Theme	Ready for Upscaling	Require Validation	Further Research
Coffee	Improved Coffee Varieties	6	1	2
Coffee	Coffee Seed System	4	0	0
Coffee	GAP and Food Safety	3	0	0
Coffee	Coffee Agronomic Management Practices	5	0	0
Coffee	Soil Fertility Management	5	0	0
Coffee	Soil and Water Management	3	0	0
Coffee	Irrigation and drainage management	3	1	0
Coffee	Agro-forestry systems	2	0	0
Coffee	Coffee Crop Health	16	1	0
Coffee	Weed management	3	3	0
Coffee	Post-harvest Management	16	5	2
Coffee	Coffee Value Addition	6	2	1
Coffee	Mechanization of Coffee Production Activities	7	2	0
Coffee	Coffee Business and Marketing	4	1	0
Coffee	Agricultural Policy options	2	0	0
Overall Total		85	16	5

Table 3: Inventory of Coffee TIMPs, Categories and Status

TIMPs Sub Theme	TIMP Name	Category	Status
2.1 Improved Coffee Varieties	2.1.1 Batian Variety	Technology	Ready for up-scaling
	2.1.2 Ruiru 11 Variety	Technology	Ready for up-scaling
	2.1.3 SL28 Variety	Technology	Ready for up-scaling
	2.1.4 SL34 Variety	Technology	Ready for up-scaling
	2.1.5 K7 Variety	Technology	Ready for up-scaling
	2.1.6 Robusta Variety	Technology	Ready for up-scaling
	2.1.7 Arabusta Variety	Technology	Requires validation
	2.1.8 Drought tolerant variety	Technology	Requires further Research
	2.1.9 Dwarf pure line coffee variety	Technology	Requires further Research
2.2 Coffee Seed System	2.2.1 Seed propagation	Technology	Ready for up-scaling
	2.2.2 Vegetative propagation	Technology	Ready for up-scaling
	2.2.3 Nursery Management	Management practice	Ready for up-scaling
	2.2.4 Tissue culture protocol	Innovation	Ready for up-scaling
2.3 GAP and Food Safety	2.3.1 Good Agricultural Practices (GAP) for Coffee	Management Practice	Ready for up-scaling
	2.3.2 Food Safety Management System: Hazard Analysis Critical Control Points (HACCP) Plan for Coffee Value Chain in Kenya	Management Practice	Ready for up-scaling
	2.3.3 Safe use of Agro – chemicals	Management Practice	Ready for up-scaling
2.4 Coffee Agronomic Management Practices	2.4.1 Coffee establishment manual	Management practice	Ready for up-scaling
	2.4.2 Intercropping in coffee	Management practice	Ready for up-scaling
	2.4.3 Shade in coffee	Management practice	Ready for up-scaling
	2.4.4 Canopy management	Management practice	Ready for up-scaling
	2.4.5 Organic coffee production	Management practice	Requires validation
2.5 Soil Fertility Management	2.5.1 Coffee nutrition	Management practice	Ready for up-scaling
	2.5.2 Soil and leaf analysis	Technology	Ready for up-scaling
	2.5.3 Rapid soil testing	Innovation	Ready for up-scaling

	2.5.4 Integrated Soil Fertility Management	Management practice	Ready for up-scaling
	2.5.5 Low-cost composting	Management practice	Ready for up-scaling
2.6 Soil and Water Management	2.6.1 Bench terraces	Management practice	Ready for up-scaling
	2.6.2 Grass strips	Management practice	Ready for up-scaling
	2.6.3 Mulching in coffee	Management practice	Ready for up-scaling
2.7 Irrigation and drainage management	2.7.1 Cobalt Chloride moisture deficit kit	Technology	Ready for up-scaling
	2.7.2 Sprinkler Irrigation in Coffee	Technology	Ready for up-scaling
	2.7.3 Solar Irrigation Systems for smallholder farmers	Innovation	Requires validation
	2.7.4 Drip Irrigation Systems for smallholder farmers	Technology	Ready for up scaling
2.8 Agroforestry systems	2.8.1 Agroforestry for Soil Fertility	Management practice	Ready for up scaling
	2.8.2 Windbreaks and live hedges	Management practice	Ready for up scaling
2.9 Coffee Crop Health	2.9.1 Integrated management of Coffee berry disease	Management practice	Ready for up scaling
	2.9.2 Integrated management of Coffee leaf rust	Management practice	Ready for up-scaling
	2.9.3. Integrated management of Bacterial blight	Management practice	Ready for up-scaling
	2.9.4 Integrated management of fusarium bark disease	Management practice	Ready for up-scaling
	2.9.5 Integrated management of fusarium root disease	Management practice	Ready for up-scaling
	2.9.6 Integrated management of Armillaria root rot	Management practice	Ready for up-scaling
	2.9.7 Integrated management of Damping off	Management practice	Ready for up-scaling
	2.9.8 Integrated management of Root knot nematodes	Management practice	Ready for up-scaling
	2.9.9 Integrated management of Coffee berry borer	Management practice	Requires validation
	2.9. 11 Integrated management of Antestia bugs	Management practice	Ready for up-scaling
	2.9.12 Integrated management of Thrips	Management practice	Ready for up-scaling
	2.9.13 Integrated management of Root Mealy bugs in coffee	Management practice	Ready for up-scaling

	2.9. 14 Integrated management of green scales	Management practice	Ready for up-scaling
	2.9.15 Integrated management of White Stem Borer	Management practice	Ready for up-scaling
	2.9.16 Integrated management of Yellow headed borer	Management practice	Ready for up-scaling
	2.9.17 Integrated management of Berry moth	Management practice	Ready for up-scaling
2.10 Weed management	2.10.1 Integrated Weed Management (IWM) in Coffee	Management practice	Requires validation
	2.10.2 Mechanical control of Weeds	Management practice	Ready for up-scaling
	2.10.3 Cultural control of Weeds	Management practice	Ready for up-scaling
	2.10.4 Biological Control of Weeds	Technology	Requires validation
	2.10.5 Cover cropping to control weeds	Management practice	Requires validation
	2.10.6 Chemical management of weeds	Management practice	Ready for up-scaling
2.11 Postharvest Management	2.11.1 Factory layout guidelines	Management practice	Ready for up-scaling
	2.11.2 Manual selective coffee harvesting	Management practice	Ready for up-scaling
	2.11.3 Manual colour sorting	Management practice	Ready for up-scaling
	2.11.4 Mechanical colour sorting	Innovation	Requires validation
	2.11.5 Sorting by floatation	Innovation	Requires validation
	2.11.6 Disc pulper	Innovation	Ready for up-scaling
	2.11.7 Drum pulper	Innovation	Ready for up-scaling
	2.11.8 Fully washed processing procedure	Management practice	Ready for up-scaling
	2.11.9 Coffee processing procedure	Innovation	Requires further research
	2.11.10 Demucilager	Technology	Ready for up-scaling
	2.11.11 Whole fruit processing procedure (Naturals)	Management practice	Requires further research
	2.11.12 Guidelines on open sun drying of fully washed coffee	Management practice	Ready for up-scaling
	2.11.13 Green house solar driers	Innovation	Requires validation
	2.11.14 Mechanical driers	Innovation	Ready for up-scaling
	2.11.15 Raised drying beds	Management practice	Ready for up-scaling

	2.11.16 Concrete drying surfaces	Management practice	Requires validation
	2.11.17 Multi-storey raised drying beds	Innovation	Requires validation
	2.11.18 Storage guidelines	Management practice	Ready for up-scaling
	2.11.19 Conditioning bins	Management practice	Ready for up-scaling
	2.11.20 Coffee bagging	Management practice	Ready for up-scaling
	2.11.21 Green bean grading	Management practice	Ready for up-scaling
	2.11.22 Coffee classification	Management practice	Ready for up-scaling
	2.11.23 Coffee Hulling	Technology	Ready for up-scaling
2.12 Coffee Value Addition	2.12.1 Coffee wine	Innovation	Requires validation
	2.12.2 Coffee vinegar	Innovation	Requires validation
	2.12.3 Coffee roasting	Management practice	Ready for up-scaling
	2.12.4 Coffee brewing	Management practice	Ready for up-scaling
	2.12.5 Coffee packaging	Management practice	Ready for up-scaling
	2.12.6 Artistic murals from low grade coffees	Innovation	Ready for up- scaling
	2.12.7 Extraction of caffeine	Innovation	Ready for up scaling
	2.12.8 Coffee husk Briquettes	Technology	Ready for up scaling
	2.12.9 Coffee husk as a source of fuel	Innovation	Requires further research
2.13 Mechanization of Coffee Production Activities	2.13.1 Bulldozer	Technology	Ready for up -scaling
	2.13.2 Wheeled Excavator	Technology	Ready for up -scaling
	2.13.2 Wheeled tractor	Technology	Ready for up -scaling
	2.13.3 Line level	Technology	Ready for up -scaling
	2.13.4 Hand held hole drill	Technology	Ready for up -scaling
	2.13.5 Tractor Hole Drill	Technology	Ready for up -scaling
	2.13.6 Back Pack weeder	Technology	Ready for up -scaling
	2.13.7 Motorized Sprayer	Technology	Ready for up -scaling
	2.13.8 Mechanical Coffee harvesting	Technology	Requires validation
2.14 Coffee Business and Marketing	2.13.9 Selective coffee harvesting machine	innovation	Requires validation
	2.14.1 Online Coffee Marketing	Management practice	Ready for up -scaling
	2.14.2 Central coffee Auction System	Innovation	Ready for up-scaling
	2.14.3 Direct coffee sales	Innovation	Ready for up-scaling

	2.14.4 Contract production model	Management practice	Requires validation
	2.14.5 Strategic planning	Management practice	Ready for up -scaling
2.15Agricultural Policy options	2.15.1 County Integrated Development Plan	Management practice	Ready for up -scaling
	2.15.2 Policy Instruments related to coffee	Management practice	Ready for up -scaling

3 DETAILED COFFEE VALUE CHAIN

3.1 Improved Coffee Varieties

3.1.1 Batian variety

2.1.1 TIMP Name	Batian variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	- Inadequate seed supply of high yielding hybrid varieties to meet farmers' demand. - Low yields and crop losses due to of Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR)
What is it? (TIMP description)	Batian is an improved coffee variety suitable for all coffee agro-ecological zones, with an altitude of 1,200–2,100 m above sea level. It requires an optimal temperature range of 15 °C–27 °C and rainfall ranging from 1000 mm–1145 mm per year. It is a true-to-type variety, enabling easier multiplication by seed. It is a high-yielding variety with good cup quality and is resistant to Coffee Berry Disease and Coffee Leaf Rust. The variety is cost-effective, reducing costs by 30%. It matures 18–24 months after establishment.  <i>Batian coffee variety</i>
Justification	The gap between supply and demand for the Arabica coffee variety Ruiru 11 has been growing since its release. The single most important constraint on Ruiru 11 seed production is its inherent hybrid nature, which requires manual pollination. This makes it an expensive process, and the seed produced is

	not sufficient to meet the farmers' demand. The Batian coffee variety is a high-yielding hybrid variety that is easy to multiply.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, consumers, researchers, extension service providers, agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - on-farm and on-station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization of the technology • Field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Coffee farmers' organizations-coordination of production and marketing • County governments – extension, policy and regulation • Ministry of Agriculture and Livestock Development (MoALD)- extension, policy and funding • Coffee marketing agents and dealers - promotion of technology uptake • Agriculture and Food Authority (AFA) – Coffee Directorate – regulation and promotion of uptake • KEPHIS –phytosanitary services • Other coffee industry players- promotion of the technology
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of the variety • Poorly packaged dissemination pathways
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs

	• Sensitization campaigns and on-farm demonstrations • Develop easy-to-understand information packages for farmers
Lessons learned during promotion, if any	• High uptake of the variety in the upcoming coffee-growing regions • Can be established at higher plant densities older varieties
Social, environmental, policy and market conditions necessary for development and upscaling	• Wide farmers' acceptability • Well-structured and functional farmer organizations • Higher economic returns as compared to the traditional varieties • Favourable agro-ecological conditions • Favourable macro-business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Production costs-Approximately KES. 250,000.00/acre
Estimated returns	KES. 477,400.00 per acre/ year
Gender issues and concerns in dissemination, adoption and scaling up	• Coffee enterprise ownership is dominated by men, who are also advanced in age. • Men attend the training, yet women and youth carry out most farm work. • Land ownership by men limits women and youth access to land • Decision-making on land use is done by men, limiting women and youth participation in technology uptake • While women and youth carry out most of the farm activities revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information and knowledge • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers • 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	

Success stories from previous similar projects	The Coffee Productivity Project (CPP) promoted the adoption of Batian in Kapsaos Farmers' Cooperative Society, Nandi County which significantly increased yields from 200,000 kg to 1,500,000 kg cherry. This led to the expansion of wet processing mills and higher incomes for the farmers.
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations. 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI-Jane Cheserek and James Gimase
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Cooperatives • Agriculture and Food Authority (AFA) • Coffee marketers

GAPs

1. Validation of variety spacing regime

3.1.2 Ruiru 11 variety

2.1.2 TIMP Name	Ruiru 11 variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Loss of yields and earnings due to fungal coffee diseases
What is it? (TIMP description)	Ruiru 11 is an improved coffee variety that is suitable for all coffee agro-ecological zones with an altitude of 1,200–2,100 m above sea level. It requires an optimal temperature range of 15°C–27°C and rainfall ranging from 1000 mm to 1145 mm per year. It is compact in growth, hence its high plant population per unit area (2550 stems per hectare). It is a high-yielding variety with good cup quality and is resistant to Coffee Berry Disease and Coffee Leaf Rust. The coffee variety is cost-effective, reducing costs by 30%. It matures 18-24 months after establishment.

	 <i>Ruiru 11 coffee variety</i>
Justification	The traditional coffee varieties are susceptible to both CBD and CLR, with a high cost of production due to disease control. Due to its disease resistance, Ruiru 11 reduces the cost of production by about 30%, which results from chemical disease control.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, consumers, extension providers, processors, Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural Innovation Platforms (AIP) • Demonstrations - on-farm and on-station • Agricultural shows/exhibitions/field days • Trainings - workshops/seminars/meetings • Public and private extension agents • Farmer to farmer extension models • Mass media- electronic and print • Publications - posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Coffee farmers organizations – coordination of production and marketing • County governments – extension, policy and regulation • Ministry of Agriculture and Livestock Development (MoALD)- Extension, policy and funding • Coffee marketing agents and dealers - promotion of technology uptake • Agriculture and Food Authority (AFA) – Coffee Directorate – Regulation and promotion of uptake • KEPHIS –Phytosanitary services • Other coffee industry players- promotion of the technology
C: Current situation and future scaling up	

Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of the variety
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	• High uptake of the variety in the upcoming coffee-growing regions • Can be established at higher plant population per unit area
Social, environmental, policy and market conditions necessary for upscaling	• Wide farmers' acceptability • Well-structured and functional farmer organizations • Higher economic returns as compared to the traditional varieties • Reduced use for pesticide application • Favourable agro-ecological conditions • Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Production costs-Approximately KES. 318,080.00/acre
Estimated returns	KES. 620,00 per acre/year
Gender issues and concerns in dissemination, adoption and scaling up	• Coffee enterprise ownership is dominated by men, who are also advanced in age. • Men attend the training, yet women and youth carry out most farm work. • Land ownership by men limits women and youth access to land • Decision-making on land use is done by men, limiting women and youth participation in technology uptake • While women and youth carry out most of the farm activities, revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information, technology and knowledge • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers • 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The Coffee Productivity Project (CPP) promoted the adoption of Batian in Kapsaos Farmers' Cooperative Society, Nandi County which significantly increased yields from 200,000 kg to 1,500,000 kg cherry. This led to the expansion of wet processing mills and higher incomes for the farmers
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations. 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Jane Cheserek, James Gimase
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate • Coffee marketers • Other coffee industry stakeholders e.g., KCPA, KCTA, Techno Serve and World Vision

Research GAPS

1. Susceptibility to drought due to shallow roots system
2. Susceptibility to infestation by nematodes

3.1.3 SL28 variety

2.1.3 TIMP Name	SL28 variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low yields and poor cup quality
What is it? (TIMP description)	SL28 is a high-yielding and high-quality coffee variety susceptible to Coffee Berry Disease but tolerant to Coffee Leaf Rust. The variety is suitable for medium- to low-altitude coffee agro-ecological zones, which are more prone to Leaf Rust. It requires an optimal temperature range of 15°C–27°C and rainfall ranging from 1000 mm–1145 mm per year.  <i>SL28 variety coffee</i>
Justification	The variety is recommended for medium and low-altitude coffee agro-ecological zones where Coffee Rust is prevalent, as it is tolerant to the disease.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, consumers, extension agents, processors and agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization of the technology • Field demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Coffee farmers organizations - coordination of production and marketing • County governments - extension, policy and regulation • Ministry of Agriculture and Livestock Development (MoALD) - Extension, policy and funding

	• Coffee marketing agents and dealers - promotion of technology uptake • Agriculture and Food Authority (AFA) - Coffee Directorate – Regulation and promotion of uptake • KEPHIS –Phytosanitary services • Other coffee industry players- promotion of the technology
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of the variety
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	• High uptake of the variety in coffee-growing regions • Low plant population per unit area (1300 trees/hectare)
Social, environmental, policy and market conditions necessary for upscaling	• Wide farmers' acceptability • Well-structured and functional farmer organizations • Favourable agro-ecological conditions • Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Production costs-Approximately KES. 222,955.00/acre
Estimated returns	KES 334,800.00 per acre/year
Gender issues and concerns in dissemination, adoption and scaling up	• Coffee enterprise ownership is dominated by men, who are also advanced in age. • Men attend the training, yet women and youth carry out most farm work. • Land ownership by men limits women and youth access to land • Decision making on land use is done by men, limiting women and youth participation in technology uptake • While women and youth carryout most of the farm activities. revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information, technology and knowledge • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers

	• 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 opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations. 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	• Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Jane Cheserek, James Gimase
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate • Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) • NGOs

3.1.4 SL34 variety

2.1.4 TIMP Name	SL34 variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low coffee yields and poor cup quality
What is it? (TIMP description)	SL34 is a high-yielding and high-quality coffee variety. It is susceptible to Coffee Leaf Rust and tolerant to Coffee Berry Disease. The variety is suitable for high-altitude coffee agro-ecological zones with high rainfall. It requires an optimal temperature range of 15°C–27°C and rainfall ranging from 1000 mm to 1145 mm per year.  <i>SL34 coffee variety</i>
Justification	The variety is recommended for high altitudes coffee agro-ecological zones where Coffee Berry Disease is prevalent as it is tolerant to the disease. It has high coffee yields and excellent cup quality.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, consumers, extension providers, processors and agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field demonstration plots • Enhanced funding for technology dissemination

Partners/stakeholders for scaling up and their roles	• Coffee farmers organizations - coordination of production and marketing • County governments -extension, policy and regulation • Ministry of Agriculture and Livestock, Development (MoALD)- extension, policy and funding • Coffee marketing agents and dealers - promotion of technology uptake • Agriculture and Food Authority (AFA) – Coffee Directorate – coffee regulations and promotion of uptake • KEPHIS –phytosanitary services • Other coffee industry players- promotion of the technology
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of the variety
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	• High uptake of the variety in coffee growing regions • Low plant population per unit area (1300 trees /hectare)
Social, environmental, policy and market conditions necessary for up-scaling	• Wide farmers’ acceptability • Well-structured and functional farmer organizations • Favourable agro-ecological conditions • Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Production costs-Approximately KES. 222,955 per acre
Estimated returns	KES. 334,800 per acre/year
Gender issues and concerns in dissemination, adoption and scaling up	• Coffee enterprise ownership is dominated by men, who are also advanced in age. • Men attend the training, yet most farm work is carried out by women and youth. • Land ownership by men limits women and youth access to land • Decision making on land use is done by men, limiting women and youth participation in technology uptake

	While women and youth carryout most of the farm activities. revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	- VMGs have limited access to land for coffee cultivation - VMGs have less access to agricultural information, technology and knowledge - VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers - 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. Coffee Research Institute. (2020) Coffee Production Recommendations 2. Coffee Research Institute. (2017) Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Jane Cheserek, James Gimase
Partner organizations	- Agriculture and Food Authority (AFA) – Coffee Directorate– Coffee Directorate - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) - Other coffee industry stakeholders e.g., - KCPA, KCTA, Techno-Serve

3.1.5 K7 variety

2.1.5 TIMP Name	K7 variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Low Coffee yields and quality • Loss of crop due to coffee leaf rust
What is it? (TIMP description)	K7 is a high-yielding and quality coffee variety. It is tolerant to Coffee Leaf Rust and drought. The coffee variety is suitable for low-altitude coffee agro-ecological zones with low rainfall. It requires an optimal temperature range of 15°C–27°C and rainfall ranging from 1000mm to 1145mm per year.  <i>K7 coffee variety</i>
Justification	The coffee plants introduced by the white missionaries were of low yields and quality. Variety development saw the introduction of high-yielding varieties, which replaced the low-yielding imported coffee varieties. The variety is tolerant to Coffee Leaf Rust, which is prevalent in the low altitude coffee zones.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, consumers, extension providers, agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media - electronic and print • Publications - posters/brochures/leaflets, manuals • Digital Platforms- website, dashboards, Apps, social media and short message services

Critical/essential factors for successful promotion	• Access to the technology • Sensitization of the technology • Field demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Coffee farmers organizations - coordination of production and marketing • County governments- extension, policy and regulation • Ministry of Agriculture and Livestock Development (MoALD)- extension, policy and funding • Coffee marketing agents and dealers - promotion of technology uptake • Agriculture and Food Authority (AFA) – Coffee Directorate – coffee regulations and promotion of uptake • KEPHIS –Phytosanitary services • Other coffee industry players- promotion of the technology
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of the variety
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	• High uptake of the variety in low altitude coffee growing regions • Low plant population per unit area 1330 trees /hectare
Social, environmental, policy and market conditions necessary for up-scaling	• Wide farmers’ acceptability • Well-structured and functional farmer organizations • Favourable agro-ecological conditions • Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Production costs-Approximately KES 222,955/acre
Estimated returns	KES 334,800 per acre/ year
Gender issues and concerns in dissemination, adoption and scaling up	• Coffee enterprise ownership is dominated by men, who also advanced in age • Men attend the training, yet most farm work is carried out by women and youth

	• Land ownership by men limits women and youth access to land • Decision making on land use is done by men, limiting women and youth participation in technology uptake • While most farm work is carried out by women and youth, revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	• Establishment of nursery enterprises by women and youth • Training of youths as agripreneurs to offer specialized coffee farming services at a fee • Establishment of MSMEs based on the technology e.g. coffee houses.
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs need financial and farm operational support for the adoption of the technology • Affirmative institutional support to promote adoption, dissemination and scaling up of the technology • Establish special Agricultural Innovations Platforms (AIPs) for the VMGs
VMG related opportunities	• Establishment of nursery enterprises by the VMGs • Training of VMGs as TOTs to reach out to the other VMGs farmers • Establishment of MSMEs based on the technology e.g. coffee houses.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations 2. Coffee Research Institute. (2017). Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Jane Cheserek, James Gimase
Partner organizations	• Ministry of Agriculture and Livestock development (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate– Coffee Directorate • Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) • Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-Serve, World Vision

3.1.6 Robusta variety

2.1.6 TIMP Name	Robusta Variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Lack of appropriate coffee varieties for coffee production in low altitude areas (500-1432 metres above sea level)
What is it? (TIMP description)	The Robusta is a high-yielding coffee species that grows well in low altitude areas with a spacing of 10 ft x 10ft. It is tolerant to some coffee insect pests, nematodes and soil-borne pathogens.  <i>Robusta coffee variety</i>
Justification	Lack of appropriate coffee varieties for coffee production in low altitude areas has led to a high demand for a suitable coffee species for the low altitude areas. The Robusta variety is well suited to low altitude areas of 500-1432 metres above sea level.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Researchers, consumers, extension providers, agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals

	Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	- Field demonstration plots - Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	- County governments- regulations - Ministry of Agriculture and Livestock Development (MoALD) - Extension and funding - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU)- promotion of technology - Agriculture and Food Authority (AFA) – Coffee Directorate– coffee Directorate regulation - Other coffee industry stakeholders e.g. KCPA, KCTA - promotion of technology
C: Current situation and future scaling up	
Counties where already promoted if any	Busia, Siaya, Kisumu, Homabay and Bungoma,
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	- Weak research-extension-farmer linkage in technology delivery - Low awareness of the variety
Suggestions for addressing the challenges	- Strengthen the research-extension-farmer linkage through AIPs - Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	Not documented
Social, environmental, policy and market conditions necessary for up-scaling	- Wide farmers' acceptability - Well-structured and functional farmer organizations - Favourable agro-ecological conditions - Favourable macro business environment - Favourable institutional policy environment - Favourable environmental conditions - Favourable market prices
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	- Coffee enterprise ownership is dominated by men, who are also advanced in age. - Men attend the training, yet most farm work is carried out by women and youth. - Land ownership by men limits women and youth access to land - Decision making on land use is done by men, limiting women and youth participation in technology uptake - While women and youth carryout most of the farm activities. revenue from coffee is controlled by men, limiting women and youth access to the use of income

Gender related opportunities	Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	- VMGs have limited access to land for coffee cultivation - VMGs have less access to agricultural information, technology and knowledge - VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers - 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None available
Application guidelines for users	- Coffee Research Institute. (2020). Coffee Production Recommendations. - Coffee Research Institute. (2017). Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI - Jane Cheserek and James Gimase
Partner organizations	- Ministry of Agriculture and Livestock Development (MoALD) - Agriculture and Food Authority (AFA) – Coffee Directorate - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) - Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-serve, world vision, NCE

Research GAPS

- Lack of improved Robusta varieties

3.1.7 Arabusta Variety

2.1.7 TIMP Name	Arabusta Variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Lack of improved high-quality coffee variety adaptable to lower altitude coffee growing areas.
What is it? (TIMP description)	It is a coffee variety developed from an interspecies cross between Robusta and Arabica coffee varieties. The variety has a higher cup quality compared to Robusta. It performs well in the low altitude regions
Justification	There is high demand for coffee production in the low altitude areas.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, consumers, extension providers, agripreneurs
Approaches to be used in dissemination	- Farmer Field and Business Schools (FFBS) - Agricultural innovation platforms (AIP) - Demonstrations - on-farm and on station - Agricultural shows/exhibitions/field days - Training - workshops/seminars/meetings - Public and private extension Agents - Farmer-to-farmer extension models - Mass media - electronic and print - Publications- posters/brochures/leaflets, manuals - Digital Platforms - website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	- Field demonstration plots - Enhanced funding for technology dissemination
Partners/stakeholders for validation	- County governments- capacity building and extension - Ministry of Agriculture and Livestock Development (MoALD)-extension and funding - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU)- promotion of technology - Agriculture and Food Authority (AFA) – Coffee Directorate– Coffee Directorate – coffee regulations - KEPHIS –Phytosanitary services - Other coffee industry stakeholders e.g. KCPA, KCTA - promotion of technology
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	Weak research-extension-farmer linkage in technology delivery

	• Low awareness of the variety
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	None
Social, environmental, policy and market conditions necessary for up-scaling	• Favourable agro-ecological conditions • Favourable macro business environment • Favourable institutional policy environment • Favourable environmental conditions • Favourable market prices
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	• Coffee enterprise ownership is dominated by men, who are also advanced in age. • Men attend the training, yet most farm work is carried out by women and youth. • Land ownership by men limits women and youth access to land • Decision making on land use is done by men, limiting women and youth participation in technology uptake • While women and youth carry out most of the farm activities, revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information and knowledge • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers • 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 opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Need to be developed

F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI Jane Cheserek and James Gimase
Partner organizations	- Ministry of Agriculture and Livestock Development(MoALD) - Agriculture and Food Authority (AFA) Coffee Directorate - Coffee marketers - Other coffee industry stakeholders

3.1.8 Drought tolerant coffee variety

2.1.8 TIMP Name	Drought tolerant coffee variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Adverse effects of climate change on coffee production in low altitude areas
What is it? (TIMP description)	Arabica coffee variety bred for high yield and cup quality, and tolerant to drought.
Justification	Due to climate change, there is a shift in Arabica coffee growing zones as a result of increased temperatures and reduced precipitation. This requires a coffee variety adaptable to the adverse abiotic factors
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers ,researchers, consumers, extension agents and agripreneurs

Approaches to be used in dissemination	- Farmer Field and Business Schools (FFBS) - Agricultural innovation platforms (AIP) - Demonstrations - on-farm and on station - Agricultural shows/exhibitions/field days - Training - workshops/seminars/meetings - Public and private extension agents - Farmer-to-farmer extension models - Mass media –electronic and print - Publications -posters/brochures/leaflets, manuals - Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	- Field demonstration plots - Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	- County governments- regulations - Ministry of Agriculture and Livestock Development (MoALD) - extension and funding - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU)- promotion of technology - Agriculture and Food Authority (AFA) – Coffee Directorate - regulation - KEPHIS –Phytosanitary services - Other coffee industry stakeholders e.g., - KCPA, KCTA - promotion of technology
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be up scaled	Currently none. Yet to be released
Challenges in development and dissemination	- Weak research-extension-farmer linkage in technology delivery - Low awareness of the variety
Suggestions for addressing the challenges	- Strengthen the research-extension-farmer linkage through AIPs - Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	None
Social, environmental, policy and market conditions necessary for up-scaling	- Favourable agro-ecological conditions - Favourable macro business environment - Favourable institutional policy environment - Favourable environmental conditions - Favourable market prices
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	- Coffee enterprise ownership is dominated by men, who are also advanced in age. - Men attend the training, yet most farm work is carried out by women and youth

	• Land ownership by men limits women and youth access to land • Decision making on land use is done by men, limiting women and youth participation in technology uptake • While women and youth carryout most of the farm activities. revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information and knowledge • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision-making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	• Affirmative action opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	None developed
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Requires further research
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI Jane Cheserek, James Gimase
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate • KEPHIS • Development partners and other stakeholders

3.1.9 Dwarf pure line coffee variety

2.1.9 TIMP Name	Dwarf pure line coffee variety
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	- Inadequate seed supply of high-yielding hybrid varieties. - Management of Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR)
What is it? (TIMP description)	This is a pure-line coffee variety that is short in stature, similar to Ruiru 11, with high yield and quality, and resistant to CBD and CLR.
Justification	The production of hybrid Ruiru 11 seed has been a challenge due to the inherent hybrid nature. Production of hybrid seed is costly since it requires skilled labour, dependent on weather patterns and is manually produced. The Dwarf pure-line coffee variety is easier to multiply by seed.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, consumers, extension service providers, agripreneurs
Approaches to be used in dissemination	- Farmer Field and Business Schools (FFBS) - Agricultural innovation platforms (AIP) - Demonstrations - on-farm and on station - Agricultural shows/exhibitions/field days - Training - workshops/seminars/meetings - Public and private extension agents - Farmer-to-farmer extension models - Mass media – electronic and print - Publications -posters/brochures/leaflets, manuals - Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	- Field demonstration plots - Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	- County governments- regulations - Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MoALD)-extension and funding - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU)- promotion of technology - Agriculture and Food Authority (AFA) – Coffee Directorate–Coffee regulations - KEPHIS –Phytosanitary services - Other coffee industry stakeholders e.g., - KCPA, KCTA - promotion of technology
C: Current situation and future scaling up	
Counties where already promoted if any	None

Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	Weak research-extension-farmer linkage in technology delivery
Suggestions for addressing the challenges	Strengthen the research-extension-farmer linkage through AIPs
Lessons learnt during its promotion, if any	None
Social, environmental, policy and market conditions necessary for up-scaling	- Favourable agro-ecological conditions - Favourable macro business environment - Favourable institutional policy environment - Favourable environmental conditions - Favourable market prices
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	- Coffee is regarded as a man's crop - Coffee enterprise ownership is dominated by men, who are also advanced in age - Men attend the training, yet most farm work is carried out by women and youth. - Land ownership by men limits women and youth access to land - Decision making on land use is done by men, limiting women and youth participation in technology uptake - While women and youth carryout most of the farm activities. revenue from coffee is controlled by men, limiting women and youth access to the use of income
Gender related opportunities	Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	- VMGs have limited access to land for coffee cultivation - VMGs have less access to agricultural information and knowledge - VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers - 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 opportunities exist for VMGs to acquire the required credit

E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	
F: Status of TIMP Readiness (1. Ready for upscaling, 2. Requires validation, 3. Requires further research)	Requires further research
H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Jane Cheserek and James Gimase
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA)- Coffee Directorate • Other coffee industry stakeholders • KEPHIS

3.2 Coffee Seed System

3.2.1 Seed propagation

2.2.1 TIMP Name	Seed propagation
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Shortage of quality coffee planting materials
What is it? (TIMP description)	This is the production of coffee planting materials from certified coffee seed. Certified seed is only available from CRI-Ruiru centre.  <i>Coffee seed propagation</i>
Justification	Coffee production can be increased through the adoption of high-yielding coffee varieties. However, this is faced with the challenge of an inadequate supply of quality coffee planting

	materials. Production of planting materials generated from seed is one way of meeting the demand.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, coffee nursery managers, consumers, extension providers and agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social, media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology to the industry stakeholders • Field Demonstration plots • Involvement of all the industry stakeholders
Partners/stakeholders for scaling up and their roles	• Coffee farmers organizations – coordination of production, processing and marketing • County governments – Extension, policy and regulation • Ministry of Agriculture and Livestock Development (MoALD)- Extension, policy and funding • Coffee marketing agents and dealers - promotion of technology uptake • Agriculture and Food Authority (AFA) – Coffee Directorate – Regulation and promotion of uptake • KEPHIS –Plant phytosanitary services • Other coffee industry players- promotion of the technology
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of the variety
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	• Shortage of certified coffee seeds has resulted in unscrupulous nursery operators raising seedlings from uncertified seed and selling them to farmers

Social, environmental, policy and market conditions necessary for up-scaling	• Farmers' willingness to adopt the technology • Favourable agro-ecological conditions • Favourable institutional policy environment • Favourable market prices
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Depends on the variety
Estimated returns	1000 plants@10 kg cherry @ KES 100 = KES 1,000,000
Gender issues and concerns in dissemination, adoption and scaling	• Women and youth may also have limited access to finances to buy the required inputs such as quality planting materials and manure to implement the technology • Women have less access to agricultural information, technology and knowledge on the technology • Women have limited access to education, training and extension services
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have less access to agricultural information and knowledge on the technology • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers • 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	
Application guidelines for users	• Coffee Research Institute (2020). Coffee Production Recommendations. • Coffee Research Institute (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Jane Cheserek, James Gimase

Partner organizations	- Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MoALD) - Agriculture and Food Authority (AFA) – Coffee Directorate - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU, KCCE) - Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-serve, world vision

3.2.2 Vegetative propagation (VP)

2.2.2 TIMP Name	Vegetative propagation (VP)
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Shortage of true-to-type coffee planting materials
What is it? (TIMP description)	This is a method of propagating coffee seedlings using plant vegetative parts. The seedlings produced are genetically identical to the mother plant. It involves rooting of cuttings, grafting, top working and tissue culture.   <i>Coffee seedling in in the greenhouse</i>
Justification	Vegetative propagation ensures mass production of clean, high quality and true to type of coffee planting materials and adequate supply of planting materials for coffee farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, coffee nursery operators, consumers. extension 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 - Training - workshops/seminars/meetings - Public and private extension Agents - Farmer-to-farmer extension models - Mass media – Electronic and print - Publications -posters/brochures/leaflets, manuals - Digital Platforms– website, dashboards, Apps, social media and short message services

Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Availability of field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Coffee farmers' organizations – coordination of production, processing and marketing • County governments – extension, policy and regulation • Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MoALD)- extension, policy and funding • Coffee marketing agents and dealers - promotion of technology uptake • Agriculture and Food Authority (AFA) – Coffee Directorate – regulations and promotion of uptake • KEPHIS –Plant phytosanitary services • Other coffee industry players- promotion of the technology
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee-growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of the variety
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations
Lessons learnt during its promotion, if any	• Partnering with County governments and other stakeholders has enhanced the dissemination of the technology • Technical backstopping on the suitability of the various coffee varieties to different agro ecological zones enhances the uptake of coffee planting materials
Social, environmental, policy and market conditions necessary for up-scaling	• Farmers' willingness to adopt the technology • Favourable agro-ecological conditions • Favourable institutional policy environment • Favourable market prices
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Ruiru 11/Batian seedling - KES37 • Grafted Ruiru 11 -KES 45 • Ruiru 11 Cuttings- KES 20 • Ruiru TC – KES 70
Estimated returns	• Seedlings- KES 40 • Grafted –KES 55 • Cuttings- KES 40 • Tissue culture –KES 55
Gender issues and concerns in dissemination, adoption and scaling	• Women and youth may also have limited access to finances to buy the required inputs such as quality planting materials and manure to implement the technology

	• Women have less access to agricultural information, technology and knowledge on the technology • Women have limited access to education, training and extension services
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in 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 required inputs such as quality planting materials, manure and fertilizers • 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Underit youth group in Nandi County
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations. 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Jane Cheserek, James Gimase, Rose Mayoli, Hudson Lubabali
Partner organizations	• Ministry of Agriculture and Livestock Development • Agriculture and Food Authority (AFA)- Coffee Directorate • Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) • Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-Serve, World Vision

GAPs

1. Unavailability of pre-selected scions
2. Inadequate skills and knowledge on grafting

3.2.3 Nursery management

2.2.3 TIMP Name	Nursery management
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Inadequate supply of certified planting materials
What is it? (TIMP description)	It is the management of coffee seedlings in the nursery from seed and vegetative propagation to maturity.  <i>Coffee seedlings in the nursery</i>
Justification	The practice ensures the production of certified and high-quality coffee planting materials.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, nursery operators, extension providers and agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization of the technology • Availability of field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• County governments- promotion and extension, capacity building of professional grafters, regulations. • Private nurseries – production of seedlings • Non-governmental organizations – provide funding for nursery operations • Ministry of Agriculture and Livestock Development (MoALD)- capacity building of extension staff • Agriculture and Food Authority (AFA) - Directorate - policy and regulations

C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• High cost of nursery construction and consumables • Weak Research-extension-farmer linkage • Coffee Pests and diseases attack of seedlings in the nurseries • Inadequate information on nursery management
Suggestions for addressing the challenges	• Use of cheap and locally available nursery construction materials • Capacity building of extension staff on nursery management • Strengthening research-extension-farmer linkage
Lessons learnt during its promotion, if any	• Need for technical backstopping in nursery management practices
Social, environmental, policy and market conditions necessary for up-scaling	• Enhance policy and legal framework at the county governments for the operationalization of coffee nurseries • Good coffee prices to encourage uptake of seedlings
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs (Nursery construction)	KES. 350,000 per 50,000 seedling capacities
Estimated returns	KES. 600,000 per average sale of 30,000 seedlings
Gender issues and concerns in dissemination, adoption and scaling up	• Women and youth may also have limited access to finances to buy the required inputs such as quality planting materials and manure to implement the management practice • Women and youth may have limited access to land to put up a nursery • Women have less access to agricultural information, technology and knowledge on the technology • Women have limited access to education, training and extension services
Gender related opportunities	Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge on the technology than men. • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers • 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	

Application guidelines for users	
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for upscaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI- Jane Cheserek and James Gimase
Partner organizations	- Ministry of Agriculture and Livestock Development (MoALD) - Agriculture and Food Authority (AFA) – Coffee Directorate - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) - Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-serve and world vision

3.2.4 Tissue culture propagation protocols

2.2.4 TIMP Name	Tissue culture propagation protocols
Category (i.e., technology, innovation or management practice)	Innovations
A: Description of the technology, innovation or management practice	
Problem to be addressed	Inadequate supply of improved, disease-resistant coffee planting materials.
What is it? (TIMP description)	A method of propagating coffee planting materials using vegetative plant parts such as the leaf and nodes, by subjecting them to the right stimulus mainly the plant hormones. It is used for F1 hybrid propagation to supplement manual hybrid seed production.  <i>Tissue cultured coffee plantlet</i>
Justification	An efficient protocol for regenerating coffee seedlings using tissue culture technique.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, agripreneurs

Approaches to be used in dissemination	- Farmer Field and Business Schools (FFBS) - Agricultural innovation platforms (AIP) - Demonstrations - on-farm and on station - Agricultural shows/exhibitions/field days - Training - workshops/seminars/meetings - Public and private extension Agents - Farmer-to-farmer extension models - Mass media – electronic and print - Publications -posters/brochures/leaflets, manuals - Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	- Willingness of farmers to plant tissue culture coffee seedlings - Farmers awareness on tissue culture coffee seedlings
Partners/stakeholders for scaling up and their roles	Research Institutions and Universities - capacity building on tissue culture protocols
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	- High cost of production of seedlings through tissue culture - Weak research- extension staff – farmer linkage
Suggestions for addressing the challenges	- Increase funding from development partners - Strengthen research-extension-farmer linkage
Lessons learnt during its promotion, if any	Delicate nature of the pre-germs during weaning and acclimatization.
Social, environmental, policy and market conditions necessary for up-scaling	Favourable coffee prices
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 and youth may also have less access to finances to build a tissue culture infrastructure - Women have less access to agricultural information and technologies - Women have limited access to education, training and extension services
Gender related opportunities	Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in dissemination, adoption and scaling up	- VMGs have less access to agricultural information and knowledge of the technology - VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers - 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 opportunities exist for VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations 2. Coffee Research Institute. (2017). Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P. O. Box 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI-Rose Mayoli, Hudson Lubabali and Jane Kahia
Partner organizations	Coffee nursery operators

3.3 Good Agricultural Practices (GAPs) and Food Safety Management Systems

3.3.1 Good Agricultural Practices (GAPs) for Coffee

2.3.1 TIMP Name	Good Agricultural Practices (GAPs) for Coffee
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Presence of chemical, biological and physical contaminants in the coffee value chain • Reduced food quality • Poor workers' safety and health
What is it? (TIMP description)	This is a global, systematic process of implementing a standardized production system that is designed to reassure consumers about the safety of food. The four 'pillars' of GAPs include economic viability, environmental sustainability, social acceptability, and food safety and quality. In coffee, the focus is on the farm-to-farm gate/coffee washing station processes that ensure that the four pillars are adhered to. This results in safe and

	quality coffee beans, as well as protecting the environment and workers/farmers' safety.
Justification	Food safety has gained increasing importance over the years because of its implications for health and trade. Recent studies have shown that increased consumption and movement of crop produce have led to increased incidences of food-borne diseases. The evolving food industry and changes in consumer food preferences, feeding habits, and practices have increased the volume of crops produced, leading to increased complexity in the distribution systems and thereby increasing exposure to contamination. Coffee is not an exception with the increased number of handlers, from the farm to the millers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, pulping factory workers, extension staff, processors, transporters, Agripreneurs, market outlet operators-including wholesale and retail chains and domestic markets
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message service
Critical/essential factors for successful promotion	• Supportive government policy - particularly the enforcement of KS1758 domestic scope standard • Sensitization and training of coffee value chain stakeholders
Partners/stakeholders for scaling up and their roles	• County governments - promotion and extension, capacity building on GAPs • Ministry of Agriculture and Livestock Development (MoALD)- capacity building of extension staff
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee-growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in dissemination	• Lack/inadequate knowledge on the benefits GAPs • The perception that GAPs is oppressive rather than supportive
Suggestions for addressing the challenges	• Continuous sensitization of farmers, extension staff and other value-chain players
Lessons learnt during its promotion, if any	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform

	Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for up-scaling	Supportive policy framework of National and County governments to promote adaption of GAPs
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Is dependent on the initial risk assessment of the production unit
Estimated returns	Depends on the farm risks identified
Gender issues and concerns in development, dissemination, adoption and scaling up	- Women have less access to agricultural information, technology and knowledge on GAPs - Women have less access to education, training and extension services on GAPs
Gender related opportunities	- Employment opportunities for youths exist in performing the task of GAPs - Proper application of GAPs will lead to improved health of the various gender categories due to consumption of clean health coffee that is free from hazards
VMG issues and concerns in development, dissemination, adoption and scaling up	- Requires a lot of movement on the farm to maintain records and process verification which may be untenable by some VMGs who are elderly or disabled - VMGs have limited access to education, training and extension services on GAPs - VMGs have less access to agricultural information, technology and knowledge on GAPs - High illiteracy level of the VMGs makes them unable to read the dissemination documents and other materials
VMG related opportunities	- Employment opportunities for youths exist in performing the task of GAPs - Proper application of GAPs will led to improved health of the various gender categories due to consumption of clean health coffee that is free from hazards
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	- Coffee Research Institute. (2020). Coffee Production Recommendations. - Coffee Research Institute. (2017). Coffee Growers Handbook. - FAO (20220 Training manual – Good agricultural practices (GAP) guidelines. Volumes 1 and 2. https://doi.org/10.4060/cc3338en
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling

G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box, 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny, Harrison Mugo
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Commodities Fund • Other coffee industry stakeholders e.g., KCPA, KCTA, NGOs • Pest Control Products Board • Universities

3.3.2 Food Safety Management System: Hazard Analysis Critical Control Points (HACCP) Plan for Coffee Value Chain in Kenya

2.3.2 TIMP Name	Food Safety Management System: Hazard Analysis Critical Control Points (HACCP) Plan for Coffee Value Chain in Kenya
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Health risks due to contaminants in agricultural products • Health hazards due to mycotoxins and pesticide use • Lack of access to export markets due to lack of food safety certification
What is it? (TIMP description)	It is a system of food safety monitoring and control based on the systematic identification and assessment of various hazards through Hazard Analysis and Critical Control Points (HACCP) in the coffee value chain. It is a preventive rather than a reactive tool that places the protection of the coffee supply from biological, chemical and physical hazards into the hands of food management systems.
Justification	The Hazard Analysis and Critical Control Points (HACCP) system assures coffee safety through monitoring of the value chain. The HACCP approach can be applied to all stages of the coffee value chain process, ranging from production to processing, transportation, retail in commercial establishments and/or direct utilization by the consumer. Through its application, key elements will be identified and used (or modified) to reduce/manage hazards.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, consumers, researchers, extension officers, agripreneurs, traders and exporters,
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station

	• Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Training and sensitization of coffee value chain stakeholder • Constitute an expert team composed of HACCP specialist, food scientist, microbiologist, representative of the coffee growers, public health officer, and a quality control and safety specialist from the Kenya Bureau of Standards. • Distribution of the printed HACCP plan for coffee value chain actors for implementation in order to reduce hazards
Partners/stakeholders for scaling up and their roles	• KALRO and National Agricultural Research Institutes (NARIs) and international research organizations- research, awareness and capacity building • Institutions with the required analytical testing capacity- conduct food safety analysis, awareness and training • Market players, producers and exporters associations- dissemination of information and capacity building • Central government, county governments- capacity building, policy, awareness and dissemination • NGOs- for farmer organizing and mobilization
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Inadequate knowledge on FSMS and HACCP • Inadequate awareness among the primary stakeholders and market outlets • Inadequate funding to reach all the industry stakeholders
Suggestions for addressing the challenges	• Training and awareness on food safety concerns
Lessons learnt during its promotion, if any	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform • The Kenya coffee value chain players are willing to adopt the HACCP plan if well engaged.
Social, environmental, policy and market conditions necessary for up-scaling	• Involve stakeholders in the promotion use of FSMS and HACCP Plan • The Kenya Public health policies and laws in place for application FSMS and HACCP Plan • Improved coffee market through application FSMS and HACCP Plan • Improved health and environmental conditions through application of FSMS and HACCP Plan

D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be determined
Estimated returns	To be determined
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have limited access to education, training and extension services on HACCP
Gender related opportunities	• Employment opportunities for youths exist in performing the task of HACCP • Proper application of HACCP will lead to improved health of the various gender categories due to consumption of clean health coffee products that are free from hazards.
VMG issues and concerns in development, dissemination, adoption and scaling up	• Requires a lot of movement on the farm to maintain records and process verification which may be untenable by some VMGs who are elderly and disabled. • VMGs may have limited access to education, training and extension services on HACCP • VMGs have less access to agricultural information, technology and knowledge on HACCP
VMG related opportunities	• Proper application of HACCP will lead to improved health of VMGs due to consumption of clean health coffee products that are free from hazards
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Coffee processors and marketers have successfully applied HACCP in coffee exports
Application guidelines for users	• FAO (2022) Training manual – Good agricultural practices (GAP) guidelines. Volumes 1 and 2. https://doi.org/10.4060/cc3338en • FAO (2023) Introduction to Hazard Analysis and Critical Control Point (HACCP). FAO Good Hygiene Practices (GHP) and Hazard Analysis and Critical Control Point (HACCP) Toolbox for Food Safety. Rome. https://doi.org/10.4060/cc6246en
F: Status of TIMP Readiness (1.Ready for upscaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization scientists and Partner organizations	KALRO-CRI, Cecilia Kathurima
	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA)- Coffee • Directorate

	• Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) • PCPB, AAK, KEPHIS, • Nairobi Coffee Exchange • Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-Serve, World Vision • Kenya Bureau of Standards (KEBS)

3.3.3 Safe use of agrochemicals

2.3.3 TIMP Name	Safe use of agrochemicals
Category (i.e., technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Health risks and hazards due to improper use of agrochemicals
What is it? (TIMP description)	This is practice that includes methodologies for safe and appropriate use and handling of agrochemicals from purchase to disposal of left overs and containers to minimize pollution of the environment and contamination of the produce.
Justification	Improper use of agrochemicals is a common practice in most areas. Incidences of excessive use, improper handling that lead to the spray operators inhaling the chemicals in the process of spraying, use of inappropriate spray equipment that lead to leakages and thereby exposing the operators to health risks as well as contamination of the water bodies have been reported. There is need to correct this through sensitization and capacity building forums for end users. Increased chronic diseases in human beings have been reported.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, youth spraying teams, input providers including agro-dealers and Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Pests Control Products Board (PCPB) -for Regulation and approval of agro-chemicals

	- Farmer Co-operative Societies (FCS)- for mobilization and sensitization of farmers, availing products to farmers - Agrochemical Manufacturers- to avail and distribute products, finance trials - Financial institutions to facilitate the acquisition of products by FCS - Research organizations and universities- to validate and upscale the management practice - National and County governments - to finance and facilitate extension services to the farmers - Extension service providers- for dissemination and sensitization of farmers
C: Current situation and future scaling up	
Counties where already promoted if any	32 regions growing coffee
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	- Weak research-extension-farmer linkage in technology delivery - Weak collaboration among the stakeholders - Inadequate information and knowledge among farmers - Smuggling of banned herbicides from neighbouring countries - Inadequate capacity by farmers and agrochemical companies to dispose of expired herbicides and containers. - Lack of innovation platforms to facilitate for interaction of farmers with relevant stakeholders
Suggestions for addressing the challenges	- Strengthen the research-extension-farmer linkage through AIPs - Sensitization campaigns and on-farm demonstrations - Strengthen collaboration among the stakeholders - Formation of youth spray teams to spray at a fee. - Establishment of training of Extension staff and lead farmers as TOTs. - Establish coffee innovation platforms - Capacity building and sensitization forums for both farmers and agro-dealers using a participatory approach. - Establishment of aggregation centres for the disposal of herbicide containers, left overs and expired products - Increase surveillance along border points to prevent smuggling of unregistered agro-chemicals.
Lessons learned in up-scaling if any	- Upscaling of this technology needs young men and youth to do the spraying and collection of empty containers. - Successful scaling up is higher when diverse value chain stakeholders collaborate - Availability of registered agro-chemicals is essential - Partnership facilitated through innovation platforms is important in technology dissemination and adoption

	The illiteracy levels of farmers may hinder the uptake of the technology
Social, environmental, policy and market conditions necessary for development and up-scaling	- Favourable agro-ecological conditions - Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of a complete set of protective clothing is approximately KES 5,000.
Estimated returns	Not applicable. The TIMP takes care of the agrochemical applicator, consumer and environment.
Gender issues and concerns in development, dissemination, adoption and scaling up	- Women have less access to agricultural information, technology and knowledge on the dangers of chemicals, especially on storage and disposal - Women have limited access to education, training and extension services - Women and youth may have limited access to finances to buy the required pesticides and protective gear
Gender related opportunities	Affirmative action opportunities exist for women and youths to acquire the required credit.
VMGs issues and concerns in development, dissemination, adoption and scaling up	- VMGs have less access to agricultural information, technology and knowledge on the dangers of chemicals, especially on storage and disposal - VMGs have limited access to education, training and extension services - VMGs may have limited access to finances to buy the required pesticides and protective gear
VMG related opportunities	Affirmative action opportunities exist for women and youths to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	32 regions growing coffee
Application guidelines for users	- Momanyi, V. (2017). Guidelines for Safe and Effective Use of Pesticides (1st ed.). Lap Lambert Academic Publishing - FAO (2021) Managing pesticides in agriculture and public health: A compendium of FAO and WHO guidelines and other resources - Second edition
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	2. Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org

Lead organization and scientists	KALRO-CRI- Danstan Aim Odeny, Violet N. Momanyi
Partner organizations	• PCPB • AAK

3.4 Coffee Agronomic Management Practices

3.4.1 Coffee establishment

2.4.1 TIMP Name	Coffee establishment
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low coffee yields due to poor coffee establishment
What is it? (TIMP description)	this is a process of land preparation, acquisition of clean planting material and planting of seedlings in the field. <i>Land preparation in a coffee farm</i>
Justification	Poor establishment of coffee leads to poor root development, lodging and poor nutrient uptake. Observing good establishment practices ensures the sustainability and profitability of the coffee enterprise.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Enhanced funding for the management practice • Willingness of farmers to adopt the practices • Capacity building on coffee establishment
Partners/stakeholders for scaling up and their roles	• County governments - promotion and extension, capacity building and regulations • Non-governmental organizations - provision of funds for coffee planting materials

	- Ministry of Agriculture and Livestock Development (MoALD)- capacity building of extension staff and policy regulations - Agriculture and Food Authority (AFA)- Coffee - Directorate - policy and regulations - Commodities fund- funding
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	- High initial cost of coffee establishment - Low levels of Researchers-extension staff- farmers linkage - Inadequate access to information on the coffee establishment
Suggestions for addressing the challenges	- Establishment of coffee plantation in phases - Sensitization of the farmers on the coffee establishment by trained extension officers - Strengthening research-extension-farmer linkage
Lessons learnt during its promotion, if any	Poor returns from poorly established coffee have forced affected farmers to uproot and re-plant coffee making it costly in the long run
Social, environmental, policy and market conditions necessary for up-scaling	- Supportive policy and legal framework at the National and County governments - Favourable coffee prices
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Establishment costs: - Ruiru 11- KES 100,000/acre Batian- KES 76,000/acre SL34, K7, and SL28 –KES 53,000/acre
Estimated returns	To be determined
Gender issues and concerns in development, dissemination adoption and scaling up	- Women and youths have limited access to credit to purchase the required implements required for land preparation, ploughing and harrowing etc. - Women have less access to agricultural information, technology and knowledge than men. - Women have limited access to education, training and extension services than men.
Gender related opportunities	- Affirmative action fund opportunities such as the women and youth enterprise fund exist for them to access the required finances - Employment opportunity exist males and youth males in digging, infilling holes and actual planting of coffee
VMG issues and concerns in development, dissemination, adoption and scaling up	- Due to their social status VMGs are often excluded from decision making in development and dissemination activities. - VMGs have limited access to credit to purchase the required implements required for ploughing and harrowing

	• VMGs have limited access to training and extension services.
VMG related opportunities	• Affirmative action and opportunities such as the women and youth enterprise fund exist for them to access the required finances
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Coffee farms established following the research recommendations have high production.
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations. 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA)- Coffee Directorate • Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) • Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-Serve, World Vision

3.4.2 Intercropping in coffee

2.4.2 TIMP Name	Intercropping in coffee
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Decreased yields and low farm returns • Declining soil fertility due to soil degradation • Weed infestation and vulnerability to crop pests • Lack of space to grow other crops in some coffee farming households
What is it? (TIMP description)	Intercropping is the growing of two or more crops in close proximity (in the same row or bed, or in rows or strips that are close enough) for biological interaction. It also includes the growing of two or more cash crops together. The practice offers

	the potential to increase yields, enhance soil fertility and minimize the effects of climate change  <i>Intercropping coffee and legumes</i>
Justification	Climate change is negatively impacting agricultural production. Farmers are experiencing low yields, crop failures, declined soil fertility and generally low farm returns from their investments. Intercropping is one of the potential management practices for enhancing climate change adaptation. It offers the potential to increase crop yield, enhance soil fertility/biodiversity and minimize the effects of climate change. Due to the fluctuating world coffee prices and diminishing size of land, household food and nutrition security have become threatened. It has become necessary to practice crop diversification through intercropping in coffee to expand household income streams and ensure food security.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, agro-dealers, 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 • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Willingness of farmers to adopt the intercropping systems in coffee • Sensitization on intercropping • Availability of high value intercrop
Partners/stakeholders for scaling up and their roles	• County governments - promotion and extension, capacity building on intercropping • Ministry of Agriculture and Livestock Development- extension staff and policy regulation • KALRO and other research entities- research and promotion
C: Current situation and future scaling up	
Counties where already	Thirty-two (32) coffee-growing counties

promoted if any	
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Weak Research- extension farmer linkage • Low access to information on right crops for intercropping with coffee
Suggestions for addressing the challenges	• Strengthening research-extension-farmer linkage • Capacity building of the farmers on intercropping systems in coffee
Lessons learnt during its promotion, if any	• Most of the existing intercrops are not compatible with coffee
Social, environmental, policy and market conditions necessary for up-scaling	• Favourable environment for intercrops • Supportive policy guidelines on intercropping in coffee
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Varies with type of intercrop
Estimated returns	Varies with type of intercrop
Gender issues and concerns in development, dissemination, adoption and scaling up	• The technology may reduce women work burden when it comes to weeding. • Women have less access to agricultural information, technology and knowledge than men.
Gender-related opportunities	• Intercropping offers good opportunities for various gender categories e.g. men and women to grow diverse crops for economic gains.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information, technology and knowledge
VMG related opportunities	• Intercropping places emphasis on the importance of using available land space to grow a diversity crop thus increasing biodiversity, pest management for VMGs economic and health gains.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	With the right intercrops, high coffee production and quality are realized
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations 2. Coffee Research Institute. (2017). Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box, 4-00232, Ruiru

	Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI- Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Commodities fund • Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-Serve, World Vision

Gaps

1. Appropriate agronomic practices for potential intercrop crops

3.4.3 Shade in Coffee

2.4.3 TIMP Name	Shade in Coffee
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low coffee yields due to the effects of high temperatures as a result of Climate change
What is it? (TIMP description)	This is planting of trees with suitable canopy and rooting characteristics within a coffee farm. Having a tree canopy is advantageous for coffee plants since it helps create microclimates. This is a crucial method for coping with climate change and shielding coffee plants from its adverse impacts.  <i>Trees planted within a coffee farm</i>
Justification	Higher than normal temperatures in coffee growing areas due to the effects of climate change have led to declining coffee yields. Intercropping coffee with the appropriate tree species ameliorates the situation by modifying the microenvironment. The management practice also contributes to a more sustainable use of land resources and promotes greater biodiversity. The shade trees help to regulate incident radiation, enrich the soil with humus, minimize soil erosion and reduce the intensity of

	hailstone damage and are thus a climate-smart agricultural practice.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, agripreneurs
Approaches to be used in dissemination	- Farmer Field and Business Schools (FFBS) - Agricultural innovation platforms (AIP) - Demonstrations - on-farm and on station - Agricultural shows/exhibitions/field days - Training - workshops/seminars/meetings - Public and private extension Agents - Farmer-to-farmer extension models - Mass media – electronic and print - Publications -posters/brochures/leaflets, manuals - Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	- Willingness of farmers to adopt shading systems in coffee - Capacity building on shading in coffee
Partners/stakeholders for scaling up and their roles	- County governments - promotion and extension, capacity building on intercropping - Ministry of Agriculture and Livestock Development (MoALD)- policy direction
	- Farmers - adoption of the technology - Extension staff- Transfer of knowledge through capacity building
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	- Weak Research - extension-farmer linkage - Inaccessibility of information on right shade trees and their spacing
Suggestions for addressing the challenges	- Strengthening research-extension-farmer linkage - Capacity building of the farmers on intercropping systems in coffee
Lessons learnt during its promotion, if any	Significant reduction in coffee yields due to excess shading
Social, environmental, policy and market conditions necessary for up-scaling	- Favourable environment for shading - Multi-purpose trees to provide shade, fruits, firewood and timber
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Varies with the type of shade tree used
Estimated returns	Varies with the type of shade tree used

Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to agricultural information and knowledge • Women have limited access to education, training and extension services • Women and youths have less access to credit to purchase the required coffee inputs
Gender related opportunities	• 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 have less access to agricultural information, technology and knowledge • VMGs may also have limited access to finances to buy the required inputs such as quality planting materials, manure and fertilizers • 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 opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Not documented
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations 2. Coffee Research Institute. (2017). Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G. Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box, 4-00232, Ruiru Email: director.cri@kalro.org
	Website: www.kalro.org
Lead organization and scientists	KALRO-CRI - Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Other coffee industry stakeholders e.g., KCPA, KCTA, • NGOs

3.4.4 Canopy management

2.4.4 TIMP Name	Canopy management
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Irregular annual cropping patterns • low productivity and quality
What is it? (TIMP description)	The overall process of optimizing production of bearing wood in order to maximize regular annual cropping through pruning, tree training, handling, de-suckering and change of cycle.  <i>Pruning coffee trees on a farm</i>
Justification	A well-managed canopy maximizes yield and produces a high proportion of premium coffee beans grades such as AA and AB. Properly pruned coffee is vigorous in growth and reduces the effects of disease and insect pest attacks. Well-pruned coffee does not suffer “biennial bearing phenomena” often associated with poorly managed canopy.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Willingness of farmers to adopt proper canopy management practices • Capacity building on canopy management
Partners/stakeholders for scaling up and their roles	• County governments- Promotion and extension, capacity building on canopy management • Ministry of Agriculture and Livestock Development (MoALD)- capacity building of extension staff

C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in development and dissemination	• Comprehensively understanding of the art and science behind canopy management • Weak research-extension-farmer linkage
Suggestions for addressing the challenges	• Capacity building of farmers/service providers on canopy management by training extension officers • Strengthening research-extension-farmer linkage
Lessons learnt during its promotion, if any	• Poor canopy management practices have led to low productivity and poor quality. Additionally, timely canopy management reduces cases of pest and disease on coffee trees.
Social, environmental, policy and market conditions necessary for up-scaling	None
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Batian – KES 32,000 per acre • Ruiru 11 – KES 40,000 per acre • Traditional varieties – KES 21,000 per acre
Estimated returns	
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to agricultural information, and knowledge on canopy management • Women have limited access to training and extension services
Gender related opportunities	• 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 and knowledge on canopy management • VMGs may have limited access to finances to buy the required inputs • VMGs have limited access to 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 VMGs to acquire the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	High production and quality have been realized in farms embracing proper canopy management

Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2,	Ready for upscaling
Requires validation, 3. Requires further research)	
G. Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Rose Mayoli
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate • Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) • Other coffee industry stakeholders e.g., KCPA, KCTA, Techno-Serve, World Vision

3.4.5 Canopy management

2.4.5 TIMP Name	Organic coffee production
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Restricted market access to niche markets due to maximum residue levels (MRLs) in coffee
What is it? (TIMP description)	Organic agriculture is an all-inclusive production management system that promotes and enhances agro-ecosystem health, including biodiversity and biological cycles. It emphasizes the use of locally adapted management practices and inputs in preference to the use of inorganic inputs.  <i>Organic coffee farming</i>

Justification	Organic coffee farming in Kenya is practiced by a few organised groups that targets niche markets mostly through direct sales. Due to emerging changes in consumer preferences, the practice is gaining popularity across the country. These niche markets attract high prices.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, consumers, extension service providers, coffee marketers agripreneurs
Approaches to be used in dissemination	- Farmer Field and Business Schools (FFBS) - Agricultural innovation platforms (AIP) - Demonstrations - on-farm and on station - Agricultural shows/exhibitions/field days - Training - workshops/seminars/meetings - Public and private extension Agents - Farmer-to-farmer extension models - Mass media – electronic and print - Publications -posters/brochures/leaflets, manuals - Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	- Sensitization on the technology - Field demonstration plots - Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	- County governments- capacity building - Ministry of Agriculture and Livestock Development (MoALD)- capacity building - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) - coffee marketing - Agriculture and Food Authority (AFA)- Coffee Directorate- Policy regulation and market promotion - NGOs –promotion and awareness
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in development and dissemination	Stringent demands by market segments
Suggestions for addressing the challenges	Develop harmonized standards for organic coffee production
Lessons learnt during its promotion, if any	None
Social, environmental, policy and market conditions necessary for up-scaling	- Farmers are willing to engage in organic farming for increased income - There exists a niche market demand for organic farming products

	The reduced dependence on external inputs allows farmers to use agronomic systems that are more resilient to the effects of climate change
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 agricultural information, and knowledge - Women have limited access to training and extension services - Women and youths have less access to credit to purchase the required coffee farming inputs
Gender related opportunities	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 have less access to agricultural information and knowledge - VMGs may also have limited access to finances to buy the required inputs such as quality planting materials - VMGs have limited access to training and extension services - Due to their social status VMGs are often excluded from decision-making - There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Affirmative action opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Not documented
Application guidelines for users	- Coffee Research Institute. (2020). Coffee Production Recommendations. - Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Requires validation
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny
Partner organizations	- Ministry of Agriculture, Livestock Development (MoALD) - Agriculture and Food Authority (AFA) – Coffee Directorate - Coffee marketers (CMS, SMS, Sasini, KBCM, New KPCU) - Other coffee industry stakeholders e.g., KCPA, - NGOs

3.5 Soil Fertility Management

3.5.1 Coffee Nutrition

2.5.1 TIMP Name	Coffee Nutrition
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low yields and quality in coffee
What is it? (TIMP description)	It is the timely and optimal application of required nutrients to the coffee plant to enhance productivity and quality. It involves the application of both macro and micro-nutrients to the plant at a specific period based on soil and leaf analysis recommendations.  <i>A healthy coffee tree</i>
Justification	The coffee plant requires an adequate supply of nutrients to produce optimally. Most of the soils have inadequate nutrient reserves to sustain proper plant growth and production. The coffee tree requires certain elements in large quantities such as. Nitrogen (N), Phosphorous (P), Potassium (K) among others.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, agripreneurs, farm input manufacturers and suppliers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology

	• Field Demonstration plots • Enhanced funding for technology dissemination • Policy regulations on subsidized inputs
Partners/stakeholders for scaling up and their roles	• National and County governments- policy and extension framework • Commodities fund- fund input procurement • New KPCU- advance inputs through the Cherry Advance Revolving Fund • Farm inputs manufacturers and suppliers – supply • certified inputs
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in dissemination	• Low levels of awareness by farmers on the importance of coffee nutrition • Sustainable sources of fertilizers • Sub-standard organic and inorganic fertilizers in the market
Suggestions for addressing the challenges	• Use of low-cost and available fertilizers • Sensitization and capacity building of the farmers on coffee nutrition • Strength quality assurance of irrigation equipment
Lessons learned in upscaling if any	Farmers who adhere to the nutrition programs have consistently and sustainably optimized productivity and quality
Social, environmental, policy and market conditions necessary for development and up-scaling	• Higher economic returns as compared to non-fertilized farms • Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Ruiru 11 – KES 90,000 per acre • Batian – KES 70,000 per acre • Traditional varieties - KES 50,000 per acre
Estimated returns	
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to agricultural information, and knowledge on the management practice • Women have limited access to training and extension services • Women and youths have less access to credit to purchase the required coffee inputs such as manure and fertilizer
Gender related opportunities	• 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 have less access to agricultural information, and knowledge • VMGs may also have limited access to finances to buy the required inputs such as manure and fertilizers

	• VMGs have limited access to 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 VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers who adhere to the nutrition programs have consistently and sustainably optimized productivity and quality.
Application guidelines for users	1. Coffee Research Institute. (2020) Coffee Production Recommendations. 2. Coffee Research Institute. (2017) Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box,4-00232, Ruiru
	Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA) – Coffee • Directorate • KEBS • Farm input suppliers

Research Gaps:

1. Field assessment for various newly formulated fertilizers.

3.5.2 Soil and leaf analysis

2.5.2 TIMP Name	
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low production due to nutrient deficiency
What is it? (TIMP description)	It is soil and leaf sampling, laboratory analysis, and generation of soil fertility reports and recommendations.

	 <i>Some of the apparatus used to collect samples</i>
Justification	Soil and leaf analysis is an important aspect of coffee farming. The purpose of the analysis is to provide farm-specific advice on the fertilizer use and other soil management practices. Farmers are required to undertake soil and leaf analysis periodically (every 2-3 years).
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, agripreneurs, extension service providers, Government agencies, manufacturers and suppliers of farm inputs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Willingness of farmers to take up soil and leaf analysis • Capacity building on soil and leaf sampling techniques • Funding for soil and leaf analysis services
Partners/stakeholders for scaling up and their roles	• County governments- promotion and extension, capacity building on soil and leaf analysis • Commodities fund- funding costs relating to sampling and analysis • Fertilizer manufacturers- funding and development of fertilizer formulations
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee-growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Low levels of awareness by farmers on the importance of soil and leaf analysis

Suggestions for addressing the challenges	Capacity building of the farmers on soil and leaf sampling techniques
Lessons learned in up scaling if any	Delay in effective implementation of the recommendations by the farmers leads to low productivity
Social, environmental, policy and market conditions necessary for development and upscaling	- Improved coffee production and income as a result of implementing soil analysis recommendations - Favourable agricultural policy on plant nutrition
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES1,000 per soil sample KES 1,000.00 per leaf analysis
Estimated returns	To be determined
Gender issues and concerns in dissemination, adoption and scaling up	- Women have less access to agricultural information, and knowledge - Women have limited access to education, training and extension services - Women and youths have less access to credit to purchase the required inputs
Gender related opportunities	- Employment opportunities exist for the youths in performing the task of soil and leaf analysis - 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 have less access to agricultural information, and knowledge - VMGs have limited access to 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	- Employment opportunities exist for the youths in performing the task of soil and leaf analysis - Affirmative action opportunities exist for VMGs to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers where leaf and soil analysis are conducted as recommended have increased production and quality of coffee
Application guidelines for users	- Coffee Research Institute. (2020). Coffee Production Recommendations - Coffee Research Institute. (2017). Coffee Growers Handbook
F: Status of TIMP Readiness (1.Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling

H: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O Box,4-00232, Ruiru Email: director.cri@kalro.org Website.www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock, Development (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate • County Governments

3.5.3 Rapid Soil Testing

2.5.3 TIMP Name	Rapid Soil Testing
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Low yields due to nutrient deficiency • Limited access to soil testing services and low uptake due to high costs for conventional methods • Lack of paired soil and leaf testing solutions in conventional methods to determine the health of soil and crop simultaneously
What is it? (TIMP description)	This is a dry method for soil testing using the interaction of electromagnetic radiation with matter to characterize the biochemical composition of soil and/or plant tissue. It does not require routine laboratory analysis using chemicals. When a sample is run through a scanner, soil testing results are generated with accompanying recommendations instantly. However, the method requires partners involved (ICRAF and iSDA) to work closely with KALRO and county agricultural officers to sensitize farmers to embrace the testing method. This innovation will involve working closely with agronomists to generate specific fertilizer recommendations driven by soil and crop data obtained.
Justification	Rapid soil testing provides farm-specific advice on fertilizer use and other soil management practices. Soil testing is the basis for good fertilizer management that maintains the soil productivity and improves the quality of crops. It promotes efficient fertilizer use, prevents environmental pollution from excess fertilizer application, and provides cost-efficient solutions. However, limited access to soil testing services is depriving farmers' ability to make informed decisions about soil management and fertilizer use. Farmers are required to undertake soil and leaf analysis periodically (every 2–3 years).

B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, agripreneurs, extension service providers, Government agencies, manufacturers and suppliers of farm inputs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Willingness of farmers to take up soil and leaf analysis • Capacity building on soil and leaf sampling techniques • Funding for soil and leaf analysis services
Partners/stakeholders for scaling up and their roles	• County governments- promotion and extension, capacity building on soil and leaf analysis • Commodities fund- funding costs relating to sampling and analysis • ICRAF and iSDA- Tests and validate the recommendations obtained in collaboration with Soil Cares and KALRO. • Fertilizer companies- provide fertilizer blends according to soil health status • Agro-dealers- to stock required fertilizers that is readily available to farmers
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee-growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• It requires continuous updating of methods to improve recommendations. • Low levels of awareness by farmers on the importance of soil and leaf analysis
Suggestions for addressing the challenges	• Capacity building of the farmers on soil and leaf sampling techniques • Awareness creation, intensive farmer field training (capacity building) • Make the whole process cost efficient. Use of scanners (spectroscopy) and less wet chemistry analysis • Automated methods for updating existing recommendations by generating local soil libraries
Lessons learned in up scaling if any	Delay in effective implementation of the recommendations by the farmers leads to low productivity

Social, environmental, policy and market conditions necessary for development and up-scaling	Favourable environment during soil and leaf sampling
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES1,000 per soil sample KES 1,000 per leaf analysis
Estimated returns	To be determined
Gender issues and concerns in development and dissemination, adoption and scaling	• Women have less access to credit to pay for the rapid soil testing services • Women and youth have limited access to land for coffee cultivation • Women have less access to agricultural information, and knowledge • Bringing services closer to the users saves time and resources to the various gender categories using the rapid soil testing.
Gender related opportunities	• Employment opportunities exist for youths who can be trained on soil sampling to help the local community in rapid soil testing
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information, technology and knowledge
VMG related opportunities	• Employment opportunities exist for youths who can be trained on soil sampling to help the local community in rapid soil testing
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers where leaf and soil analysis are conducted as recommended have increased production and quality of coffee
Application guidelines for users	1. Coffee Research Institute. (2017) Coffee Growers Handbook 2. Coffee Research Institute. (2020) Coffee Production Recommendations
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box,4-00232, Ruiru Email: director.cri@kalro.org Website.www.kalro.org
Lead organization and scientists	KALRO-CRI-Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock Development, (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate • County Governments

3.5.4 Integrated Soil Fertility Management

2.5.4 TIMP Name	Integrated Soil Fertility Management
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low coffee production and low quality coffee
What is it? (TIMP description)	This is a set of soil fertility management practices that include the use of fertilizers, locally available organic inputs, improved seed and good agronomic practices to adapt to local conditions. It is the timely and optimal application of required nutrients to the coffee plant to enhance productivity and quality.
Justification	Soils within the farming system are heterogeneous due to spatial variability in soil fertility. These inherent differences arise from the parent material from which the soil has evolved, and the position in the landscape that influences how soil develops. The coffee plant requires adequate supply of nutrients in order to produce optimally. Most of the soils have inadequate nutrient reserves to sustain proper plant growth and production.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, agripreneurs, extension service providers, farm input manufacturers and suppliers, National and County governments
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Sensitization on the technology • Field Demonstration plots • Enhanced funding for technology dissemination • Policy regulations on subsidized inputs
Partners/stakeholders for scaling up and their roles	• National and County governments- policy and extension framework • Commodities fund- fund input procurement • New KPCU- advance inputs through the Cherry Advance Revolving Fund • Farm inputs manufacturers and suppliers- supply certified inputs
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee-growing counties

Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in dissemination	• High cost of fertilizers • Low levels of awareness by farmers on the importance of coffee nutrition • Sustainable sources of fertilizers • Sub-standard organic and inorganic fertilizers in the market
Suggestions for addressing the challenges	• Use of low-cost and available fertilizers • Sensitization and capacity building of the farmers on coffee nutrition • Strength quality assurance of irrigation equipment
Lessons learned in up scaling if any	• Farmers who adhere to the nutrition programs have consistently and sustainably optimized productivity and quality
Social, environmental, policy and market conditions necessary for development and up-scaling	• Higher economic returns as compared to non-fertilized farms • Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Ruiru 11 – KES 90,000 per acre • Batian – KES 70,000 per acre • Traditional varieties - KES 50,000 per acre
Estimated returns	To be determined
Gender issues and concerns in development, dissemination, adoption and scaling up	• It is labour-intensive, hence may not be adopted by women who are already overburdened. • Women and youth have limited access to credit to purchase the required inputs such as fertilizers • Women have less access to agricultural information and knowledge
Gender related opportunities	Opportunity exists for women to access the required credit through the women enterprise funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs have less access to agricultural information and knowledge • It is labour-intensive hence may not be adopted by some VMGs who are elderly. • VMG's have limited access to credit to purchase the required inputs such as fertilizers than men.
VMG related opportunities	• Affirmative action in various areas as for instance in the provision of finances to VMGs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers who adhere to the nutrition programs have consistently and sustainably optimized productivity and quality.
Application guidelines for users	1. Coffee Research Institute. (2020) Coffee Production Recommendations 2. Coffee Research Institute. (2017) Coffee Growers Handbook

F: Status of TIMP Readiness (1.Ready for upscaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O Box,4-00232, Ruiru Email: director.cri@kalro.org Website.www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA) – Coffee Directorate • KEBS • Farm input suppliers

Gaps

1. Field assessment for various newly formulated fertilizers.

3.5.5 Low-cost composting

2.5.5 TIMP Name	Low-cost composting
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Low coffee yields • Environmental contamination from the use of inorganic fertilizers • Mitigation against GHG emissions
What is it? (TIMP description)	Composting is an effective process for recycling organic waste intended for use in agriculture. Composting is the biological decomposition of organic waste such as food or plant material by bacteria, fungi, worms, and other organisms under controlled aerobic conditions, resulting in the accumulation of partially decayed organic matter called humus.  <i>Compost heap</i>

Justification	Compost contains nutrients such as nitrogen, phosphorus, and potassium, which are found in most chemical fertilizers, as well as secondary and trace elements such as zinc, iron, and magnesium, which are useful to the roots of growing plants. The compost also adds balanced nutrients to the soil in an easily assimilated form and helps improve soil structure by lightening heavy clays and improving water retention properties in porous sands. Coffee compost improves the environment through the use of environmentally friendly coffee by-products.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, agripreneurs, extension officers, farm input manufacturers and suppliers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field Demonstration plots • Enhanced funding for technology dissemination • Policy regulations on subsidized inputs
Partners/stakeholders for scaling up	• National and County governments- Policy and extension framework • Commodities fund- To fund input procurement • New KPCU- To advance inputs through the cherry Revolving Fund
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Challenges in dissemination	• Low levels of awareness by farmers on the importance of coffee nutrition • Sustainable sources of coffee pulps
Suggestions for addressing the challenges	• Sensitization and capacity building of the farmers on coffee Compost • Synchronize the production of coffee pulps with usage
Lessons learned in up scaling if any	The source of coffee pulps for composting needs to be enhanced
Social, environmental, policy and market conditions	• Higher economic returns as compared to non-fertilized farms • Favourable macro business environment

necessary for development and up-scaling	• Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Preparation of composts requires labour for building a compost heap, maintaining it and finally transporting and applying it field which take a lot of effort and time
Estimated returns	To be determined
Gender issues and concerns in development, dissemination, adoption and scaling up	• It is labour-intensive hence may not be adopted by women who are already overburdened • Women and youth have limited access to credit to purchase the required inputs such as such as fertilizers • Women and youth have limited access to land for kale cultivation • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	• Opportunity exist for women to access the required credit through the women enterprise funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge • It is labour intensive hence may not be adopted by some VMGs who are elderly • Women and youth have limited access to credit to purchase the required inputs such as such as fertilizers
VMG related opportunities	• Affirmative action in various areas as for instance in the provision of finances to VMGs.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. Coffee Research Institute. (2020) Coffee Production Recommendations 2. Coffee Research Institute. (2017). Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Up scaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Joseph K Mburu
Partner organizations	Coffee co-operative societies

Research gaps

1. Conduct nutrient budget study on selected farms using composts in the 24 Counties
2. Efficiency of composting types available to farmers

3.6 Soil and Water Management

3.6.1 Bench Terraces

2.6.1 TIMP name	Bench Terraces
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Low yields due to soil erosion and increased runoff • low soil water retention capacity
What is it? (TIMP description)	Bench terraces consist of a series of beds that are more or less level and run across a slope at vertical intervals, supported by steep banks or risers (walls or bunds). The flat beds created by bench terraces enable the cultivation of crops on medium- to steep slopes. The technology is highly suitable for semi-arid to humid regions of rainfall (700 mm) or more and medium to steep slopes (12–47%). Bench terraces are not recommended for slopes less than 12%, soil depths of greater than 50 cm, or areas with no gullies, nor stones.  <i>Bench terrace (Source: FAO)</i>
Justification	Agricultural production is threatened in many parts of the Kenya by soil erosion and limited soil moisture. Conservation of soil and moisture through the construction of terraces has led to better and more reliable crop yields, especially in the ASAL counties of Kenya. Climate change increases the likelihood of heavy downpours, which raises the risk that surges of flowing water will carry soil away with it. Bench terraces can slow down water flow and help reduce erosion and improve infiltration
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, agripreneurs
Approaches used in dissemination	• On-farm demonstrations during farmer field schools • Training in workshops.

	• Extension information materials which will be distributed to farmers through farmer groups and the county extension service providers.
Critical/essential factors for successful promotion	• Availability of labour as the technology is labour intensive. • Farmers and extension service with skills to design and construct contour bunds • Land tenure systems that allows individual ownership
Partners/stakeholders for scaling up and their roles	• County government extension service providers – delivery of information to farmers, technology access, capacity building • Community farmer groups – Provide on-farm demonstration plots to hold farmer field schools. • External service providers – capacity building and access to technology
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee-growing counties.
Current extent of reach	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma
Counties where TIMP will be promoted	Thirty-two (32) coffee-growing counties
Challenges in dissemination	• Increased risk of soil erosion if terraces are improperly laid out • Labour intensive during construction and maintenance and many farmers may find it difficult to implement at large scale • Land tenure systems – communal land ownership, or in places where individuals don't have land title deeds
Suggestions for addressing the challenges	• Farmers need to be supported with appropriate equipment for preparation of Bench terrace for efficiency and increased output per man hour. • Training youthful farmers to be champions of making bench terraces construction at the Ward level/village level. • Training on site specific designs and construction of bench terraces • Fast-track land registration
Lessons learned if any	• Terracing is popular due largely to the rapid benefits it gives in terms of improved crop performance. • Existence of well-developed self-help groups can lead to successful soil and water conservation activities • Conducting publicity campaigns has been found to add to the success of soil and water conservation. • Similarly, when the farmers are adequately trained and sensitized on the technology, many of them would be willing to invest.

Social, environmental, policy and market conditions necessary	• Enforce policies on soil and water conservation at the County level • Create awareness on the importance of soil and water conservation • Avail low-cost technologies for soil and water conservation • Policies that support individual land tenure systems
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The main input cost is the labour for <i>Bench terrace</i> preparation. The cost will depend on the land size, labour costs and the landscape terrain/slope
Estimated returns	Bench terraces broadly provide ecosystem services, through conservation of soil and water. Economic returns depend on the value chain being addressed.
Gender issues and concerns in development, dissemination, adoption and scaling up	• It is labour intensive in terms of preparation and application hence may not be adopted by women who are already overburdened • Women and youth have limited access to land for coffee cultivation • Women may have less access to agricultural information, and knowledge
Gender related opportunities	• Opportunities for youth males employment exist in performing the task of bench terraces
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • Women have less access to agricultural information, technology and knowledge • The technology is labour intensive and may be difficult for the VMG to implement in the field.
VMG related Opportunities	• Opportunities for youth males employment exist in the task of bench terraces.
E: Case studies/profiles of success stories	
Success stories	the Kyungu Mwethya group in Machakos had improved harvests after construction of terraces
Application guidelines for users	FAO (2021) Crop sector development strategy for Eastern Africa
F: Status of TIMP readiness (1=Ready for up scaling; 2=Requires validation; 3=Requires further research)	1 =Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box, 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI- Danstan Odeny
Partner organizations	• County governments • Public-Private-Partnerships

3.6.2 Grass strips

2.6.2 TIMP Name	Grass strips
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Land degradation due to water erosion
What is it? (TIMP description)	Involves activities that maintains or enhances the productive capacity of land in areas affected by or prone to soil erosion. It includes prevention, reduction and control of soil erosion alongside proper management of the land and water resources  <i>Grass strips</i>
Justification	Agronomic soil and water conservation practices improve land productivity through control, diversion and conservation of surface run-off.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, extension service providers, researchers, agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization ofpro the technology • Field Demonstration plots • Enhanced funding for technology dissemination • Availability of essential equipment to promote soil and water conservation
Partners/stakeholders for scaling up and their roles	• National and County governments – promotion of soil and water harvesting practices

	• Ministry of Water, Sanitation and Irrigation – policy direction • Water Resources Management Authority- regulation • National and County governments- promotion and extension services • Commodities fund- to finance procurement of essential equipment for soil and water conservation • Manufacturers - supply the equipment
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee-growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• High cost of equipment especially for conserving soil and water • Low levels of awareness by farmers on Soil and water conservation
Suggestions for addressing the challenges	• Use of low-cost equipment for soil and water conservation • Sensitization and capacity building of the farmers on coffee irrigation
Lessons learned in up scaling if any	Farmers who adhere to soil and water conservation practices have consistently and sustainably optimized productivity and quality
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Terraces/grass strips KES 35,000.00 per acre
Estimated returns	
Gender issues and concerns in development, dissemination, adoption and scaling up	• It is labour intensive in terms of preparation and application hence may not be adopted by women who are already overburdened. • Women and youth have limited access to land for coffee cultivation. • Women have less access to agricultural information and knowledge
Gender related opportunities	• Employment opportunities for the various gender categories i.e., youths, women and men performing the task.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • Women have less access to agricultural information, and knowledge • The technology is labour intensive and may be difficult for the VMG to implement in the field.
VMG related Opportunities	• Employment opportunities for youths exist in performing the task.

E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. Coffee Research Institute (2020) Coffee Production Recommendations. 2. Coffee Research Institute (2017) Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O Box,4-00232, Ruiru Email: director.cri@kalro.org Website.www.kalro.org
Lead organization and scientists	KALRO-CRI, Joseph Mburu, Rose Mayoli
Partner organizations	National and County governments

3.6.3 Mulching in coffee

2.6.3 TIMP name	Mulching in coffee
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low crop yields due to accelerated loss of soil moisture, water stress, weed infestation and loss of organic matter
What is it? (TIMP description)	The practice of covering the soil/ground with natural materials such as straw, dead leaves and compost to make more favourable conditions for plant growth, development and efficient crop production. Plastics like polythene, and row covers are also used as mulch. Benefits include; retention of moisture in the soils, suppress weeds, lowers soil temperature, and help improve soil fertility as the mulches decompose.  Mulching (Source: Odeny D.A.)

Justification	Mulching facilitates the retention of soil moisture and helps in control of temperature fluctuations, improves the physical, chemical and biological properties of soil, as it adds nutrients to the soil and ultimately enhances the growth and yield of crops. It minimizes weed problems and nutrient loss. It also improves soil; structure directly by preventing raindrop impact and indirectly by promoting biological activity.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, extension service providers, researchers, agripreneurs
Approaches used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Availability of plant or crop residues. • Size of the land. • Competing uses of crop residues. • Type of the crops
Partners/stakeholders for scaling up and their roles	• County government extension services; Provide link with farmers • Community farmer groups; play coordination role for ease in problem identification and dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties.
Current extent of reach	Farmers, extension service providers, researchers, agripreneurs
Counties where TIMP will be promoted	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Lack of enough plant and crop residues due to competing uses • Possibilities of insect build up categorized as pest or disease vectors
Suggestions for addressing the challenges	• Crop diversification to increase availability of residues. • Establish and follow a good integrated pest control management program for the particular crop. • Adapting alternative mulching materials like high absorbance polymers in fruit trees like mangoes and

	Bananas, as well as plastic mulches and row covers in vegetables
Lessons learned if any	There is need to adapt alternative mulching technologies in addition to use of organic materials like crop, plant residues, and agricultural processing wastes.
Social, environmental, policy and market conditions necessary	• Practice is socially acceptable • Environmentally friendly • Increased productivity will provide supply to the markets • Supporting frameworks/policies are available.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Organic mulch is low-cost but labour-intensive practice during the initial application. Such costs are dependent on the value chain and plant spacing. However, plastic mulch is costly and needs to be used for high-value crops.
Estimated returns	Dependent on the type of value chain and mulch used
Gender issues and concerns in development, dissemination, adoption and scaling up	• Mulching is labour intensive hence it may increase the labour burden for the various gender categories. This may lead to the technology not being adopted especially by women who are already overburdened. • The TIMP will reduce women's weeding time that can be used performing other productive activities.
Gender related opportunities	• The TIMP can offer employment opportunities for the youths. • The mulch is locally available on-farm.
VMG issues and concerns in development, dissemination, adoption and scaling up	• Since the activity is labour intensive it may increase the labour burden for the various gender categories. This may lead to the technology not to be adopted. • The TIMP will reduce women's weeding time that can be used performing other productive activities.
VMG related opportunities	• The TIMP can offer employment opportunities for the youths • The mulch is locally available on-farm
E: Case studies/profiles of success stories	
Success stories	Farmers in different value chains have reported improved soil conditions, reduced runoff and nutrient loss, soil moisture retention in the soil and generally increased crop production following application of mulching technology.
Application guidelines for users	1. Coffee Research Institute (2020) Coffee Production Recommendations 2. Coffee Research Institute (2017) Coffee Growers Handbook
F: Status of TIMP readiness (1=Ready for up scaling; 2=Requires validation; 3=Requires further research)	1 =Ready for up scaling (Organic mulch)
G: Contacts	

Contacts	Institute Director, Coffee Research Institute, P.O Box, 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny
Partner organizations	County governments Public-Private-Partnerships

3.7 Irrigation and Drainage Management

3.7.1 Cobalt Chloride moisture deficit kit

2.7.1 TIMP Name	Cobalt Chloride moisture deficit kit
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Rapid technology to assess water stress at critical stages of coffee development and timely conduct the irrigation
What is it? (TIMP description)	It is used to determine and schedule irrigation in coffee. This is accomplished by attaching a blue (dry) cobalt chloride paper disc on the lower leaf surface and noting the time it takes to change from blue to pink (wet). If the average time taken to change from blue to pink is 5 minutes or more, the leaf water potential is 2.0Mpa or lower and irrigation should be applied.  <i>Cobalt Chloride moisture deficit kit</i>
Justification	A cheap and easy technique to use to determine water stress on coffee and make timely irrigation that enhances the coffee yield and quality
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, agripreneurs, agri-dealers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models

	• Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization of the technology • Field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• County governments - promotion and extension • Cooperative societies – Supply of Cobalt Chloride moisture deficit kits
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Low levels of awareness by farmers on the importance of Cobalt Chloride moisture deficit kits
Suggestions for addressing the challenges	• Sensitization and capacity building of the farmers on Cobalt Chloride moisture deficit kits
Lessons learned in up scaling if any	• Timely irrigation leads to high coffee productivity
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 400 per unit
Estimated returns	Not yet determined
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited access to land for coffee cultivation • Women and youth may also have limited access to finances to purchase the technology • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	• Employment opportunities exist for youth operating the technology
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to land for coffee cultivation • VMGs may also have limited access to finances to purchase the technology • VMGs have less access to agricultural information, technology and knowledge
VMG related opportunities	• Affirmative action in various areas as for instance in the provision of finances to VMGs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None

Application guidelines for users	1. Coffee Research Institute (2020) Coffee Production Recommendations 2. Coffee Research Institute (2017) Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P. O. Box 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Rose Mayoli
Partner organizations	• Irrigation systems suppliers • County Governments • Coffee Cooperative Societies

3.7.2 Sprinkler Irrigation in Coffee

2.7.2 TIMP Name	Sprinkler Irrigation in Coffee
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Water stress at critical stages of coffee production
What is it? (TIMP description)	Irrigation is the artificial application of water to the soil during moisture stress period. <i>Sprinkler irrigation</i>
Justification	Sprinkler irrigation in coffee supplement rainfall. It increases efficiency in fertilizer uptake and utilization. In addition, it induces flowering resulting to significant increase in yields and quality. The coffee plant requires sufficient moisture for root development and vegetative growth.
B: Assessment of dissemination and scaling up/out approaches	

Users of TIMP	Farmers, researchers, extension service providers, irrigation system suppliers, agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization of the technology • Field Demonstration plots • Enhanced funding for technology dissemination • Availability of good quality water for irrigation
Partners/stakeholders for scaling up and their roles	• Ministry of Water, Sanitation and Irrigation – policy direction • Water Resources Management Authority- regulation • County governments- promotion and extension on coffee irrigation • Commodities fund- to finance procurement of irrigation equipment for coffee farmers • Irrigation system service providers – to supply and maintain/service the equipment
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in development and dissemination	• High cost of the initial installation of equipment especially for drip and overhead irrigation • Low levels of awareness by farmers on the importance of coffee irrigation • Sustainable sources of water for irrigation • Sub-standard irrigation equipment in the market
Suggestions for addressing the challenges	• Use of low cost and available irrigation technologies such as basin and bottles • Sensitization and capacity building of the farmers on coffee irrigation • Efficient use of available water • Strength quality assurance of irrigation equipment
Lessons learned in up scaling if any	• Farmers who adhere to the irrigation programs have consistently and sustainably optimized productivity and quality

Social, environmental, policy and market conditions necessary for development and up-scaling	• Higher economic returns as compared to rain fed agriculture • Favourable macro business environment • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Estimated cost of installation: - • Overhead irrigation- KES 700,000/acre
Estimated returns	• Not yet determined
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited access to land for coffee cultivation • Women have less access to agricultural information, and knowledge
Gender related opportunities	• Employment opportunities for the various gender categories i.e., youth males and men 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 than men. • VMGs have less access to agricultural information, technology and knowledge than men.
VMG related opportunities	• Employment opportunities for youths exist in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Enhanced coffee flowering and high production are as a result of irrigation management practice
Application guidelines for users	1. Coffee Research Institute (2020) Coffee Production Recommendations 2. Coffee Research Institute (2017) Coffee Growers Handbook 3. Drip Irrigation: Options for Smallholder Farmers In Eastern and Southern Africa Sijali I.V (2001)
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P. O. Box 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Rose Mayoli
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA)- Coffee Directorate • KEBS • Irrigation systems suppliers • Water Resource Management Authority

Research gap

1. Quantification of the appropriate amounts of water and the frequency of irrigation required for different stages of coffee growth

3.7.3 Solar Irrigation Systems for smallholder farmers

2.7.3 TIMP name	Solar Irrigation Systems for smallholder farmers
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem to be addressed	• High cost of pumping water for irrigation using electricity or fossil fuel powered pumps • Reduction of greenhouse gas emissions
What is it? (TIMP description)	These are systems equipped with solar panels to generate electricity, which is then used to power pumps for drawing, lifting, and distributing water for irrigation purposes.
Justification	There has been a general increase in diesel and electricity prices, making pumping irrigation water a costly operation. Though Solar panels have been used successfully to light houses and in small businesses in rural areas, they have hardly been used in the irrigation systems despite their potential. Solar power would be a good power source for addressing climate-smart agriculture focusing on renewable and green energy. It also has the advantage of low cost and sustainability.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, irrigation system suppliers, agripreneurs
Approaches used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Documentation of available solar irrigation systems • Access to solar irrigation performance data. • Improving solar irrigation systems efficiencies in irrigation schemes • Creating local support for solar irrigation technologies

Partners/stakeholders for scaling up and their roles	- Ministry of Water, Sanitation and Irrigation – policy direction - Water Resources Management Authority- regulation - County governments- promotion and extension on coffee irrigation - Commodities fund- to finance procurement of irrigation equipment for coffee farmers - Irrigation system service providers – to supply and maintain/service the equipment
C: Current situation and future scaling up	
Counties where already promoted if any	Various Counties including Marsabit, Garissa, Machakos, Nyeri, Kajiado, Siaya, Bomet, Kericho and Uasin Gishu
Counties where TIMP will be promoted	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	- High cost of the initial installation of equipment - Farmers lack knowledge on the potential of solar as a power source for irrigation systems - Sustainable sources of water for irrigation - Sub-standard irrigation equipment in the market
Suggestions for addressing the challenges	- Promote efficient low cost solar systems - Awareness creation on advantages of solar irrigation and the different solar irrigation systems - Capacity building of extension workers - Developing information packages - Creating solar irrigation systems network
Lessons learned if any	Solar irrigation systems should be well-designed for water delivery, storage and application to the field.
Social, environmental, policy and market conditions necessary	- Practice is socially acceptable, - Environmentally friendly, - Policies are friendly to the technology - Capable of increasing marketable products
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Higher investment costs but low operation costs. Costs depend on the energy required and size of irrigated area.
Estimated returns	Not determined
Gender issues and concerns in development, dissemination, adoption and scaling up	- Women and youth have limited access to land for coffee cultivation - Women and youth may also have limited access to finances to implement and operationalize the solar irrigation system. - Women have less access to agricultural information and knowledge
Gender related opportunities	Employment opportunities exist for youth in installing the solar irrigation systems.
VMG issues and concerns in development, dissemination, adoption and scaling up	VMGs have limited access to land for coffee cultivation

	• VMGs may also have limited access to finances to implement and operationalize the solar irrigation system. • VMGs have less access to agricultural information and knowledge t
VMG related opportunities	• Affirmative action in various areas as for instance in the provision of finances to VMGs.
E: Case studies/profiles of success stories	
Success stories	Solar irrigation systems success stories have been reported in Counties such as Kajiado on high value crops
Application guidelines for users	Choose a solar irrigation system that suits the farm area to irrigate Use efficient water application method such as drip to avoid wastage since the water is relatively scarce.
F: Status of TIMP readiness (1=Ready for up scaling; 2=Requires validation; 3=Requires further research)	2 =Requires validation
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P. O. Box 4-00232, Ruiru Email: director.cri@kalro.org Website.www.kalro.org
Lead organization and scientists	KALRO-CRI, Rose Mayoli
Partner organizations	• Solar irrigation systems suppliers • National Irrigation Acceleration Programme (NIAP) • Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA)- Coffee Directorate • KEBS • Water Resource Management Authority

Gaps

1. Upscaling of the technology to smallholder community schemes
2. Solar irrigation systems that maximize crop water productivity

3.7.4 Drip Irrigation Systems for smallholder farmers

2.7.4. TIMP name	Drip Irrigation Systems for smallholder farmers
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Increased crop water stress caused by seasonal • Rainfall variability in rain-fed production

What is it? (TIMP description)	This is a technology that supplies water to plants grown in solid substrates in small controlled drops. It allows the optimal usage of the limited water resource by dripping water slowly into the crop roots at low pressure through a number of emission points (drippers). A drip system saves water by minimizing evaporation losses and delivering water at the root zone where it is required. It also provides the opportunity for farmers to increase crop yields. It's easy to design and operate. The layout can either be above the surface or buried below the surface. The system provides efficient fertilizer usage (fertigation) with irrigation water  <i>Drip irrigation system in Coffee (Source: Sakami Coffee)</i>
Justification	The impacts of climate change (seasonal rainfall variability and drought) to crop production is a real threat to food security. Main streaming drip irrigation systems into crop production provides the opportunity for farmers to enhance crop resilience, increase yields and incomes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension service providers, irrigation system suppliers, agripreneurs
Approaches used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - on-farm and on station • Agricultural shows/exhibitions/field days • Training - workshops/seminars/meetings • Public and private extension Agents • Farmer-to-farmer extension models • Mass media – electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– website, dashboards, Apps, social media and short message services
Critical/essential factors for successful promotion	• Correct field design (system installation) of the drip system to minimize water inefficiencies. • Training of farmers and extension • Drip management skills
Partners/stakeholders for scaling up and their roles	• County governments- capacity building, supportive policies and frameworks

	• Private sector (AMIRAN)- facilitate access to technology; technology demonstration; access to credit • NGOs (Kenya Red Cross- KRC, Action Aid, World Vision, and OXFAM); facilitate access to technology; technology demonstration
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Current extent of reach	Used extensively by vegetable farmers
Counties where TIMP will be promoted	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Relatively high cost of drip kits for majority of poor resource farmers in ASALs. • High temperatures experienced in ASALs cause water salinity challenges • Drip poly tubing also tend to collapse causing inadequate water conveyance along the tube • Limited knowledge on the drip irrigation technology and its management
Suggestions for addressing the challenges	• Model farmer demonstration would create awareness and willingness to invest on the system • Modification of drip system tubes in ASAL areas is required (use of PVC pipes) to manage clogging free flow of water • Regular maintenance of the system especially the drip filters is required to flush out accumulated salts that tend to clog emitters • Intensive farmer training is required on the management of drip irrigation system
Lessons learned if any	• Drip system increases yield, incomes and food security • Linking farmers with markets is critical for enhancing sustainability • Covering the soil with organic matter (crop residue or green manures) in a drip system have also helped preserve moisture and additional nutrients to the soil • It is also important to link farmers to Micro Finance Institutions for financial needs
Social, environmental, policy and market conditions necessary	• Capacity building for increased awareness • Policy support for increased investments in Drip irrigation systems • The water quality should be known to adjust the drip systems to avoid clogging
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 200,000 per acre
Estimated returns	• Income from drip system rises by as much as 35% stemming from the management of crop water stresses.

	Increased water saving means more water is available for other competing needs (domestic, livestock or industrial).
Gender issues and concerns in development, dissemination, adoption and scaling up	- Women and youths have less access to credit required to install drip irrigation. - Women have less access to technology and information on the TIMP. - Women have less access to education, training and extension services.
Gender related opportunities	Employment opportunities exist for youths in installing the drip irrigation kits.
VMG issues and concerns in development, dissemination, adoption and scaling up	- VMGs have less access to credit required to install drip irrigation. - VMGs have less access to technology and information on the TIMP. - VMGs have less access to education, training and extension services.
VMG related opportunities	Employment opportunities exist for youths in installing the drip irrigation kits.
E: Case studies/profiles of success stories	
Success stories	There are many successful farmer drip irrigation models across the country implemented by government and other development partners. It is noted that linking markets to crops under drip is crucial for sustainability
Application guidelines for users	- Isaya V. Sijali, 2001. Drip Irrigation: Options for smallholder farmers in eastern and southern Africa. Technical Handbook No. 24. Published by SIDA's Regional Land Management Unit, Nairobi. - FAO, 2014. Irrigation Techniques for Small-scale Farmers: Key Practices for DRR Implementers. Rome: Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org/3/a-i3765e.pdf
F: Status of TIMP readiness (1=Ready for up scaling; 2=Requires validation; 3=Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute Q. O. Box 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Rose Mayoli
Partner organizations	County Governments, Coffee Cooperative Societies AMIRAN Kenya, HortiPro, Agro-Irrigation, Aqua-Valley Services Ltd, Davis & Shirliff, and many Micro finance institutions (MFIs)

Research gaps

1. The impact of drip irrigation on economics of agriculture in the regions of adoption under study
2. Limited irrigation packages suited to small farmers - improved irrigation, agronomy, credit, technical support and assistance with marketing – to spur adoption

3.8 Agroforestry Systems

3.8.1 Agroforestry for Soil Fertility

2.8.1. TIMP name	Agroforestry for Soil Fertility
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Land degradation characterized by the declining soil fertility, low yields, increased soil moisture stress, increased soil erosion and loss of biodiversity
What is it? (TIMP description)	It is a land use management system in which trees or shrubs are grown in, or among crops or pasture land for the purpose of improving soil fertility and rehabilitation of degraded lands. These systems include: • Improved fallows; leguminous trees planted in natural fallows • Hedgerow intercropping/alley cropping; leguminous tree species planted in hedges • Green manure; Biomass from growing leguminous plants that are cut at a certain height and ploughed back to the soil as source of manure • Mixed cropping; system of sowing two or three crops (that includes a legume) together on the same land, where one is the main crop and others are considered subsidiaries • Multi-strata; an agroforestry system whose components (crops, trees, shrubs, livestock) occupy distinct layers of the vertical structure of the community
Justification	Given the acute poverty and limited access to mineral fertilizers in most rural farmers in Kenya, the promising approach integrates organic and inorganic fertilizers. Organic fertilizers include improved fallows of leguminous trees, shrubs, herbaceous legumes and biomass transfer. Moreover, continuous land operation continues to emit more GHGs (greenhouse gases, mainly carbon) responsible for climatic changes. Agroforestry with leguminous trees has potential to: - • Increase the productivity by improving soil structure, and protect the soil against erosion and nutrient losses by maintaining a permanent soil cover and minimizing soil

	disturbance • Conserve soil water • Enhance biodiversity
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension workers, Agripreneurs
Approaches used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Training on principles and benefits of agroforestry legumes for green manure • Model demonstration plots
Partners/stakeholders for scaling up and their roles	• County governments-extension services; • Community - mobilization and support, supporting frameworks/policies at the local level • KALRO & KEFRI - Implementing institutions
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Current extent of reach	Few areas within the Counties already promoted
Counties where TIMP will be promoted	Thirty-two (32) coffee growing counties
Challenges in dissemination	• Limited species appropriate to different agro-ecological zones • Many farmers lack knowledge and skills needed to grow them • Change of mindset • Competing interests • land tenure (farmers reluctant to invest in agroforestry technologies where they do not have clear land rights)
Suggestions for addressing the challenges	• Enhance Public Private Partnerships to support increased production and market access • Improve county government capacity to train and re-tool technical team so as to enhance uptake of the technology • Availing inputs and credit • Allocation of more funds for continued research and dissemination of this technology would aid increased uptake agroforestry for soil fertility
Lessons learned if any	• Mind sets of local farmers negative about agroforestry for soil fertility improvement. • Inadequate skills in the technology and its management practices

Social, environmental, policy and market conditions necessary	Reliable technology adoption and suitable price and market access for produce grown under the improved agroforestry system
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Dependent on the technology being promoted, though minimal focusing on labour costs
Estimated returns	Returns dependent on the technology and value chain
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited access to land for cultivation • Women and youth may also have limited access to finances to implement and operationalize the technology • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	• Employment opportunities exist for youth in installing the technology
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to land for cultivation VMGs may also have limited access to finances to implement and operationalize the technology • VMGs have less access to agricultural information, technology and knowledge
VMG related opportunities	• Employment opportunities exist for youth in installing the technology • Affirmative action in various areas as for instance in the provision of finances to VMG
E: Case studies/profiles of success stories	
Success stories	Farmers who adopt the technology have reported increased and sustainable source of income
Application guidelines for users	Adopters of agroforestry for soil fertility will need training to make informed decisions on appropriate tree species to plant
F: Status of TIMP readiness (1=Ready for up scaling; 2= Requires validation; 3=Requires further research)	1= Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box, 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KEFRI and KALRO, J. Ndufa, Odeny D.
Partner organizations	County government, Private Public Partnerships

Gaps

1. Validation of existing technologies in different agro-ecological zones/Counties

3.8.2 Windbreaks and live hedges

2.8.2. TIMP name	
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Low coffee yields and quality due to effects of high temperatures, wind and drought as a result of climate change
What is it? (TIMP description)	 Source: Kundu C. A. 2022 (Mwenge Coffee farm) This is the planting of trees that have a suitable canopy and rooting characteristics within a coffee farm. Windbreak/shelterbelts/live hedges is the planting of one or two rows of trees or shrubs along the edge of the farm, boundary and around the homestead in such manner as to provide shelter from the wind by reducing wind velocity and to protect soil from erosion and to provide other tree products
Justification	Higher than normal temperatures in coffee-growing areas due to effects of climate change have led to declining coffee yields. Intercropping coffee with the appropriate tree species ameliorates the situation by modifying the micro-environment. The management practice also contributes to a more sustainable use of land resources and promotes greater biodiversity. The shade trees help to regulate incident radiation, enrich the soil with humus, minimize soil erosion and reduce the intensity of hailstone damage and are thus a climate smart agricultural practice. Proper shade tree management helps protect the coffee plant from excessive heat and reduces its exposure to direct sunshine. In addition, shade trees can act as windbreaks and also contribute to soil fertility by providing organic matter and nutrients from falling leaves. Shade trees may also help to reduce the aggressiveness of some weeds.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Farmers • Researchers • Extension officers
Approaches used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents

	• Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Willingness of farmers to adopt shading systems in coffee • Capacity building on shading in coffee
Partners/stakeholders for scaling up and their roles	• County governments - promotion and extension, capacity building on intercropping • Ministry of Agriculture and Livestock Development(MoALD)- policy direction • Farmers - adoption of the technology • Extension staff- Transfer of knowledge through capacity building
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two (32) coffee growing counties
Current extent of reach	Thirty-two (32) coffee growing counties
Counties where TIMP will be promoted	Nyeri, Kiambu, Murang'a, Kirinyaga, Embu, Machakos, Meru and Tharaka Nithi
Challenges in dissemination	• Weak Research - extension-farmer linkage • Inaccessibility of information on right shade trees and their spacing • Limited species appropriate to different agro- ecological zones • Shortage of seed
Suggestions for addressing the challenges	• Strengthening research-extension-farmer linkage • Capacity building of the farmers on intercropping systems in coffee
Lessons learned if any	Significant reduction in coffee yields due to excess shading
Social, environmental, policy and market conditions necessary for development and upscaling	• Reliable technology adoption will provide easy access to multiple tree products and income, and mitigation of climate of change • Favourable environment for shading • Multi-purpose trees to provide shade, fruits, firewood and timber
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Varies with the type of shade tree used
Estimated returns	Varies with the type of shade tree used
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women and youth have limited access to land for coffee and tree planting • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	Employment opportunities exist for men in planting trees
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to land for coffee and tree planting • VMGs may also have limited access to finances to implement and operationalize the technology

	• VMGs have less access to agricultural information, technology and knowledge
VMG related opportunities	• Employment opportunities exist for youth males in planting trees
Success stories	Farmers who adopt the technology have reported increased and sustainable source of income and increased resilience and have sufficient fuelwood for home consumption
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations. 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP readiness (1=Ready for up scaling; 2=Requires validation; 3=Requires further research)	1=Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box, 4-00232, Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Odeny
Partner organizations	• Ministry of Agriculture and Livestock, Development (MoALD) • Other coffee industry stakeholders e.g., KCPA, KCTA, • NGOs • County Governments

3.9 Coffee Crop Health

3.9.1 Integrated management of Coffee berry disease

2.9.1 TIMP Name	Integrated management of Coffee berry disease (<i>Colletotrichum kahawae</i>) in coffee
	 Coffee berry diseases (CBD) infection top left: on flowers, top right: early infection on expanding berries, bottom right: extensive lesions, and bottom left: infection on ripe berries Coffee berry disease (<i>Colletotrichum kahawae</i>) Source: James Minai (KALRO)
Category (i.e., technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem addressed	Loss of coffee yield by more than 80% and reduced quality following infection by coffee berry disease
What is it? (TIMP description)	Integrated disease management of coffee berry disease is the use of several approaches applied in an combination to break the cycle of the disease. These include: - Cultural control • Planting of resistant coffee varieties i.e. Ruiru 11, Robust coffee. • Improvement of drainage by creating water pathways in the farm, that limit the spread of the disease. • Removal old stems and strip off diseased berries to reduce sources of disease. • Pruning the coffee trees to enhance aeration through the foliage which also enables them to be sprayed effectively. Biological control • Spray the berries with Trilogy 70 EC (Clarified Hydrophobic extract of Neem oil, 70%) and follow manufacturers recommendation • Spray the berries with Bio-chance 150 SL (Naringin 150g/L) and follow manufacturers recommendation Chemical control • Spraying with a PCPB registered fungicide

Justification	Coffee berry disease causes considerable reduction in yield and lowers the quality of coffee beans. Where the disease is severe and not controlled, the yield is greatly reduced by over 80%, posing challenges and leading to rejection of produce. Integrated disease management of coffee berry disease considers food safety concerns and should be highly advocated since coffee is one of the major cash crops in Kenya
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's, 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 services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological control products • Create awareness of the benefits of the IDM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IDM technologies on diseases • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage diseases • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public) - • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in disease management • PCPB to promote registration of pesticides for disease management • Universities to develop the technologies and conduct

	ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IDM technologies • Inadequate knowledge on IDM strategies on diseases infecting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IDM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated disease management practices and safe use of pesticides
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IDM in disease management • Adoption of good agricultural practices by farmers is key in management of CBD • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through agricultural innovation platforms (AIPs)
Social, environmental, policy and market conditions necessary for development and upscaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB, to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management practices • Producers are organized in groups to ensure that management practices are effectively upscaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 100,000 as costs for fungicides and application per acre per season; KES 10,000 as labour and other costs for implementation of the rest of management practices in the IDM package per acre. Total basic costs; KES 110,000
Estimated returns	Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 per season

	Farmers who do not use the IDM package lose 80% of KES 560,000 (i.e. a loss of 448,000) (Depending on levels of infection, weather conditions and stage at which the disease affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals because revenue from the enterprise is controlled by men. • Women may have limited access to education, training and extension services • Women may have less access to agricultural information, technology and knowledge • Women have limited access to training and extension services as men attend most of the training workshops and seminars
Gender related opportunities	• Opportunities for youths exists in spraying the crop
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to training and extension services as men attend most of the training workshops and seminars • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Employment opportunities exist for youth in spraying the crop
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Successful management of coffee berry disease using the integrated disease management (IDM) increases yield and quality of coffee among farmers in the 32 counties
Application guidelines for users	1. Knowledge Bank, Coffee Berry Disease, Plantwise 2. Coffee Production Recommendations (CPR): James Minai (ed) 3. Coffee Growers Handbook: James Minai 2021
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Ms. Getrude Okutoyi Alwora KALRO-Food Crop Research Centre-Muguga: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata

Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps:

1. Explore the effectiveness of registered bio-pesticides for control of coffee berry disease

3.9.2 Integrated management of Coffee leaf rust (*Hemileia vastatrix*) in coffee

2.9.2 TIMP Name	Integrated management of Coffee leaf rust (<i>Hemileia vastatrix</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice
	 Left: early infection stages, Middle: Severe infection with coalescing lesions and Right: defoliation due to CLR infection Coffee leaf rust (<i>Hemileia vastatrix</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Coffee leaf rust causes coffee yield loss of between 75-100%
What is it? (TIMP description)	Integrated disease management (IDM) of coffee leaf rust involves the combination of cultural, biological and chemical control methods. These are: - Cultural control • Proper and timely pruning of coffee trees • Planting of resistant coffee varieties i.e., Ruiru 11, Robusta coffee Biological control • Spray the tree with Serenade® ASO SC Suspension Concentrate containing <i>Bacillus amyloliquefaciens</i> strain QST 713 13.96 g/L (1.042*10¹² CFU/L) Chemical control • Spray with a PCPB registered fungicide
Justification	Coffee leaf rust is a major disease affecting coffee. Yield losses of 75% or more have been experienced where the

	disease is severe. The use of integrated management of coffee leaf rust reduces disease incidences and lowers yield losses, hence increasing productivity and income for farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's, Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agrochemical companies to sell biological controls products • Create awareness of the benefits of the IDM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IDM technologies on diseases • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in disease management • PCPB to promote registration of pesticides for disease management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create

	awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in dissemination	• Unwillingness of farmers to adopt IDM technologies • Inadequate knowledge on IDM strategies on disease infecting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IDM options • Establish innovation platforms for technology disseminations • Dissemination of integrated disease management practices and safe use of pesticides
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IDM in insect management • Adoption of good agricultural practices by farmers is key in management of the disease • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 100,000 as costs for fungicides and application per acre per season; KES 5,000 as labour and other costs for implementation of the rest of management practices in the IDM package per acre. Total basic costs; KES 105,000
Estimated returns	Estimated returns (700 trees x 10 kg x KES 80)/acre = KES 560,000

	Farmers who do not use the IDM package lose 75-100% of KES 560,000 (i.e. a loss of 420,000-560,000) (Depending on levels of infestation, weather conditions and stage at which the disease affects the crop)
Gender issues and concerns in development and dissemination, adoption, and scaling	• Women and youth have limited access to productive resources such as credit to purchase the required inputs such as chemicals because revenue from the enterprise is controlled by men. • Women have limited access to education, training and extension services • Women have less access to agricultural information, technology and knowledge • Women have limited access to training and extension services as men attend most of the training workshops and seminars
Gender related opportunities	• Opportunities for youths exists in spraying the crop
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to training and extension services as men attend most of the training workshops and seminars • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Employment opportunities exist for youths in spraying the crop
E: Case studies/profiles of success stories	
Success stories if any	Successful management of coffee leaf rust using the integrated disease management (IDM) increases yield and quality of coffee among farmers in the 32 counties
Application guidelines for users	1. Talhinhos, P.; Batista, D.; Diniz, I.; Vieira, A.; Silva, D.; Loureiro, A.; Tavares, S.; Pereira, A.P.M.C.; Gil Azinheira, H.; Guerra Guimarães, L. The Coffee Leaf Rust pathogen <i>Hemileia vastatrix</i>: One and a half centuries around the tropics. Mol. Plant Pathol. 2017, 18, 1039–1051. 2. Gitonga, K.; Snipes, K. Kenya: Coffee Annual Report. USDA Foreign Agricultural Service, GAIN Report; pp. 1–4. Available online: https://gain.fas.usda.gov/RecentGAINPublications/CoffeeAnnual Nairobi Kenya 5-13-2016.pdf2015 (accessed on 25 November 2021). 3. Plantwise Knowledge Bank 4. Coffee Production Recommendations (CPR)-James Minai 5. Coffee Growers Handbook-James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires	1. Ready for upscaling

validation, 3. Requires further research)	
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Ms. Getrude Okutoyi Alwora KALRO-Food Crop Research Centre -Muguga: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata
Partner organizations	CABI, KEPHIS, Real IPM, Koppert, Universities, County government, CIGs, Bayer Crop science

Research Gap

1. Breeding of coffee varieties resistant to coffee leaf rust

3.9.3 Integrated management of Bacterial blight (*Pseudomonas syringae* pv. *garcae*) in coffee

2.9.3 TIMP Name	Integrated management of Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>garcae</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice
	 Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>garcae</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Bacterial blight causes yield losses of up to 70% in coffee production
What is it? (TIMP description)	Integrated management of bacterial blight of coffee involves selection of effective, environmentally safe options such as: - Cultural control • Proper and timely pruning

	• Sterilization of pruning tools • Proper and timely application of nitrogenous fertilizers • Rogueing and burning of infected plants and branches • Frequent de-suckering • Planting of disease-free certified seedlings Biological control • Spray the plant and drench the planting holes with Kobe 1.2 SL and follow manufacturers recommendation Chemical control • Spray with a PCPB registered fungicide
Justification	Bacterial blight is a major disease affecting coffee. Where the disease is severe, losses of up to 90% have been experienced.. The use of integrated management of bacterial blight reduces disease incidences and lowers yield losses, hence increasing productivity and income for farmers
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's, Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological controls products • Create awareness of the benefits of the IDM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IDM technologies on diseases • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion

Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in disease management • PCPB to promote registration of pesticides for disease management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IDM technologies • Inadequate knowledge on IDM strategies on disease infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IDM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated disease management practices and safe use of pesticides •
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IDM in disease management • Adoption of good agricultural practices by farmers is key in management of the disease • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management

	practices - Producers are organized in groups to ensure that management practices are effectively up-scaled - Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 100,000 as costs for fungicides and application per acre per season; KES 3,000 as labour and other costs for implementation of the rest of management practices in the IDM package per acre. Total basic costs; KES 103,000
Estimated returns	Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 Farmers who do not use the IDM package lose 70% of KES 560,000 (i.e. a loss of 392,000) (Depending on levels of infection, weather conditions and stage at which the disease affects the crop)
Gender issues and concerns in development and dissemination, adoption, and upscaling	- Women and youth have limited access to productive resources such as credit to purchase the required inputs such as chemicals because revenue from the enterprise is controlled by men. - Women have limited access to education, training and extension services - Women have less access to agricultural information, technology and knowledge - Women have limited access to training and extension services as men attend most of the training workshops and seminars
Gender related opportunities	Opportunities for youths exists in spraying the crop
VMG issues and concerns in development and dissemination, adoption and scaling up	- VMGs have limited access to credit to buy the required inputs such as chemicals - VMGs have limited access to training, extension services, workshops and seminars - Due to their social status VMGs are often excluded from decision making in development and dissemination activities - There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for youths in spraying the crop
E: Case studies/profiles of success stories	
Success stories if any	Successful management of bacterial blight using the integrated disease management (IDM) increases yield and quality of coffee among farmers in the 32 Counties
Application guidelines for users	- Plantwise Knowledge Bank - Coffee Production Recommendations (CPR)- James Minai - Coffee Growers Handbook: James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires	Ready for upscaling

validation, 3. Requires further research)	
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Ms. Getrude Okutoyi Alwora KALRO-Food Crop Research Centre -Muguga: Berrick Ochieng KALRO-FCRC- Kabete- Ruth Amata
Partner organization	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County government, CIGs, Bayer Crop science

Gaps

1. Explore ways for natural promotion of biological control of bacterial blight of coffee

3.9.4 Integrated management of fusarium bark disease (*Fusarium stilboides*) in coffee

2.9.4 TIMP Name	Integrated management of fusarium bark disease (<i>Fusarium stilboides</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice  Storey's Bark Scaly bark Collar Fusarium bark disease (<i>Fusarium stilboides</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Fusarium bark disease causes yield losses of 75% in and reduction in quality.

What is it? (TIMP description)	Integrated management of fusarium bark disease consists of several approaches, applied in an integrated manner to break the disease cycle. The following options can be applied: - Cultural control • Proper establishment of coffee tree as per recommendations • Proper soil nutrient management, and soil and water conservation • Proper mulch application • Sterilize pruning tools with Jik (50 ml per litre of water) • Control wood boring insect pests e.g., yellow headed borer, white borer • Rogue and burn all infected trees having die bark from Collar rot. • Uproot and burn severely infected trees • Cut off and burn infected suckers or twigs Biological control • Drench planting holes with Trianum - P 11.5 WP (<i>Trichoderma harzianum</i> Rifai strain KRL-AG2 (T-22) 11.5 g/kg (1x10⁹ cfu/g)) and follow manufacturer's recommendations • Drench planting holes with bio cure F 1.5 WP (<i>Trichoderma viride</i> strain TV-1 1.5*10⁶cfu/g) and follow manufacturers recommendation • Drench soil with Trichotech (<i>Trichoderma asperillum</i> 8 x 10⁹ spores/g) and follow manufacturers recommendation Chemical control • Spray with PCPB registered fungicides
Justification	Fusarium bark disease has increased in coffee farms across the country limiting the yield potential of coffee in most areas. When the disease is not managed through IDM, yield losses of above 50% are recorded. Application of integrated disease management will ensure higher productivity and income for farmers
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological control products

	• Create awareness of the benefits of the IDM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IDM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers to adopt appropriate agronomic practices • Formation of well-organized farmer groups and networks • Formation of spray service providers (teams) to manage disease • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion.
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in disease management • PCPB to promote registration of pesticides for disease management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IDM technologies • Inadequate knowledge on IDM strategies on disease infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IDM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated disease management practices and safe use of pesticides
Lessons learned in upscaling if any	• Sensitization is necessary for people to appreciate the use of IDM in disease management • Adoption of good agricultural practices by farmers is key in management of the disease • Chances of successful upscaling are higher when many value

	chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB, to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management practices • Producers are organized in groups to ensure that management practices are effectively upscaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 100,000 as costs for fungicides and application per acre per season; and other costs for implementation of the rest of management practices in the IDM package per acre. Total basic costs; KES 100,000
Estimated returns	Estimated returns (700 trees x 10 kg x KES 80)/acre = KES 560,000 Farmers who do not use the IDM package lose 75% of KES 560,000 (i.e. a loss of 420,000) (Depending on levels of infection, weather conditions and stage at which the disease affects the crop)
Gender issues and concerns in development and dissemination, adoption, and upscaling	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals because revenue from the enterprise is controlled by men. • Women have limited access to education, training and extension services • Women have less access to agricultural information, technology and knowledge • Women have limited access to training and extension services as men attend most of the training workshops and seminars
Gender related opportunities	• Opportunities for youths exists in spraying the crop
VMG issues and concerns in development and dissemination, adoption and upscaling	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to training and extension services as men attend most of the training workshops and seminars • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Employment opportunities exist for youths in spraying the crop
E: Case studies/profiles of success stories	

Success stories if any	Successful management of fusarium bark disease using the integrated disease management (IDM) increases yield and quality of coffee among farmers in the 32 counties
Application guidelines for users	1. https://www.kalro.org 2. Coffee Production Recommendations (CPR) –James Minai 3. Coffee Growers Handbook: James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
	Institute Director, Coffee Research Institute, Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Ms. Getrude Okutoyi Alwora KALRO-Food Crop Research Centre-Muguga: Berrick Ochieng KALRO-FCRC- Kabete- Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps

1. Explore ways for natural promotion of biological control of fusarium bark disease

3.9.5 Integrated management of fusarium root disease (*Fusarium xylarioides* Steyaert) in coffee

2.9.5 TIMP Name	Management practice
Category (i.e., technology, innovation, or management practice)	 Fusarium rot disease (<i>Fusarium xylarioides</i> Steyaert) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Fusarium rot disease causes losses of up to 77% in coffee production
What is it? (TIMP description)	Integrated disease management (IDM) of fusarium rot involves the combination of chemical, biological and cultural control methods. These are: - Cultural control • Uproot and burn infected trees • Leave the hole exposed for at least six months before infilling

	• Proper coffee tree establishment as recommended Biological control • Drench planting holes with Trianum - P 11.5 WP (<i>Trichoderma harzianum</i> Rifai strain KRL-AG2 (T-22) 11.5 g/Kg (1x10⁹ cfu/g)) and follow manufacturer's recommendations • Drench planting holes with Bio cure F 1.5 WP (<i>Trichoderma viride</i> strain TV-1 1.5*10⁶cfu/g) and follow manufacturers recommendation • Drench soil with Trichotech (<i>Trichoderma asperullum</i> 8 x 10⁹ spores/g) and follow manufacturers recommendation Chemical control • Use a PCPB registered fungicide
Justification	Fusarium rot disease causes a considerable reduction in yield by over 50%. Where the disease is severe and not controlled, yields are greatly reduced, posing challenges. Integrated Management of fusarium rot disease considers food safety concerns, and increases productivity and farmer's incomes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological control products • Create awareness of the benefits of the IDM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IDM technologies on diseases • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage disease • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion.

Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in disease management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IDM technologies • Inadequate knowledge on IDM strategies on disease infecting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IDM options • Establish bean innovation platforms for technology disseminations • Dissemination of integrated disease management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketing
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IDM in insect management • Adoption of good agricultural practices by farmers is key in management of the disease • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and upscaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management practices • Producers are organized in groups to ensure that management practices are effectively upscaled

	• Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 100,000 as costs for fungicides and application per acre per season; KES 10,000 as labour and other costs for implementation of the rest of management practices in the IDM package per acre. Total basic costs; KES 110,000
Estimated returns	Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 Farmers who do not use the IDM package lose 77% of KES 560,000 (i.e. a loss of 431,200) (Depending on levels of infestation, weather conditions and stage at which the disease affects the crop)
Gender issues and concerns in development and dissemination, adoption, and scaling	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals because revenue from the enterprise is controlled by men. • Women have limited access to education, training and extension services than men • Women have less access to agricultural information, technology and knowledge • Women have limited access to training and extension services as men attend most of the training workshops and seminars
Gender related opportunities	• Opportunities for youths exists in spraying the crop
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to training and extension services as men attend most of the training workshops and seminars • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Employment opportunities exist for youths in spraying the crop
E: Case studies/profiles of success stories	
Success stories if any	Successful management of fusarium rot disease using the integrated disease management (IDM) increases coffee yield and quality among farmers in the 32 counties
Application guidelines for users	1. https://www.kalro.org 2. Coffee Production Recommendations (CPR) 3. Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	

	Institute Director, Coffee Research Institute, Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Ms. Getrude Okutoyi Alwora KALRO-Food Crop Research Centre-Muguga: Berrick Ochieng KALRO-FCRC- Kabete- Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps

1. Explore ways for natural promotion of biological control of fusarium rot disease

3.9.6 Integrated management of Armillaria root rot (*Armillaria heimii*) in coffee

2.9.6 TIMP Name	Integrated management of Armillaria root rot (<i>Armillaria heimii</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice  Armillaria root rot (<i>Armillaria heimii</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Losses of up to 50% in coffee production and quality due to infection on coffee tree by Armillaria root rot
What is it? (TIMP description)	Integrated disease management (IDM) of Armillaria root rot involves the combination of chemical, biological and cultural control methods. These are: - Cultural control • Removal of all forest tree stumps and roots and leaving the planting holes open for 3-4 months to sterilize soil by sun radiation • Uproot infected trees and treat the soil with recommended fumigants/ fungicides Chemical control • Use a PCPB registered fungicide

Justification	Armillaria root rot causes a considerable reduction in yield. Where the disease is severe and not controlled yield is greatly reduced by over 50-100%. Integrated disease management of Armillaria root rot considers food safety concerns and should be highly advocated since coffee is one of the major cash crops in Kenya
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agrochemical companies to sell biological controls products • Create awareness of the benefits of the IDM management practices • Willingness of stakeholders to participate • Carry out Applied and adaptive research to validate IDM technologies on diseases • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage diseases • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion.
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in disease management • PCPB to promote registration of pesticides for disease management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness.

	• CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties e.g. Nairobi. Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IDM technologies • Inadequate knowledge on IDM strategies on disease infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IDM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated disease management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketing
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IDM in disease management • Adoption of good agricultural practices by farmers is key in management of the disease • Chances of successful scaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 100,000 as costs for fungicides and application per acre per season; KES 10,000 as labour and other costs for implementation of the rest of management practices in the IDM package per acre. Total basic costs; KES 110,000
Estimated returns	Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 Farmers who do not use the IDM package lose 50% of KES 560,000 (i.e., a loss of 280,000) (Depending on levels of infestation, weather conditions and stage at which the disease affects the crop)

Gender issues and concerns in development and dissemination, adoption, and scaling	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals because revenue from the enterprise is controlled by men. • Women have limited access to education, training and extension services • Women have less access to agricultural information, technology and knowledge • Women have limited access to training and extension services as men attend most of the training workshops and seminars
Gender related opportunities	• Opportunities for youths exists in spraying the crop
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to training and extension services as men attend most of the training workshops and seminars • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Employment opportunities exist for youths in spraying the crop
E: Case studies/profiles of success stories	
Success stories if any	Successful management of armillaria root rot using the integrated disease management (IDM) increases yield and quality of coffee among farmers in the 32 counties
Application guidelines for users	1. Baumgartner K, Coetzee MP, Hoffmeister D. 2011. Secrets of the subterranean pathosystem of <i>Armillaria</i>. <i>Molecular Plant Pathology</i> 12(6), 515-534. 2. Downer AJ, Faber B. 2019. <u>Non-chemical control of <i>Armillaria mellea</i> infection of <i>Prunus persica</i></u>. <i>J Plant Sci. Phytopathol.</i> 3: 050-055. 3. Coffee Production Recommendations (CPR): James Minai 4. Coffee Growers Handbook- James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Ms. Getrude Okutoyi Alwora KALRO-FCRC-Muguga: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata

Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps

1. Explore ways for natural promotion of biological control of armillaria root rot in coffee

3.9.7 Integrated management of Damping off (*Rhizoctonia solani* and *Pythium spp*) in coffee

2.9.7 TIMP Name	Integrated management of Damping off (<i>Rhizoctonia solani</i> and <i>Pythium spp</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice  Damping off (<i>Rhizoctonia solani</i> and <i>Pythium spp</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Losses of up to 80% in coffee production and quality due to infestation on coffee tree by Damping off
What is it? (TIMP description)	Integrated disease management (IDM) of damping off is the use of a combination of chemical, biological and cultural control methods. These are: - Cultural control • Start coffee seedbed in light, well-drained, well-prepared soil or sterile mix (containing perlite, peat moss, or vermiculite) • Treat soil with steam, dry heat or a fumigant • Avoid overcrowding, excessive shade, overwatering, too deep planting, and overfertilizing • Sow crack-free, healthy seed dusted with fungicide seed protectant Biological control • Drench seedbed with Trichotech (Trichoderma asperullum 8x 10⁹ spores/g) and follow manufacturer's recommendation • Drench seedbed with bio cure F 1.5 WP (Trichoderma viride strain TV-1 1.5*10⁶cfu/g) and follow manufacturers recommendation • Drench seedbed with Trianum - P 11.5 WP (<i>Trichoderma harzianum</i> Rifai strain KRL-AG2 (T-22) 11.5 g/Kg (1x10⁹ cfu/g)) and follow manufacturers recommendation Chemical control • Use a PCPB registered fungicide

Justification	Damping off disease causes a considerable reduction in yield and lowers the quality of seedlings. Losses of 50-100% are experienced due to the disease. Integrated management of the disease lowers losses in the initial stages of growth.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro chemical companies to sell biological controls products • Create awareness of the benefits of the IDM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IDM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage disease • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticide products and farmers would enhance promotion.
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in disease management • PCPB to promote registration of pesticides for disease management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer.

	Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	- Unwillingness of farmers to adopt IDM technologies - Inadequate knowledge on IDM strategies on disease infecting coffee and losses attributed to them - Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	- PCPB enhance registration of crop protection products - Training of stakeholders in IDM options - Establish coffee innovation platforms for technology disseminations - Dissemination of integrated disease management practices and safe use of pesticides
Lessons learned in upscaling if any	- Sensitization is necessary for people to appreciate the use of IDM in disease management - Adoption of good agricultural practices by farmers is key in management of the disease - Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform - Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	- Favourable environmental conditions - Willingness of stakeholders to participate - Favourable environmental conditions - Regulatory bodies e.g. PCPB to ensure fungicides sold to farmers are genuine and of high quality - Producers willing to adopt the disease management practices - Producers are organized in groups to ensure that management practices are effectively upscaled - Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 100,000 as costs for fungicides and application per acre per season; KES 20,000 as labour and other costs for implementation of the rest of management practices in the IDM package per acre. Total basic costs; KES 120,000
Estimated returns	Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 Farmers who do not use the IDM package lose 80% of KES 560,000 (i.e. a loss of 448,000) (Depending on levels of infection, weather conditions and stage at which the disease affects the crop)
Gender issues and concerns in development and dissemination, adoption, and scaling	Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals because revenue from the enterprise is controlled by men.

	• Women have limited access to education, training and extension services than men • Women have less access to agricultural information, technology and knowledge • Women have limited access to training and extension services as men attend most of the training workshops and seminars
Gender related opportunities	• Opportunities for youths exists in spraying the crop
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to training and extension services as men attend most of the training workshops and seminars • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Employment opportunities exist for youths in spraying the crop
E: Case studies/profiles of success stories	
Success stories if any	Successful management of damping off using the integrated disease management (IDM) increases yield and quality of coffee among farmers in the 32 counties
Application guidelines for users	1. Baumgartner K, Coetzee MP, Hoffmeister D. 2011. Secrets of the subterranean pathosystem of <i>Armillaria</i>. <i>Molecular Plant Pathology</i> 12(6), 515-534. 2. Downer AJ, Faber B. 2019. <u>Non-chemical control of <i>Armillaria mellea</i> infection of <i>Prunus persica</i></u>. <i>J Plant Sci. Phytopathol.</i> 3: 050-055. 3. Coffee production Recommendation- James Minai 4. Coffee Grower Handbook-James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Ms. Getrude Okutoyi Alwora KALRO-FCRC-Muguga: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps

1. Explore ways for natural promotion of biological control of damping off in coffee

3.9.8 Integrated management of Root knot nematodes (*Meloidogyne* spp) in coffee

2.9.8 TIMP Name	Integrated management of Root knot nematodes (<i>Meloidogyne</i> spp) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice
	 Photo Root knot nematodes (<i>Meloidogyne</i> spp) Source: James Gimase
A: Description of the technology, innovation, or management practice	
Problem addressed	Losses of coffee yield and quality of 20-25% due to crop damage by root knot nematodes
What is it? (TIMP description)	Integrated management (IPM) of root knot nematodes involve the use of a combination of cultural, biological and chemical control methods. These are: Cultural control • Use clean planting materials free from root knot nematodes • Practice crop rotation when planting a new crop • Avoid moving soil from one field to another as this can introduce nematodes from infested fields to un-infested fields. • Make sure you clean soil off any tools and shoes before going to the next field. • Make sure you clean machinery by washing tires and any part of the machinery to remove all soil particles before changing fields. • Do not use infested soil in your nursery beds. • Incorporate organic matter like cow or chicken manure into the soil near coffee trees to stimulate microbial competition against the nematodes. Nematodes do not like high amount of organic matter. • Control weeds in coffee fields as they could serve as alternate host for the nematode e.g. Blackjack (<i>Bidens pilosa</i>) and <i>Solanum</i> species e.g. wild nightshades. • Make rough soil surfaces or contours parallel to the slope to have a drainage pattern that minimizes erosion and minimizes movement of nematodes through the field.

	Biological control • Drench the soil with neem-based products e.g. Achook, Nimbecidin, Neemraj Super • Drench the soil with Bio Nematon Liquid spores and mycelial fragments according to manufacturer's recommendation • Drench the soil with Mazao Sustain according to manufacturer's recommendation • Drench soil with Aminem XY16 Liquid Emulsion according to manufacturer's recommendation • Drench soil with Bio-Nematon 1.15% WP Wettable Powder according to manufacturer's recommendation
Justification	Root knot nematodes cause considerable reduction in yield. Losses of above 30% are experienced due to high pest infestation. Integrated Management of pests considers food and environmental safety concerns should be advocated since coffee is one of the major cash crops in Kenya. Integrated management of root knot nematodes involve the use of a combination of cultural, bio-control and chemical that are relatively safe. Soft synthetic nematicides are recommended as a last option.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's, Seed producing companies and SMEs, Processors, Agro-input dealers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro chemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IPM technologies on root knot nematodes • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage nematodes • A strong partnership between technical personnel /Extension

	/ companies producing biological control and biopesticides products and farmers would enhance promotion. • Capacity building of farmers, extension officers and other stakeholder on integrated management practices of root knot nematodes • Establishment of FFBS Mapping of root knot nematodes free zones for up and out scaling of certified coffee seed production funding by government to promote production and distribution of certified seeds at farm level
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in nematodes management • PCPB to promote registration of insecticides/nematicides for insect/nematodes management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee Growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IPM technologies • Inadequate knowledge on IPM strategies on nematodes infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated pest management practices and safe use of pesticides •
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IPM in nematodes management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation

	platforms
Social, environmental, policy and market conditions necessary for development and upscaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure pesticides sold to farmers are genuine and of high quality • Producers willing to adopt the insect management practices • Producers are organized in groups to ensure that management practices are effectively upscaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 5,000 as costs for nematicides and application per acre per season. KES 25,000 as labour and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 30,000
Estimated returns	Estimated returns (700 trees x 10 kg x KES 80)/acre = KES 560,000 Farmers who do not use the IPM package lose 20-25% of KES 560,000 (i.e. a loss of 112,000-140,000) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue • Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for VMGs to access the required funds.
E: Case studies/profiles of success stories	
Success stories if any	Successful management of root knot nematodes using IPM has led to increase in yield and quality of coffee in the 32 counties where it is implemented.

Application guidelines for users	1. Plantwise Knowledge Bank. Root Knot Nematodes 2. PCPB website- List of approved chemicals on 3. Coffee farmers handbook: James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Ms. Getrude Okutoyi Alwora KALRO-FCRC-Muguga: Berrick Ochieng KALRO-FCRC; Kabete: Ruth Amata
Partner organizations	MoALD, CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Research gap

1. Develop IPM approaches for the management of root knot nematodes
2. Explore Bio-control option for root knot nematodes

3.9.9 Integrated management of Coffee berry borer (*Hypothenemus hampei*) in coffee

2.9.9 TIMP Name		Integrated management of Coffee berry borer (<i>Hypothenemus hampei</i>) in coffee		
Category (i.e., technology, innovation, or management practice)	Management practice			
				
	Bored green beans	Ripe berries	Berry Borer damaged beans	
	Coffee berry borer: (<i>Hypothenemus hampei</i>) Source: James Minai (KALRO)			
A: Description of the technology, innovation, or management practice				
Problem addressed	Coffee yield and quality losses of 50-100% due to crop damage by coffee berry borer (CBB)			
What is it? (TIMP description)	Integrated pest management (IPM) of coffee berry borer is the use of combination of cultural, biological and chemical control methods. These are: -			

	Cultural control • Prune regularly • Practice field hygiene by collecting fallen berries that act as reservoir for re-infestation • Strip, bury or burn all infested dried berries on the tree at the end of the harvest season • Avoid over-shading, 30% shading level is sufficient Biological control • Use of pheromone traps to capture the CBB adults e.g. Brocap traps • Use of egg parasitoids and parasitic wasps Chemical control • Spray a PCPB registered insecticide
Justification	Coffee berry borer causes a considerable reduction in yield and lowers the coffee bean quality. Losses of up to 100% are experienced under high pest infestation levels, since the quality of the berries is reduced and fetches low prices or is rejected. Currently, coffee farmers use a lot of synthetic pesticides in their control. Integrated Management of CBB considers food safety concerns and should be highly advocated since coffee is a key industrial crop in Kenya. Integrated management of coffee berry borer the use of a combination of cultural and bio-control and chemical methods that are relatively safe. Soft synthetic pesticides are advocated for use as a last option. Adoption of an IPM approach would enhance food and environmental safety and lead to increased productivity and incomes for farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee Farmers • Extension agents (Public and Private) • Research Organizations and Universities • Bio-pesticides companies • CGIAR's • Seed producing companies and SMEs • Processors • Agro-input dealers • 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 services

Critical/essential factors for successful promotion	• Support Agro chemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out Applied and adaptive research to validate IPM technologies on coffee berry borer • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage the coffee berry borer • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion. • Capacity building of farmers, extension officers and other stakeholder on integrated management practices of coffee berry borer • Establishment of FFBS • Mapping of coffee berry borer free zones for up and out scaling of certified coffee seed production funding by government to promote production and distribution of certified seeds at farm level
Partners/stakeholders for scaling up and their roles	• Ministry of Agriculture and Livestock Development (MoALD) Extension and Capacity Building • ICIPE (International Centre for Insect Physiology and Ecology)– collaborative research on crop protection • FAO (Food and Agricultural Organization)- co-sharing of resources and networking and knowledge management • CIGs (Common Interest Groups)- back stopping the technologies at grass root levels • NGOs (Non-Governmental Organization) (CARE Kenya): (Farmer Input Promotion) • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect pest management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga

Challenges in dissemination	• Big challenge between information availability and accessibility • Non-exposure of the end-user to coffee berry borer and its management strategies • Unwillingness of farmers to adopt IPM technologies • Inadequate knowledge on IPM strategies
Suggestions for addressing the challenges	• Information dissemination – coffee berry borer integrated management strategies • Scaling up participation of end-user in on-farm activities/adaptive research/extension activities • Find innovations in reducing integrated management practices costs to encourage more coffee production. • PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Dissemination of integrated pest management practices and safe use of pesticides
Lessons learned in up scaling if any	• Adoption of FFBS effective in technology dissemination and adoption • Sensitization is necessary for people to appreciate the use of IPM in coffee berry borer management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and upscaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the coffee berry borer management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic Costs	• KES 5,000 as costs for insecticides and application per acre per season; KES 4000 per acre for insect traps. KES 20,000 as labour and other costs for implementation of the integrated management practices in the IPM package per acre/season. Total basic costs; KES 29,000 • (Other initial costs for new farmers; Knapsack sprayer KES 2,000-10,000; Protective gear KES 4000)
Estimated returns	• Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 • Farmers who do not use the IPM package lose 50-100% of KES 560,000 (i.e. a loss of 280,000-560,000), depending on

	levels of infestation, weather conditions and stage at which the pest affects the crop.
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue than men • Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories, if any	Successful management of coffee berry borer using IPM of CBB has led to increase in yield and quality of coffee in the 32 counties where it is implemented.
Application guidelines for users	1. Suswati, S., Hutapea, S., Barus, R. I., Setiawan, S., and Hutapea, A. P. (2020). Integrated Control of Coffee Bean Borer (<i>Hypothenemus Hampei</i>) on Sigararutang Coffee, Motung Village, Ajibata Sub-district, Toba Samosir District, Sumatera Utara. Budapest International Research in Exact Sciences (BirEx) Journal, 2(1), 52-61. 2. Aristizábal, L. F., Bustillo, A. E., & Arthurs, S. P. (2016). Integrated pest management of coffee berry borer: strategies from Latin America that could be useful for coffee farmers in Hawaii. Insects, 7(1), 6. 3. Oliva, M., Rubio, K., Rivasplata, E., & Leiva, S. (2020). Integrated management of the coffee berry borer: A comparison of cultural, biological, and ethological control. Entomological Research, 50(11), 539-544. 4. Coffee-growers handbook- James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling

G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO- Food Crop Research Centre Muguga: Berrick Ochieng KALRO-FCRC-Kabete; Ruth Amata
Partner organizations	PCPB, AAK, Agrochemical companies CABI, KEPHIS, Real IPM, Koppert, Universities, County government, CIGs, Bayer Crop science

3.9.10 Integrated management of Antestia bugs (*Antestiopsis spp*) in coffee

2.9.10 TIMP Name	Integrated management of Antestia bugs (<i>Antestiopsis spp</i>) in coffee	
Category (i.e., technology, innovation, or management practice)	  Antestia bug Antestia bug damage Antestia bugs: (<i>Antestiopsis spp</i>) Source: James Minai (KALRO)	
A: Description of the technology, innovation, or management practice		
Problem addressed	Coffee yield and quality losses of 100% due to crop damage by Antestia bug.	
What is it? (TIMP description)	Integrated management (IPM) of coffee Antestia bug is the use of a combination of cultural, biological and chemical control methods. These are: - Cultural method • Timely pruning and de-suckering of coffee trees Biological method • Use of egg parasitoids and parasitic wasps e.g. (KALRO/CABI) • Use of pheromone traps to capture the Antestia bugs e.g. Brocap traps Chemical method • Spray a PCPB registered insecticide • N/B: Spray when the pest population reaches two (2) bugs per tree for East of Rift Valley and one (1) bug per tree for West of Rift Valley using any of the recommended insecticides	

Justification	Antestia bug causes losses of up to 100% when there is high pest infestation. Integrated management of Antestia bug considers food and environmental safety concerns and should be advocated for since coffee is one of the most important cash crops in Kenya. The IPM strategies involve the use of a combination of cultural, bio-control and biopesticides that are relatively safe. Soft synthetic pesticides are recommended as a last option.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee Farmers • Extension agents (Public and Private) • Research Organizations and Universities • Bio-pesticides companies • CGIAR's • Seed producing companies and SMEs • Processors • Agro-input dealers • Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro chemical companies to sell biological control products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IPM technologies on Antestia bug • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage the Antestia bug • A strong partnership between technical personnel/Extension/ companies producing biological control and biopesticides products and farmers would enhance promotion. • Capacity building of farmers, extension officers and other stakeholders on integrated management practices of coffee berry borer • Establishment of FFBS • Mapping of Antestia bug free zones for up and out scaling of certified coffee seed production funding by government to

	promote production and distribution of certified seeds at farm level
Partners/stakeholders for scaling up and their roles	• Ministry of Agriculture and Livestock Development (MoALD) - Extension and Capacity Building • ICIPE (International Centre for Insect Physiology and Ecology)– collaborative research on crop protection • FAO (Food and Agricultural Organization)- co-sharing of resources and networking and knowledge management • CIGs (Common Interest Groups)- back stopping the technologies at grass root levels • NGOs (non-governmental organization) (CARE Kenya): (Farmer Input Promotion) • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect pest management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee Growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in dissemination	• Big challenge between information availability and accessibility • Non-exposure of the end-user to Antestia bug and its management strategies • Unwillingness of farmers to adopt IPM technologies • Inadequate knowledge on IPM strategies
Suggestions for addressing the challenges	• Information dissemination – Antestia bug integrated management strategies • Scaling up participation of end-user in on-farm activities/adaptive research/extension activities • Find innovations in reducing integrated management practices costs to encourage more coffee production. • PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Dissemination of integrated pest management practices and safe use of pesticides
Lessons learned in up scaling if any	• Adoption of FFBS effective in technology dissemination and adoption • Sensitization is necessary for people to appreciate the use of IPM in Antestia bug management • Adoption of good agricultural practices by farmers is key in management of the insects

	• Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the Antestia bug management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 5,000 as costs for insecticides and application per acre per season; KES 4000 per acre for insect traps. KES 20,000 as labour and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 29,000
Estimated returns	Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 Farmers who do not use the IPM package lose 100% of KES 560,000 (i.e. a loss of 560,000) depending on levels of infestation, weather conditions and stage at which the pest affects the crop.
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.

E: Case studies/profiles of success stories	
Success stories from if any	Successful management of Antestia bug using IPM of antestia bug has led to increase in yield and quality of coffee in the 32 counties where it is implemented.
Application guidelines for users	1. Gerard, A., and Bigirimana, J. (2018). Mitigating Antestia Bug Damage and the Potato Taste Defect in Rwandan Coffee (No. 1878-2018-5034). 2. Waller, J. M., Bigger, M., and Hillocks, R. J. (2007). Coffee pests, diseases and their management. CABI 3. Hillocks, R. (2001). Coffee: is it still a viable cash crop for smallholders in Africa? Outlook on Agriculture, 30(3), 205-211. 4. Coffee Production Recommendations (CPR) 5. Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO- Food Crop Research Centre: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata
Partner organizations	PCPB, AAK, Agrochemical companies CABI, KEPHIS, Real IPM, Koppert, Universities, County government, CIGs, Bayer Crop science

Gaps

1. Verification of bio-pesticides and cultural practices for management of antestia bug in coffee

3.9.11 Integrated management of thrips (*Diarthrothrips coffeae*) in coffee

2.9.11 TIMP Name	Integrated management of thrips (<i>Diarthrothrips coffeae</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice  Thrips damage on leaves and berries Coffee thrips: (<i>Diarthrothrips coffeae</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Coffee thrips cause 40% reduction in coffee yield and quality.
What is it? (TIMP description)	Integrated management of coffee thrips involves selection of effective environmentally safe options such as: - Cultural control • Maintain a healthy crop as it will tolerate thrips and keep the field weed free • Avoid planting new crop near an existing infected field • Mulch fields as this helps reduce thrips population • Use overhead irrigation where possible to reduce spread of thrips • Remove and destroy volunteer plants and debris that may harbor thrips • Uproot heavily infested plant material and bury • Apply soapy sprays (mix 5 teaspoonful of soap powder or chopped bar soap with cold water and dissolve and spray on the infested plants) • Use blue sticky cardboard traps to attract thrips Biological control • Apply bio-control agents e.g. Beauvitech WP (<i>Beauveria bassiana</i>) or Bio-Power 1.5L (<i>Beauveria bassiana</i>), or Botanigard ES (<i>Azadirachtin</i>) • Spray neem-based products like neemroc EC and nimbecidine (<i>Azadirachtin</i>) use 1 l/acre (10 plastic bottle tops per 20 lts of water). Chemical control • Spray a PCPB registered insecticide • Use synthetic insecticides with PHI of 3 days or less since coffee bean is harvested at very short intervals. N/B: During dry spell and rainy period spray when 1-2 and 2-3 thrips per leaf respectively are encountered

Justification	Thrips cause a considerable reduction in yield and lower the coffee bean quality. Where the pest infestation is severe and not controlled, yields losses of above 40% can be experienced. Marketing of such produce that is severely affected poses challenges and fetches low prices or is rejected. Currently, coffee farmers use a lot of synthetic pesticides in pest control. Integrated Management of thrips considers food and environmental safety and should be highly promoted since the crop is a major cash crop in Kenya. Integrated Management of thrips involves the use of a combination of cultural, bio-control and chemical measures that are relatively safe. Soft synthetic pesticides are recommended as a last option. This minimizes overuse of synthetic pesticides. Adoption of an IPM approach would enhance food safety and increase productivity and incomes for farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out Applied and adaptive research to validate IPM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel/Extension/companies producing biological control and biopesticides products and farmers would enhance promotion.
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the

	technology • KALRO to continually undertake research in insect management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee Growing Counties e.g. Nairobi and Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in dissemination	• Unwillingness of farmers to adopt IPM technologies • Inadequate knowledge on IPM strategies on insect pests infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketing
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IPM in insect management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful scaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the insect management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 5,000 as costs for insecticides and application per acre per season; KES 5000 per acre for insect traps. KES 30,000

	as labour and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 40,000
Estimated returns	• Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 • Farmers who do not use the IPM package lose 40% of KES 560,000 (i.e. a loss of 224,000) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue than men • Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories if any	Successful management of thrips using IPM of thrips has led to increase in yield and quality of coffee in the 32 Counties where implemented
Application guidelines for users	1. Magina, F. L., Kilambo, D. L., Maerere, A. P., & Teri, J. M. (2016). Innovative strategies for control of coffee insect pests in Tanzania: A review. <i>Huria: Journal of the Open University of Tanzania</i>, 22(1), 63-72. 2. Mugo, H. M., Irungu, L. W., and Ndegwa, P. N. (2012). Population dynamics of predacious phytoseiid mites, <i>Euseius kenyae</i> and coffee thrips, <i>Diarthrothrips coffeae</i> and their Interactions in coffee agro ecosystems in Kenya. 3. Coffee Production Recommendations (CPR): James Minai 4. Coffee Growers Handbook- James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3.	Requires validation

Requires further research)	
G: Gaps	
H: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO- Food Crop Research Centre: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps

1. Explore ways for natural promotion of biological agents to suppress Thrips on coffee

3.9.12 Integrated management of coffee leaf miner (*Leucoptera coffeina*) in coffee

2.9.12 TIMP Name	Integrated management of coffee leaf miner (<i>Leucoptera coffeina</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice  Coffee leaf miner (<i>Leucoptera coffeina</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Reduction of Coffee yield and quality of up to 87% due to crop damage by coffee leaf miner.
What is it? (TIMP description)	Integrated management (IPM) of coffee leaf miner involves the use of a combination of cultural, biological and chemical control methods. These are: - Cultural control

	• Plant clean seedlings, free from all stages of the moth. • Rotate with non-host crops such as maize, and cabbages. • Remove and destroy wild host plants such as Sodom apple around the farm. • Remove and burn all infected crop residues. • Remove infested leaves before the caterpillar pupates inside and becomes an egg-laying adult. • Bury deep (50-100 cm) infested plants and foliage. • Use black sticky traps - 24 pc/acre, placed 15-20 cm above the ground. Biological control • Use of <i>Bacillus thuringiensis</i> controls outbreaks. • Pheromone traps: These will trap males, reducing males available for mating with females resulting into females laying unfertilized eggs thus no caterpillars. This can be purchased from Kenya Biologics • Use black sticky traps from Koppert Kenya Chemical control • Spray a PCPB registered insecticide • Avoid using same active ingredient for more than 3 times in a season
Justification	Leaf miners cause a considerable reduction in yield and lower the coffee bean quality. Where the pest is severe and uncontrolled coffee yield losses of above 87% are experienced. Marketing of such produce that is severely affected poses challenges and fetches low prices or is rejected. Currently coffee farmers use a lot of synthetic pesticides in pest control. Integrated management of leaf miner considers food and environmental safety and should be highly advocated since the crop is a major cash crop in Kenya. Integrated Management of leaf miner involves the use of a combination of cultural, bio-control and chemical measures that are relatively safe. Soft synthetic pesticides are recommended as a last option. This minimizes overuse of synthetic pesticides. Adoption of an IPM approach would enhance food safety and increase productivity and incomes for farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media

	short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IPM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion.
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee Growing Counties e.g. Nairobi and Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IPM technologies • In adequate knowledge on IPM strategies on insect pests infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketing

Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IPM in insect management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the insect management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 5,000 as costs for insecticides and application per acre per season; KES 5000 per acre for insect traps. KES 35,000 as labour and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 45,000
Estimated returns	• Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 • Farmers who do not use the IPM package lose 87% of KES 560,000 (i.e. a loss of 487,200) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue than men • Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness

VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories if any	Successful management of coffee leafminer using IPM has led to increase in yield and quality of coffee in the 32 counties where it is implemented
Application guidelines for users	1. Leite, S. A., Guedes, R. N. C., Santos, M. P. D., Costa, D. R. D., Moreira, A. A., Matsumoto, S. N., ... & Castellani, M. A. (2020). Profile of coffee crops and management of the Neotropical coffee leaf miner, <i>Leucoptera coffeella</i>. Sustainability, 12(19), 8011. 2. Coffee Production Recommendations (CPR): James Minai (2021) 3. Coffee Growers Handbook; James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling,
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO-Muguga Food Crop Research Centre: Berrick Ochieng KALRO-FCRC-Kabete; Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps

1. Determine performance of new coffee varieties in new areas with respect to coffee leaf miner
2. Explore Bio-control option for coffee leaf miner
3. Explore the use of ITK's in insect pest management

3.9.13 Integrated management of Root Mealy bug (*Geococcus coffeae*) in coffee

2.9.13 TIMP Name	Integrated management of Root Mealy bug (<i>Geococcus coffeae</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice  White mealy bugs encased in clusters of greenish and white fungal tissue Root Mealy bug (<i>Geococcus coffeae</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Losses in coffee yield and quality of 50-100% due to crop damage by the mealy bugs
What is it? (TIMP description)	Integrated management of root mealy bugs is the of several approaches applied in combination to break the cycle of the insect. These include: - Cultural control • Uproot infested trees and remove suckers and branches that touch the ground to prevent ants • leave the planting holes open for 3 months and replant as recommended under coffee establishment • Management of soil pH. Trees growing in soil with pH > 5 and deficient in P, are more susceptible Biological control • Apply oils (such as vegetable oils, neem oil or mineral oils) or soapy solutions (1 to 2%) to kill mealy bugs by suffocation. Use soapy water or oils only during non-hot and non-sunny periods to prevent discoloration of leaves. Prior to applying them extensively, apply to a branch and after 48 hours check for adverse reactions of the coffee plant • Conserve parasitic wasps (<i>Anagyrus kivuensis</i>) that eat inside the bug by using soft ecofriendly biopesticides e.g. Planopar (Parasitic wasp) • Apply Biomysis Mean 1.15% WP Wettable powder according to manufacturer recommendation Chemical control • Spray a PCPB registered insecticide
Justification	Root mealy bugs cause a considerable reduction in yield. Losses of above 60% are experienced due to root mealy bug under high infestation levels. Currently, coffee farmers use a lot of synthetic pesticides in pest control. Integrated management of root mealy bug considers food and environmental safety and should be

	highly advocated since the crop is a major cash crop in Kenya. Integrated Management of root mealy bug involves the use of a combination of cultural, bio-control and chemical measures that are relatively safe. Soft synthetic pesticides are recommended as a last option. This minimizes overuse of synthetic pesticides. Adoption of an IPM approach would enhance food safety and increase productivity and incomes for farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticide companies, CGIAR's, Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out Applied and adaptive research to validate IPM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel/Extension/ companies producing biological control and biopesticides products and farmers would enhance promotion
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect management • P.C.P.B to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development

	- of enabling policies and create awareness. - CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. - Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where it is already promoted if any	32 Coffee growing Counties e.g. Nairobi and Baringo
Counties where TIMPs will be upscaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	- Unwillingness of farmers to adopt IPM technologies - Inadequate knowledge on IPM strategies on insect pests infecting coffee and losses attributed to them - Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	- PCPB enhance registration of crop protection products - Training of stakeholders in IPM options - Establish coffee innovation platforms for technology disseminations - Dissemination of integrated pest management practices and safe use of pesticides
Lessons learned in up scaling if any	- Sensitization is necessary for people to appreciate the use of IPM in insect management - Adoption of good agricultural practices by farmers is key in management of the insects - Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform - Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	- Favourable environmental conditions - Willingness of stakeholders to participate - Favourable environmental conditions - Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality - Producers willing to adopt the insect management practices - Producers are organized in groups to ensure that management practices are effectively upscaled - Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 10,000 as costs for insecticides, bio pesticides and application per acre per season. KES 40,000 as labour and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 50,000
Estimated returns	- Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 - Farmers who do not use the IPM package lose 50-100% of KES 560,000 (i.e. a loss of 280,000-560,000) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop).

Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women may have limited access to and control of coffee revenue Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories if any	Successful management of root mealy bug using IPM has led to increase in yield and quality of coffee in the 32 counties where it is implemented
Application guidelines for users	1. Plant wise knowledge bank 2. Coffee Production Recommendations (CPR); James Minai 3. Coffee Growers Handbook – James Maina (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO-Food Crop Research Centre Muguga: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps

1. Explore Bio-control options for management of root mealy bug
2. Explore the use of ITKs in pest management
3. Farmer participatory evaluation of the management of bio-pesticide options for insect management

3.9.14 Integrated management of Green scales (*Coccus viridis*) in coffee

2.9.14 TIMP Name	Integrated management of Green scales (<i>Coccus viridis</i>) in coffee		
Category (i.e., technology, innovation, or management practice)	Management Practice  Mealy bugs Green scales Sooty moulds Green scales (<i>Coccus viridis</i>) Source: JamesF Minai (KALRO)		
A: Description of the technology, innovation, or management practice			
Problem addressed	Green scales cause coffee quality and yield losses of up to 50%		
What is it? (TIMP description)	Integrated Pest Management (IPM) of green scales that involves use of cultural, biological and chemical practices. These are: • Cultural control • During the dry season, scout for presence of little roundish shiny pale-green insects every 2 weeks. Look on the green wood and on the underside of leaves especially along the main leaf vein and near the tips of green shoots • De-suckering and removal unwanted young suckers • Use recommended spacing (single row 3 x 1m to 3 x 2m or double row 2 x 1m to 2 x 2m) • Plant shade trees such as Leucaena (Lukin) to maintain 30% shade to encourage natural enemies • Place sticky bands around stem bases or paint stem bases with sticky substance (at least 15 cm wide) to prevent ants from crawling up as ants protect scales from their natural enemies (e.g. lady beetles) • Avoid planting host plants of green scales such as avocado, celery, flowering ginger, guava and orange, • into the coffee plantation. • When plants are lightly infested, kill scales by rubbing them with your fingers to remove them from the infested twigs and shoots Biological control • Use of parasitic wasps that parasitize the scales. The adult		

	parasites lay egg on the scale • Use of predators such as Ladybird beetles that prey/feed/predate directly on the green scales • Spray with soapy solutions (potassium soaps; add 10-15 tablespoons full of liquid soap to a 20 l bucket) and apply only on the affected parts. Repeat weekly if necessary • Allow chickens into the plantation as they will sit on the tree branches and feed on the scale insects Chemical control • Spray a PCPB registered insecticide
Justification	Green scales cause a considerable reduction in yield and lower the coffee bean quality. Where there are high infestation levels, if uncontrolled, yield losses of above 50% are experienced. The pests produce coffee dew and sticky moulds on leaves leading to presence of ants on infested trees. Currently, coffee farmers use a lot of synthetic pesticides in pest control. Integrated Management of green scale considers food and environmental safety and is strongly encouraged since the crop is a major cash crop in Kenya. Integrated Management of green scales involves the use of a combination of cultural, bio-control and chemical measures that are relatively safe. Soft synthetic pesticides are recommended as a last option. This minimizes overuse of synthetic pesticides. Adoption of an IPM approach would enhance food safety and increase productivity and incomes for farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agrochemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IPM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices

	• Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favour the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IPM technologies • Inadequate knowledge on IPM strategies on insect pests infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketing
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IPM in insect management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful scaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms

Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the insect management practices • Producers are organized in groups to ensure that management practices are effectively upscaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 10,000 as costs for insecticides, biopesticides and application per acre per season; KES 5000 per acre for insect traps. KES 55,000 as labour and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 70,000
Estimated returns	• Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 • Farmers who do not use the IPM package lose 50% of KES 560,000 (i.e. a loss of 280,000) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Successful management of coffee green scale using IPM has led to increase in yield and quality of coffee in the 32 counties where it is implemented
Application guidelines for users	1. Plantwise knowledge bank. Green Scale

	2. Coffee Production Recommendations (CPR): James Minai 3. Coffee Growers Handbook: James Minai (2021)
F: Status of TIMP Readiness (1 Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for upscaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO-Food Crop Research Centre Muguga: Berrick Ochieng KALRO-FCRC-Kabete: Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps:

1. Explore the use of ITKs in management of green scales in coffee

3.9.15 Integrated management of White Stem Borer (*Xylotrechus quadripes*) in coffee

2.9.15 TIMP Name	Integrated management of White Stem Borer (<i>Xylotrechus quadripes</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management Practice  White stem borer damage – note the frass [a] and the exit hole [b] White stem borer (<i>Xylotrechus quadripes</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	White stem borer damage can cause coffee yield losses of 25%
What is it? (TIMP description)	Integrated pest management (IPM) of white stem borer involves the combination of chemical, biological and cultural control methods. These are: -

	Cultural control • Killing the larva(e) that is already in the stem by inserting a wire/spoke into the tunnel • Physically collect and kill the beetle at the onset of rains • Maintain optimum shade and soil moisture in the coffee orchard. It is better to plant shade trees 1-2 years before the coffee plantation Biological control • Spray the main stem and thick primaries with neem kernel extract e.g. achook • Spray 10% lime (i.e. spray lime at 10kg in 100 litres of water along with 100ml of a binder e.g. Fevicol DDL) on the main stem and thick primaries • Use a coffee white stem borer pheromone trap, i.e. cross-vane pheromone trap, to catch female beetle during flight periods Chemical control • Smoothen the trunk and paint or spray a 90 cm band above the ground with Brigade 25EC. Repeat after one year and every second year • Insert a cotton ball soaked in a diluted Kingcode Elite 50 EC through the tunnel in incidences where the larva has entered into the stem
Justification	White stem borer causes considerable reduction in yield. Losses of above 50% are experienced due to white stem borer under high infestation levels. Currently, coffee farmers use a lot of synthetic pesticides in pest control. Integrated management of white stem borer considers food and environmental safety and should be highly advocated since the crop is a major cash crop in Kenya. Integrated Management of white stem borer involves the use of a combination of cultural, bio-control and chemical measures that are relatively safe. Soft synthetic pesticides are recommended as a last option. This minimizes overuse of synthetic pesticides. Adoption of an IPM approach would enhance food safety and increase productivity and incomes for farmers
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticide companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media

	short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out Applied and adaptive research to validate IPM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel /Extension / companies producing biological control and biopesticides products and farmers would enhance promotion
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IPM technologies • In adequate knowledge on IPM strategies on insect pests infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract

	farming, collective production and marketing
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IPM in insect management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful upscaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the insect management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 5,000 as costs for insecticides and application per acre per season; KES 5000 per acre for insect traps. KES 25,000 as labor and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 35,000
Estimated returns	• Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 • Farmers who do not use the IPM package lose 25% of KES 560,000 (i.e. a loss of 140,000) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness

VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories if any	Successful management of white stem borer using IPM of white stem borer has led to increase in yield and quality of coffee in the 32 counties where implemented
Application guidelines for users	1. Plant wise Knowledge Bank. White Stem Borer 2. Coffee Production Recommendations (CPR) Coffee (James Minia) 3. Growers Handbook. James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO-Coffee Research Institute, Harrison M. Mugo KALRO- Food Crop Research Centre Muguga: Berrick Ochieng KALRO-FCRC-Kabete; Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps:

1. Explore the effectiveness of all registered fungal and bacterial based biopesticides for control of white stem borer
2. Assess the use of ITKs in pest management

3.9.16 Integrated management of Yellow headed borer (*Dirphya nigricornis*) in coffee

2.9.16 TIMP Name	Integrated management of Yellow headed borer (<i>Dirphya nigricornis</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management practice  Yellow headed borer (<i>Dirphya nigricornis</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
What is it? (TIMP description)	Integrated pest management (IPM) of yellow headed borer involves the combination of chemical, biological and cultural control methods. These are: - Cultural control • Cut off infested primaries and bury them • Kill the larva(e) already in the stem by inserting a wire/spoke at the last hole downwards • Remove and bury the heavily infested heads Biological control • Spray the main stem and thick primaries with neem kernel extract e.g. Achook, Nimbecidine, Neemraj Super and Neemroc • Spray 10% lime (i.e. spray lime at 10kg in 100 litres of water along with 100ml of a binder e.g. Fevicol DDL) on the main stem and thick primaries • Use a coffee white stem borer pheromone trap, i.e. cross-vane pheromone trap, to catch female beetle during flight periods Chemical control • Smoothen the trunk and paint or spray a 90 cm band above the ground with Brigade 25EC Repeat after one year and every second year • Insert a cotton ball soaked in a diluted Kingcode Elite 50 EC through the tunnel in incidences where the larva has entered into the stem
Justification	Yellow headed borer cause a considerable reduction in yield. Losses of above 25% are experienced due to yellow headed borer under high infestation levels. Currently, coffee farmers use a lot of synthetic pesticides in pest control. Integrated management of yellow headed borer considers food and environmental safety and should be highly advocated since the crop is a major cash crop in Kenya. Integrated Management of yellow headed borer involves the use of a combination of cultural, bio-control and chemical measures that are relatively safe. Soft synthetic pesticides are recommended as a last option.

	This minimizes overuse of synthetic pesticides. Adoption of an IPM approach would enhance food safety and increase productivity and incomes for farmers
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agro-chemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out applied and adaptive research to validate IPM technologies on insects • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage Insects • A strong partnership between technical personnel/Extension/ companies producing biological control and biopesticides products and farmers would enhance promotion.
Partners/stakeholders for scaling up and their roles	• Extension agents (both private and public): • Mobilization/sensitization of farmers and extension of the technology • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness. • CGIAR/NGOs to link farmers to the market and lobby for changes in agriculture policies to favor the farmer. • Financial institutions to provide credit facilities

C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IPM technologies • Inadequate knowledge on IPM strategies on insect pests infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IPM in insect management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful scaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the insect management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 5,000 as costs for insecticides and application per acre per season; KES 5000 per acre for insect traps. KES 25,000 as labour and other costs for implementation of the rest of management practices in the IPM package per acre. Total basic costs; KES 35,000
Estimated returns	• Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 • Farmers who do not use the IPM package lose 25% of KES 560,000 (i.e. a loss of 140,000) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth have limited access to productive resources such as credit to purchase the required inputs such as chemicals

	- Women have limited access to and control of coffee revenue - Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	- Opportunities for men and male youths exists in spraying the crop - Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	- VMGs have limited access to credit to buy the required inputs such as chemicals - VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	- Opportunities for unemployed male youths exists in spraying the crop. - Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories if any	Successful management of yellow headed stem borer using IPM of yellow headed stem borer has led to increase in yield and quality of coffee in the 32 counties where it is implemented
Application guidelines for users	https://eurekamag.com/research/002/190/002190367.php - Coffee Production Recommendations (CPR) James Minai (2021) - Coffee Growers Handbook; James Minai - Plant wise Knowledge Bank. Yellow headed borer
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO-Food Crop Research Centre-Muguga: Berrick Ochieng KALRO-FCRC-Kabete-Ruth Amata
Partner organizations	CABI, ICIPE, KEPHIS, Real IPM, Koppert, Universities, County governments

Gaps:

1. Explore the effectiveness of all registered fungal and bacterial based biopesticides for control of yellow headed borer
2. Assess the use of ITKs in pest management

3.9.17 Integrated management of Berry moth (*Hypothenemus hampei*) in coffee

2.9.17 TIMP Name	Integrated management of Berry moth (<i>Hypothenemus hampei</i>) in coffee
Category (i.e., technology, innovation, or management practice)	Management Practice   Berry moth larva Berry moth damage Berry moth (<i>Hypothenemus hampei</i>) Source: James Minai (KALRO)
A: Description of the technology, innovation, or management practice	
Problem addressed	Losses of coffee yield and quality of up to 48% due to coffee berry moth damage
What is it? (TIMP description)	Integrated pest management (IPM) of coffee berry moth is the combination of cultural, biological and chemical control methods. These are: - Cultural control • Scout for the pest during early berry development stage and if they are attacked, spray immediately and repeat the spray 5- 6 weeks later • Prune regularly • Practice field hygiene by collecting infested fallen berries that acts as reservoir for re-infestation • Remove infested berries. Destroy them by burning or deep burying • Avoid over-shading, 30% shading level is sufficient Biological control • Use of pheromone traps to capture the adults e.g. Brocap traps • Use of egg parasitoids and parasitic wasps Chemical control • Use a PCBP registered insecticides
Justification	Coffee berry moths cause a considerable reduction in yield and lower the bean quality. Where the pest is severe and uncontrolled, plants become greatly reduced in size. Losses of up to 50% are experienced due to the pest under high infestation levels reducing the quality and market value of the coffee produce or leading to rejection. Currently coffee farmers use a lot of synthetic pesticides in their control. Integrated Management of pests considers food safety concerns should be highly advocated since coffee is a key industrial crop in Kenya. This involves the use of a combination of cultural and bio-control and bio pesticides that are relatively safe. Soft synthetic pesticides are advocated for use as a last option. Adoption of an

	IPM approach would enhance food safety among the consumers and also contribute to environmental safety.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension agents (Public and Private), Research Organizations and Universities, Bio-pesticides companies, CGIAR's, Seed producing companies and SMEs, Processors, Agro-input dealers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Support Agrochemical companies to sell biological controls products • Create awareness of the benefits of the IPM management practices • Willingness of stakeholders to participate • Carry out Applied and adaptive research to validate IPM technologies on berry moth • Create a platform for interaction of coffee value chain stakeholders • Farmers adopt appropriate agronomic practices • Form well-organized farmer groups and networks • Formation of spray service providers (teams) to manage the pest • A strong partnership between technical personnel/Extension/ companies producing biological control and biopesticides products and farmers would enhance promotion. • Capacity building of farmers, extension officers and other stakeholder on integrated management practices of berry moth • Establishment of FFBS • Mapping of coffee berry moth free zones for up and out scaling of certified coffee seed production funding by government to promote production and distribution of certified seeds at farm level
Partners/stakeholders for scaling up and their roles	• Ministry of Agriculture and Livestock Development (MoALD) Extension and Capacity Building • ICIPE (International Centre for Insect Physiology and Ecology)– collaborative research on crop protection • FAO (Food and Agricultural Organization)- co-sharing of resources and networking and knowledge management • CIGs (Common Interest Groups)- back stopping the technologies at grass root levels

	• NGOs (non-governmental organization) (CARE Kenya): (Farmer Input Promotion) • Farmers/CBO: participate in trainings and adoption of the technology • KALRO to continually undertake research in insect pest management • PCPB to promote registration of insecticides for insect management • Universities to develop the technologies and conduct ToTs. • Financial institutions to provide credit facilities
C: Current situation and future scaling up	
Counties where already promoted if any	32 Coffee growing Counties e.g. Nairobi, Baringo
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Unwillingness of farmers to adopt IPM technologies • Inadequate knowledge on IPM strategies on insect pests infesting coffee and losses attributed to them • Poor linkages among stakeholders in coffee value chain
Suggestions for addressing the challenges	• PCPB enhance registration of crop protection products • Training of stakeholders in IPM options • Establish coffee innovation platforms for technology disseminations • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketing
Lessons learned in up scaling if any	• Sensitization is necessary for people to appreciate the use of IPM in insect management • Adoption of good agricultural practices by farmers is key in management of the insects • Chances of successful scaling are higher when many value chain stakeholders collaborate in an innovation platform • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable environmental conditions • Willingness of stakeholders to participate • Favourable environmental conditions • Regulatory bodies e.g. PCPB, to ensure insecticides sold to farmers are genuine and of high quality • Producers willing to adopt the insect management practices • Producers are organized in groups to ensure that management practices are effectively up-scaled • Farm input costs are within the reach of farmers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• KES 5,000 as costs for insecticides and application per acre per season; KES 5000 per acre for insect traps. KES 25,000 as labour and other costs for implementation of the rest of

	management practices in the IPM package per acre. Total basic costs; KES 35,000
Estimated returns	• Estimated returns (700 trees x10 kg x KES 80)/acre = KES 560,000 • Farmers who do not use the IPM package lose 48% of KES 560,000 (i.e. a loss of 268,800) (Depending on levels of infestation, weather conditions and stage at which the pest affects the crop)
Gender issues and concerns in development, dissemination adoption and scaling up,	• Women and youth may have limited access to productive resources such as credit to purchase the required inputs such as chemicals • Women have limited access to and control of coffee revenue • Women have less access to agricultural information, technology and knowledge as coffee is regarded as a man's enterprise – therefore they attend most of the training activities
Gender related opportunities	• Opportunities for men and male youths exists in spraying the crop • Affirmative action funds exist for youths and women to access the required funds.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to credit to buy the required inputs such as chemicals • VMGs have limited access to 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 VMGs due lack of awareness
VMG related opportunities	• Opportunities for unemployed male youths exists in spraying the crop. • Affirmative action funds exist for youths and women to access the required funds.
E: Case studies/profiles of success stories	
Success stories if any	Successful management of coffee berry moth using IPM of Coffee berry moth has led to increase in yield and quality of coffee in the 32 counties where it is implemented
Application guidelines for users	1. Coffee Production Recommendations (CPR); James Minai 2. Coffee Growers Handbook; James Minai (2021)
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for up scaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute P.O. Box 4-00232 Ruiru Email: director.cri@kalro.org Website: www.kalro.org
Lead organization and scientists	KALRO- Coffee Research Institute, Harrison M. Mugo KALRO-FCRC- Muguga: Berrick Ochieng

	KALRO-FCRC-Kabete; Ruth Amata
Partner organizations	CABI, KEPHIS, Real IPM, Koppert, Universities, County government, CIGs, Bayer Crop science

3.10 Weed Management in Coffee

3.10.1 Integrated Weed Management (IWM) in Coffee

2.10.1 TIMP Name	Integrated Weed Management (IWM) in Coffee
Category (i.e., technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Coffee yield and quality losses due to competition for growth resources such as water, nutrients and space by weeds
What is it? (TIMP description)	This is the proper and judicious use of a combination of existing management practices that include mechanical, chemical, cultural and biological methods to manage weeds in coffee
Justification	Weeds can cause economic losses by reducing coffee yields by up to 80% and lowering quality. IWM combines multiple weed control methods to achieve better results than any single method alone. Using a combination of cultural, mechanical, biological, and chemical control measures, IWM can effectively manage weeds while minimizing resistance development.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee farmers • Researchers • Extension service providers • Input providers • Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field on-farm plot demonstrations • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Pests Control Products Board (PCPB) for Regulation and approval of herbicides • Farmer co-operative Societies (FCS) for mobilization and sensitization of farmers, availing products to farmers

	• Agrochemical manufacturers to avail and distribute products, and to finance trials • Financial institutions to facilitate acquisition of products by FCS • Research organizations and Universities to Validate and upscale the technology • Development partners, National and County governments to finance and facilitate extension services to the farmers • Extension service providers for dissemination and sensitization of farmers
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of resistance coffee varieties • Weak collaboration among the stakeholders
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through Agricultural Innovative Platforms (AIPs) • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders
Lessons learned in up scaling if any	• Integrated approaches of weed management are more effective than use of one control method. • Continuous use of herbicides is an environmental, health and social hazard hence the need to follow instructions on the label. This prevents toxicity of next crop if the cycle of previous crops is short enough and safe guards the consumers.
Social, environmental, policy and market conditions necessary for development and up-scaling	• Strengthen the research-extension-farmer linkage through Agricultural Innovative Platforms (AIPs) • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Weeding (4-man days @ KES.400) x 2 weeding = KES 3,200 per acre • Herbicide cost = KES 3,500 per acre
Estimated returns	Average yield at 7,000kg of cherry per acre @ 80 = KES 560,000.00
Gender issues and concerns in development and dissemination	• Coffee is owned by men yet it is women and the youths who perform most of the weeding activities • Women and youths have limited access to productive resources such as land and chemicals than men • Women and youths have limited access to education, training and extension services than men. • Women have less access to agricultural information, technology and knowledge.
Gender issues and concerns in	• Opportunities exist for males and youth males in spraying the

adoption and scaling up	- crop. - Affirmative action opportunities exist for women and youths to acquire the required credit
Gender related opportunities	- VMGs have limited access to productive resources such as land and chemicals than men. - VMGs have limited access to training and extension services. - Due to their social status VMGs are often excluded from decision making in development and dissemination activities. - VMGs have limited access to information on production techniques. - There is low adoption by VMGs due lack of awareness.
Vulnerable and marginalized groups (VMG) issues and concerns in development, dissemination, adoption and scaling up	- Opportunities exist for males and youth males in spraying the crop. - Affirmative action opportunities exist for women and youths to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	All farmers in the country use more than one method to control weeds
Application guidelines for users	1. Coffee Production Recommendations (CPR) 2. Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	2. Requires validation
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan A. Odeny, Violet N. Momanyi
Partner organizations	• PCPB, • AAK • National and County Governments, • Research organizations

3.10.2 Mechanical control of Weeds

2.10.2 TIMP Name	Mechanical control of Weeds
Category (i.e., technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Coffee yield losses and reduction in quality due to crop damage by competition for growth resources such as water, nutrients and space by weeds
What is it? (TIMP description)	Proper and timely use of mechanical implements including hand hoes, pangas, use of fork jembes, slashers and tractor drawn mowers to manage weeds.
Justification	Weeds can cause up to 80% yield losses and significant decrease in coffee quality losses if not timely and effectively managed. Mechanical practices offer low-cost and environmentally friendly strategies for management of weeds. These practices also significantly reduce reliance on chemicals (which may be used inappropriately) by farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee farmers • Researchers • Extension service providers • Input providers including • Agripreneurs
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field days and demonstration on plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Farmer Cooperative Societies (FCS) for mobilization and sensitization of farmers, availing products to farmers • Research organizations and Universities to Validate and upscale the technology • National and County governments to finance and facilitate extension services to the farmers • Extension service providers for dissemination and sensitization of farmers

C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of resistance coffee varieties • Weak collaboration among the stakeholders
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through Agricultural Innovative Platforms (AIPs) • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders
Lessons learned in up scaling if any	Mechanical weed management is effective when done timely and by using the right implements.
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable agro-ecological conditions • Favourable institutional policy environment • Availability of market for the produce
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Weeding (4-man days @ KES.400) x 2 weedings = KES 3,200 per acre
Estimated returns	Average yield at 7,000kg of cherry per acre @ 80 = KES 560,000.00
Gender issues and concerns in development and dissemination	• Coffee is owned by men yet its women and the youths who perform most of the weeding activities • Women and youths have limited access to productive resources such as land, implements and chemicals • Women and youths have limited access to education, training and extension services. • Women have less access to agricultural information, technology and knowledge.
Gender related opportunities	• Affirmative action opportunities exist for women and youths to acquire the required credit
Vulnerable and marginalized groups (VMG) issues and concerns in development, dissemination, adoption and scaling up	• VMGs have limited access to productive resources such as land and chemicals. • VMGs have limited access to training and extension services. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • VMGs have limited access to information on production techniques. • There is low adoption by VMGs due lack of awareness.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Most farmers across the country practice mechanical weed control by using different tools.
Application guidelines for users	1. Coffee Production Recommendations (CPR) 2. Coffee Growers Handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2.	1. Ready for up scaling

Requires validation, 3. Requires further research)	
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan A. Odeny, Violet N. Momanyi
Partner organizations	• National and County Governments • Farmer cooperative Societies (FCS) • Research organization and Universities • Extension service providers • Input providers

Gaps

1. Develop simple mechanical tools to control weeds

3.10.3 Cultural control of Weeds

2.10.3 TIMP Name	Cultural control of Weeds
Category (i.e., technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Coffee yield losses and reduced quality due to crop damage caused by competition for growth resources such as water, nutrients and space by weeds.
What is it? (TIMP description)	This is the proper and timely application of recommended agronomic practices including use of shade, mulching (synthetic and organic), intercropping and irrigation to manage weeds. These practices significantly reduce reliance on chemicals which may be misused by farmers.
Justification	Weeds can cause up to 80% yield loss and significantly lower the coffee quality if not timely and effectively managed. Cultural practices offer low cost and are environmentally friendly strategies for weed management.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee farmers • Researchers • Extension service providers • Input providers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents

	• Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Farmer Co-operative Societies (FCS) for mobilization and sensitization of farmers, availing products to farmers • Research organizations and Universities to Validate and upscale • Development partners, National and County governments to finance and facilitate extension services to the farmers • Extension service providers for dissemination and sensitization of farmers
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of resistance coffee varieties Weak collaboration among the stakeholders
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders
Lessons learned in up scaling if any	• Cultural weed management is effective when done timely.
Social, environmental, policy and market conditions necessary for development and up-scaling	• Reduced use of synthetic herbicide application • Favourable agro-ecological conditions • Favourable institutional policy environment
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of synthetic mulch is about KES 10,000 per acre
Estimated returns	Average yield at 7,000kg of cherry per acre @ 80 = KES 560,000.00
Gender issues and concerns in development and dissemination	• Coffee is owned by men yet its women and the youths who perform most of the weeding activities • Women and youths have limited access to productive resources such as land and mulching materials than men • Women and youths have limited access to education, training and extension services than men. • Women have less access to agricultural information, technology and knowledge.
Gender issues and concerns in adoption and scaling up	• Affirmative action opportunities exist for women and youths to acquire the required credit

Gender related opportunities	• VMGs have limited access to productive resources such as land and mulching materials than men • VMGs have limited access to training and extension services. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • VMGs have limited access to information on production techniques. • There is low adoption by VMGs due lack of awareness.
Vulnerable and marginalized groups (VMG) issues and concerns in development, dissemination, adoption and scaling up	• Affirmative action opportunities exist for women and youths to acquire the required credit
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	1. Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan A. Odeny, Violet N. Momanyi
Partner organizations	• National and County Governments • Farmer Co-operative Societies (FCS) • Research organization and Universities • Extension service providers

3.10.4 Biological Control of Weeds

2.10.4 TIMP Name	Biological Control of Weeds
Category (i.e., technology, innovation, or management practice)	Technology
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Coffee yield losses and reduced quality due to crop damage by competition for growth resources such as water, nutrients and space by weeds.
What is it? (TIMP description)	This is the use of indigenous or exotic natural organisms to manage weeds in coffee
Justification	Weeds can cause up to 80% yield loss and significant reduction in quality if not timely and effectively controlled. Biological control agents (BCAs) offer low costs and environmentally friendly strategies for management of coffee weeds if well researched on, developed, and properly disseminated. A fungal pathogen, <i>Colletotrichum gloeosporioides</i> used as a myco-herbicide has proved effective in controlling coffee senna

	(<i>Cassia occidentalis</i>), wild senna (<i>C. marilandica</i>), and sicklepod (<i>C. obtusifolia</i>).
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee farmers • Researchers • Extension service providers • Input providers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field days and on farm plot demonstration • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Pests Control Products Board (PCPB) for Regulation and approval of natural organisms suitable for use in coffee weed management • Research organization and Universities to Research, validate and upscale the various existing biological control agents • Development partners, National and County governments to support financing for the development of the TIMP
C: Current situation and future scaling up	
Counties where already promoted if any	32 regions growing coffee
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery
	• Low awareness of resistance coffee varieties • Weak collaboration among the stakeholders
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders
Lessons learned in up scaling if any	Biological weed management is environmentally friendly and safe for the consumer
Social, environmental, policy and market conditions necessary for development and up-scaling	• The practice will be socially acceptable • Favourable agro-ecological/ climate conditions • Favourable institutional policy environment

D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	The cost of isolating the micro-herbicides (pathogens) is not known at the moment.
Estimated returns	Average yield at 7,000kg of cherry per acre @ 80/= = 560,000.00
Gender issues and concerns in development and dissemination	• Coffee is owned by men yet its women and the youths who perform most of the weeding activities • Women and youths have limited access to productive resources such as land and biological control agents (BCAs) than men • Women and youths have limited access to education, training and extension services than men. • Women have less access to agricultural information, technology and knowledge.
Gender issues and concerns in adoption and scaling up	• Affirmative action opportunities exist for women and youths to acquire the required credit
Gender related opportunities	• VMGs have limited access to productive resources such as land and biological control agents (BCAs) materials than men • VMGs have limited access to training and extension services. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • VMGs have limited access to information on production techniques. • There is low adoption by VMGs due lack of awareness.
Vulnerable and marginalized groups (VMG) issues and concerns in development, dissemination, adoption and scaling up	• Affirmative action opportunities exist for women and youths to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	
Application guidelines for users	1. Boyette DC, Hoagland ER, Weaver AM and Stetina K. Biological Control Potential of <i>Colletotrichum gloeosporioides</i> for Coffee Senna (<i>Cassia occidentalis</i>). American Journal of Plant Sciences. 2012(3):430-436. doi:10.4236/ajps.2012.34052. Available at: http://www.SciRP.org/journal/ajps.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	3. Requires further research
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org

	Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Aim Odeny, Violet N. Momanyi
Partner organizations	• PCPB • National and County Governments, • Research organizations • Relevant Universities

3.10.5 Cover cropping to control weeds

2.10.5 TIMP Name	Cover cropping to control weeds
Category (i.e., technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Coffee yield and quality losses due to competition for growth resources such as water, nutrients and space by annual and perennial narrow and broadleaved weed species, combined with poor management weeds.
What is it? (TIMP description)	This is the growing of specific, selected crops to produce biomass/canopy to cover the soil. The biomass of cover crop may later be killed by rolling it down or dried on the soil with a herbicide. This cover acts as a barrier cutting off light to stop germination of weed seeds and also in the subsequent season.
Justification	Weeds cause up to 80% yield loss and significant quality reduction. Cover cropping with appropriate crops such as non-climbing beans (<i>Phaseolus Spp.</i>) njahi (<i>dolichos lab lab</i>) and <i>mucuna puriens</i> suppress weeds in the subsequent season, conserve moisture and regulate soil temperatures.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee farmers • Researchers • Extension service providers • Input providers
Approaches to be used in dissemination	• Farmer Field Business Schools (FFBS) • Field days and farmer to farmer approach • Agricultural shows and trade fairs • Electronic and mass media • Agricultural Innovation Platforms (AIPs) • Seminars and workshops
Critical/essential factors for successful promotion	• Applied and adaptive Research to test, validate and release cover cropping in coffee varieties, • A platform for interaction of coffee value chain stakeholders, • Conduct demos and field days with farmer groups and other Stakeholders • Availability of market for the produce • Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms, demos, and field days

Partners/stakeholders for scaling up and their roles	• Pests Control Products Board (PCPB) for Regulation and approval of herbicides • Farmer co-operative Societies (FCS) for mobilization and sensitization of farmers, availing products to farmers • Agrochemical Manufacturers to avail and distribute products, Finance trials • Financial institutions to facilitate acquisition of products by FCS • Research organizations and Universities to Validate and upscale the technology • Development partners, National and County governments to finance and facilitate extension services to the farmers • Extension service providers for dissemination and sensitization of farmers
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing counties
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Weak collaboration among the stakeholders • Lack of coffee innovation platforms to facilitate interaction of farmers with relevant stakeholders
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through Agricultural Innovative Platforms (AIPs) • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders • Establish coffee innovation platforms to facilitate interaction of farmers with relevant stakeholders
Lessons learned in up scaling if any	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate • Creation of awareness through demonstrations and farmer field days help in adoption of the technology • Availability of market is essential • Partnership is important in technology dissemination and adoption
Social, environmental, policy and market conditions necessary for development and up-scaling	• Strengthen the research-extension-farmer linkage through Agricultural Innovative Platforms (AIPs) • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders • Willingness of farmers to adapt the technology • Favourable climate conditions
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cover cropping will reduce weeding by 50% (from KES 3,200 to 1,600)
Estimated returns	Average yield at 7,000kg of cherry per acre @ 80 = KES 560,000.00
Gender issues and concerns in	• Cover crop reduce labour time and costs. This may reduce

development, dissemination, adoption and scaling up	the labour burden for the various gender categories especially women who perform most of the weeding activities. • Women and youths have limited access to productive resources such as land and the required seeds for the cover crops (BCAs) than men • This time saved can be used to perform other productive activities.
Gender related opportunities	• Women can use the cover crops to ensure food and nutritional security in the household. • Affirmative action opportunities exist for women and youths to acquire the required credit
VMG issues and concerns in development, dissemination, adoption and scaling up	• The TIMP will reduce VMG's weeding time that can be used performing other productive activities.
VMG related opportunities	• Women can use the cover crops to ensure food and nutritional security in the household. • Affirmative action opportunities exist for women and youths to acquire the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Murang'a and Meru
Application guidelines for users	1. Coffee Production Recommendations (CPR) 2. Coffee Growers Handbook 3. Mwangi, H.W., Kihurani, A.W., Wesonga, J.M., Ariga, E.S. and Kanampiu, F. (2015a). Factors influencing adoption of cover crops for weed management in Machakos and Makueni counties of Kenya. <i>European Journal of Agronomy</i> 69(2015)1-9. http://dx.doi.org/10.1016/j.eja.2015.05.001.
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	2. Requires validation
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Aim Odeny, Violet N. Momanyi
Partner organizations	• PCPB, AAK, National and County Governments and Research organizations

3.10.6 Chemical/ herbicide management of Weeds

2.10.6 TIMP Name	Chemical/ herbicide management of Weeds
Category (i.e., technology, innovation, or management practice)	Management practice
A: Description of the technology, innovation, or management practice	
Problem to be addressed	Coffee yield losses and reduced quality due to crop damage by competition for growth resources such as water, nutrients and space by weeds.
What is it? (TIMP description)	This is a technology used to effectively control the germination and growth of weed species through application of herbicides to weeds or the soil.
Justification	Weeds cause up to 80% yield loss and significant quality reduction if not managed on time and effectively. Responsible use of herbicides ensures proper weed control thereby enhancing coffee productivity and quality. In addition, manual hand weeding is very labour intensive yet labour is scarce and expensive. Use of herbicides can reduce days spent weeding manually from 10-12 days per acre to nil - 2 days Herbicides can be classified as pre- and post- emergent. Pre-emergent are applied on to moist soil after field preparation and within 24 hours after planting before both the crop and weed have emerged. An example is Atrazine (150-170 mls in 20 litres water) effectively prevents seed germination of weeds. Post emergent are applied on the germinated weeds. a) Post-emergent selective such as 2,4-D (100-150 ml in 20 litres water) sprayed between crop at 2-3 weeks after germination will effectively control broad leaved weeds. Agil 100EC will effectively control grass weeds at a rate of 100-200ml in 20 litres of water Caution: Fix a hood on the nozzle while spraying a post emergent herbicide between rows to protect damage to coffee since it is also broad leaved. Spraying should only be done after users have been trained and cautioned to the hazards. b) Post-emergent non selective, broad-spectrum herbicides such as glyphosate (100-200 ml in 20 litres of water) mostly used in zero and minimum tillage may be applied as directed but guarded with a hood to avoid harming the crop.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee farmers • Researchers • Extension service providers • Input providers including Agro-dealers that provide chemicals

Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Access to the technology • Sensitization on the technology • Field Demonstration plots • Enhanced funding for technology dissemination
Partners/stakeholders for scaling up and their roles	• Pests Control Products Board (PCPB) for Regulation and approval of herbicides • Farmer Co-operative Societies (FCS) for mobilization and sensitization of farmers, availing products to farmers • Agrochemical Manufacturers to avail and distribute products, finance trials. • Financial institutions- facilitate acquisition of products by FCS • Research organizations and Universities to Validate and upscale the TIMP • National and County governments to finance and facilitate extension services to the farmers • Extension service providers for dissemination and sensitization of farmers
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Coffee
Counties where TIMPs will be up scaled	Machakos, Meru, Embu, Tharaka Nithi, Kiambu, Nyeri, Murang'a and Kirinyaga
Challenges in development and dissemination	• Weak research-extension-farmer linkage in technology delivery • Low awareness of resistance coffee varieties • Weak collaboration among the stakeholders
Suggestions for addressing the challenges	• Strengthen the research-extension-farmer linkage through AIPs • Sensitization campaigns and on-farm demonstrations • Strengthen collaboration among the stakeholders
Lessons learned in up-scaling if any	• Chemical weed control is effective and safe to the environment and consumer if registered products are used and instructions indicated on the herbicide label followed.
Social, environmental, policy and market conditions necessary for development and up-scaling	• Favourable agro-ecological conditions • Favourable institutional policy environment

D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Herbicide cost = KES 3,500 per acre USD 3,000 for each chemical product evaluated
Estimated returns	Average yield at 7,000kg of cherry per acre @ 80 = KES 560,000.00
Gender issues and concerns in development, dissemination concerns in adoption and scaling up	• Women and children are the main sources of labour for this crop. Adoption of technology will reduce the labour burden on women therefore making them have time for other economic activities. • Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men • Women and youths have less access to credit to purchase the required inputs such as chemicals
Gender related opportunities	• Affirmative action opportunities exist for women and youths to credit to rent land for seed multiplication.
VMG issues and concerns in development	• VMGs have limited access to land for Kale seed multiplication than men. • VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	• Affirmative action opportunities exist for VMGs to acquire credit to rent land for seed multiplication.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	The technology is scarcely used across the country
Application guidelines for users	1. PCPB website- List of approved chemicals on for coffee farming. Available at: https://pcpb.go.ke/listofregproducts/ 2. Coffee farmers handbook
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	1. Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Danstan Aim Odeny, Violet N. Momanyi
Partner organizations	PCPB, AAK and National and County Governments

3.11 Coffee Post Harvest Management

3.11.1 Factory layout guidelines

2.11.1 TIMP Name	Factory layout guidelines
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Reduced productivity (outputs and incomes) as a result of contamination of coffee in the primary processing facilities due to incorrect way of placement of facilities
What is it? (TIMP description)	This is a guideline that lays down how a wet mill facility should be constructed, ensuring smooth flow of work, materials and information through the processing facility for increased efficiency.
Justification	Correct way of placement of facilities avoids contamination of coffee and ensures efficiency of operations therefore increasing output and incomes
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	County Government, KALRO – CRI, Factory managers, Estates managers, Farmers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services
Critical/essential factors for successful promotion	• Appropriate site for coffee processing facilities
Partners/stakeholders for scaling up and their roles	• Farmers – to adopt the TIMP • NEMA – to ensure no contamination of environment • Entrepreneurs – to construct the facilities • KEBS – for standards
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Kiambu, Nyeri, Murang'a, Kirinyaga Meru, Tharaka Nithi, Machakos, Embu.
Challenges in dissemination	High initial capital outlay
Suggestions for addressing the challenges	• Communities to raise funds collectively • Private investors in processing
Lessons learned in promotion if any	

Social, environmental, policy and market conditions necessary for development and up-scaling	• Value chain actors willing to adopt the TIMP • Availability of resources – facilities, human resource • Sufficient land under coffee production to sustain the investment • Policies on coffee factory design implemented • Availability of market
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES 100,000 for the lay out plan
Estimated returns	Depends on level of production
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	• Reduced losses leading to more income for men who own the enterprise
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	• Well laid out structures will allow the VMGs to access and work in the factories
E: Case studies/profiles of success stories	
Success stories from previous similar projects	There are many well designed wet mills such as those in CRI, Ndumberi FCS, Mutira FCS and Mwirua FCS, which are reporting increased outputs and incomes
Application guidelines for users	Cenicafe, G. (undated). Criteria for Design of Facilities for Coffee Processing by the Wet Method in Colombia
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	• Coffee Co-operative Societies and unions • Coffee Millers • Coffee Marketers

3.11.2 Manual selective coffee harvesting

2.11.2 TIMP Name	Manual selective coffee harvesting
Category (i.e., technology, innovation or management practice)	Management Practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Reduced productivity as a result of quality loss due to untimely harvesting of coffee berries
What is it? (TIMP description)	These are guidelines on what to harvest, how to harvest, and where and how, to keep the cherry before pulping. It entails harvesting only deep red ripe cherries.
Justification	Untimely harvesting of cherries before they are deep red in color (not sufficiently mature), as well as exposure of the harvest to the sun and use of unclean containers leads to loss in quality, subjecting farmers to lower prices. Contamination on one farm ultimately affects the quality of milled products from the entire factory. Selective manual harvesting and management of the cherry enhances quality of the milled coffee and better prices for the producers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension staff, wet mills managers
Approaches to be used in dissemination	TOT-Trainings, Farmer Field Business Schools (FFBS), field demonstration plots, promotional materials (posters, brochures, leaflets, manuals)
Critical/essential factors for successful promotion	• Application of good agronomic practices to have a good crop • Market preference • Preferred traits by consumers
Partners/stakeholders for scaling up and their roles	• Farmers – up-scaling • Cooperative societies -Training and inspection • Estate managers- Training and inspection • Extension staff-Training
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Kiambu, Nyeri, Murang'a, Kirinyaga Meru, Tharaka Nithi, Machakos, Embu.
Challenges in development and dissemination	• High cost of selective harvesting • Lack of uniformity in ripening

Suggestions for addressing the challenges	• Support improved extension services on coffee harvesting • Collective understanding and enforcement by farmers	
Lessons learned in up scaling if any	Selective picking leads to improvement in quality and hence better prices of output; Successful promotion of selective harvesting requires linkage of such coffee to specialty coffee buyers Continuous capacity building is key in behavior change	
Social, environmental, policy and market conditions necessary for development and up-scaling	• Farmers’ willingness to adopt the TIMP • Favourable weather conditions • Favourable coffee prices • There will be favourable policy for adoption of the TIMP	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	KES.100 per debe (12kg) in labour costs for harvesting, which saves on labour for additional sorting	
Estimated returns	KES. 840 per debe (12kg x70 KES.)	
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women perform most of the harvesting activities therefore selective harvesting will increase their work • Women and youth have limited access to education, training and extension services than men.	
Gender related opportunities	• Employment opportunities exist for women to perform the task	
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.	
VMG related opportunities	• Employment opportunities exist for women to perform the task	
E: Case studies/profiles of success stories		
Success stories from previous similar projects	Farmers practicing selective harvesting have reported increased incomes, by being linked to specialty coffee buyers	
Application guidelines for users	KALRO (2019). <i>Coffee (Coffea Arabica and Coffea canephora)</i> Production and Utilization in Kenya. AFA (2022). <i>Robusta Coffee Growers’ Manual</i> . Agriculture and Food Authority – Coffee Directorate.	
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling	
G: Identified gaps	Intervention	Responsible institution
None		

H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization scientists and	KALRO-CRI, C. W Kathurima, F. O. Wayua
Partner organizations	Coffee Co-operatives and Unions, Coffee Millers, Coffee Marketers

3.11.3 Manual colour sorting

2.11.3 TIMP Name	Manual colour sorting
Category (i.e., technology, innovation or management practice)	Management Practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Reduced productivity due to poor quality from mixed ripening. Mixing unripe, under-ripe and over-ripe cherries, the resulting product is of lower quality.
What is it? (TIMP description)	This is the sorting done to remove the un-ripe, under-ripe and over-ripe cherries, and foreign materials which lower the quality of coffee.
Justification	Un-ripe, under-ripe and over-ripe cherries and foreign materials leads to loss in quality, hence reduced incomes
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, researchers, extension staff, wet mills managers
Approaches to be used in dissemination	• Farmer Field and Business Schools (FFBS) • Agricultural innovation platforms (AIP) • Demonstrations - On-farm and on station • Agricultural shows/exhibitions/field days • Trainings - workshops/Seminars/Meetings • Public and private Extension Agents • Farmer to farmer extension models • Mass media – Electronic and print • Publications -posters/brochures/leaflets, manuals • Digital Platforms– Website, Dashboards, Apps, social media short message services

Critical/essential factors for successful promotion	• Market preference
Partners/stakeholders for scaling up and their roles	• Farmers for up-scaling • Cooperative societies -Training and inspection • Estate managers- Training and inspection • Extension staff-Training
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Kiambu, Nyeri, Murang'a, Kirinyaga Meru, Tharaka Nithi, Machakos, Embu.
Challenges in dissemination	• Unwillingness to sort (laborious exercise) • Lack of uniformity in ripening
Suggestions for addressing the challenges	• Capacity building of farmers on effect of sorting on coffee quality and hence incomes • Support improved extension services on agronomic practices to ensure uniform ripening
Lessons learned in up scaling if any	Successful promotion of coffee sorting requires linkage of such coffee to specialty coffee buyers
Social, environmental, policy and market conditions necessary for development and up-scaling	• Farmers' willingness to adopt the TIMP • There will be favourable policy for adoption of the TIMP • Market availability for quality coffee
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approx. KES.300/- per Man-day for sorting
Estimated returns	Reduced losses, better income and nutrition (due to appropriate sorting and grading techniques)
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women perform most of the sorting activities therefore manual sorting will increase their work • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	• Employment opportunities exist for women to perform the task
VMG issues and concerns in development, dissemination, adoption and scaling up	• Women perform most of the sorting activities therefore manual sorting will increase their work • VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	• Employment opportunities exist for women to perform the task

E: Case studies/profiles of success stories	
Success stories from previous similar projects	Farmers in coffee growing areas have reported improved coffee quality and incomes from adoption of the TIMP
Application guidelines for users	KALRO (2019). Coffee (<i>Coffea Arabica</i> and <i>Coffea canephora</i>) Production and Utilization in Kenya. AFA (2022). <i>Robusta Coffee Growers' Manual</i> . Agriculture and Food Authority – Coffee Directorate.
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	1. Ready for up-scaling
G: Identified gaps	Intervention Responsible institution
None	
H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, C. W Kathurima
Partner organizations	Coffee Co-operative Societies and Unions Coffee Millers, Coffee Marketers

3.11.4 Mechanical Colour Sorting

2.11.4 TIMP Name	Mechanical Colour Sorting
Category (i.e., technology, innovation or management practice)	Innovation
	

A: Description of the technology, innovation or management practice	
Problem addressed	• Quality loss due to mixed ripening • Inefficiencies in manual sorting which is tedious and time consuming. • Loss of quality due to mixed ripening
What is it? (TIMPdescription)	It is an innovation for sorting of un-ripe, under-ripe, over-ripe cherries and foreign materials mechanically
Justification	Mixing un-ripe, under-ripe, over-ripe cherries and foreign materials lead to loss in quality. Mechanical colour sorting equipment reduces time taken and improves efficiency in sorting thus enhancing the quality of resulting product. It also addresses the challenge of limited labour at the time of sorting.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, Cooperatives, Trade Unions, AFA, Processors, Traders, Millers, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee sorting innovations • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee technologies • Sensitization and training farmers on the benefits of coffee value addition technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of value addition technologies • Participatory on-farm demonstrations by stakeholders
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scaling of agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at the county level • Farmers -for up-scaling

	• Cooperative societies – Carry out training and inspections • Estate managers- Training and inspection
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Lack of knowledge by value chain actors on the benefits of sorting on coffee quality • Lack of coordinated extension service in coffee growing areas • The cost of the machine could be inhibiting at the farm level.
Suggestions for addressing the challenges	• Improved knowledge of value chain actors on benefits of sorting on quality of coffee • Capacity building and awareness creation on the benefits of this innovation • Collaboration between partners and county governments in the promotion of this innovation and extension services • Links with financial institutions to facilitate acquisition of machine.
Lessons learned in up scaling if any	Successful promotion of coffee sorting requires linkage of farmers to specialty coffee buyers
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in use of this innovation in sorting coffee to enhance adoption • Environmental: Highlight the research results showing the benefits of mechanical clour sorting machine to environmental safety, food safety and human health • Market conditions: Affordability and availability of this innovation close to the farmers is essential for their uptake. • Capacity build farmers on benefits of this innovation to create market demand Policy: Provide enabling policy guiding and supporting the
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately 34,000 USD FOB Shanghai, for medium size
Estimated returns	Reduced losses, better income and nutrition (due to appropriate sorting and grading techniques) ???
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women perform most of the sorting activities therefore mechanical sorting will reduce their work burden. Time saved can be used in other productive agricultural activities • Women and youth have limited access to education, training and extension services than men. • Women and youth have limited access to credit to purchase the equipment
Gender related opportunities	• Employment opportunities exist for youth males and men in operating the equipment

	• Opportunities exist for youth in fabrication and repair of colour sorters.	
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men. • VMGs have limited access to credit to purchase the equipment • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.	
VMG related opportunities	• Employment opportunities exist for youth males and men in operating the implement • Opportunities exist for youth in fabrication and repair of colour sorters. • Affirmative action in various areas as for instance in the provision of finances to VMGs	
E: Case studies/profiles of success stories		
Success stories from previous similar projects	Farmers in coffee growing areas have reported improved coffee quality and incomes from adoption of the TIMP	
Application guidelines for users	1. KALRO (2019). <i>Coffee (Coffea Arabica and Coffea canephora)</i> Production and Utilization in Kenya. 2. AFA (2022). <i>Robusta Coffee Growers’ Manual</i>. Agriculture and Food Authority – Coffee Directorate.	
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up-scaling	
G: Identified gaps	Intervention	Responsible institution
None		
H: Contacts		
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org	
Lead organization and scientists	KALRO-CRI, Kathurima C. W , Wayua F. O., J. M. Ndambuki J. M.	
Partner organizations	Coffee Co-operative Societies and Unions, Coffee Millers, Coffee Marketers	

3.11.5 Sorting by flotation

2.11.5 TIMP Name	Sorting by flotation
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem addressed	Quality loss due to mixed ripening of coffee berries.
What is it? (TIMP description)	Sorting of the lights and over-ripe cherries by immersing them in water and separating them by use of density.
Justification	The lights, overripe cherries and small cherries lead to loss in quality. Sorting by floatation isolates coffee into different grades, a precursor to maintaining high quality for better prices.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Cooperatives, Trade Unions, Traders, Millers, Seed dealers and Agriprenuer.
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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee sorting innovations • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee technologies • Sensitization and training farmers on the benefits of coffee value addition technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of value addition technologies
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scaling of agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at the county level • Farmers for up-scaling • Cooperative societies -Training and inspection

	Estate managers- Training and inspection
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	- Lack of knowledge by value chain actors on the benefits of sorting on coffee quality - Lack of coordinated extension service in coffee growing areas - The cost of the machine could be inhibiting at the farm level.
Suggestions for addressing the challenges	- Improved knowledge of value chain actors on benefits of sorting on quality of coffee - Capacity building and awareness creation on the benefits of this innovation - Collaboration between partners and county governments in the promotion of this innovation and extension services - Links with financial institutions to facilitate acquisition of machine.
Lessons learned in up scaling if any	Successful promotion of coffee sorting requires linkage of coffee farmers to specialty coffee buyers.
Social, environmental, policy and market conditions necessary for development and up-scaling	- Farmers' willingness to adopt the TIMP - Policy for adoption of the TIMP are developed and/or implemented - Market able to absorb increased supply of quality coffee
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of installation of wet milling system
Estimated returns	Reduced losses, better income and nutrition (due to appropriate sorting and grading techniques)
Gender issues and concerns in development, dissemination, adoption and scaling up	- Women have less access to agricultural information, technology and knowledge than men. - Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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	Employment opportunities exist for VMG in performing the task.

E: Case studies/profiles of success stories		
Success stories from previous similar projects	Sorting improves quality and enhances farmers' incomes. Some Societies in Muranga and Kirinyaga Counties have practiced this leading to overall improvement in quality.	
Application guidelines for users	Advisory and training materials available	
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up-scaling	
G: Identified gaps	Intervention	Responsible institution
None		
H: Contacts		
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org	
Lead organization and scientists	KALRO-CRI, Kathurima C. W.	
Partner organizations	Coffee Co-operative Societies and Unions, Coffee Millers, Coffee Marketers	

3.11.6 Disc Pulper

2.11.6 TIMP Name	Disc Pulper
Category (i.e., technology, innovation or management practice)	Innovation 
A: Description of the technology, innovation or management practice	
Problem addressed	Presence of pulp on the coffee fruit resulting into degradation of the coffee quality.
What is it? (TIMP description)	Machine used for coffee pulping
Justification	Pulping reduces the mass of coffee bean to be dried, hence improved the coffee quality. Removal of pulp before fermentation reduces uncontrollable fermentation or rot that can cause loss of coffee quality

B: Assessment of dissemination and scaling up/out approaches	
Users of TIMPs	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Cooperatives, Trade Unions, Traders, Millers and Agripreneur.
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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee pulpers • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee pulping technologies • Sensitization and training farmers on the benefits of coffee value addition technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of pulping technologies • Participatory on-farm demonstrations by stakeholders
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scae agricultural research and extension service at the county level • Farmers -for up-scaling • Cooperative societies – Carry out training and inspections • Estate managers- Training and inspection • Suppliers – To supply the machinery • Cooperative societies and Estate Manager – To pulp coffee for members • Financial institution – provide funds for acquiring pulpers.
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Uses high quantities of water

	• High installation costs • Lack of skilled personnel.
Suggestions for addressing the challenges	• Adopt Eco-pulper Technology which uses less water • Provide appropriate financing for acquisition of the pulper • Support improved extension services.
Lessons learned in up scaling if any	• It is an effective way of pulping and pre- grading leading to good quality coffees in Kenya.
Social, environmental, policy and market conditions necessary for up-scaling	• Social conditions: Involve all gender in disc pulper training to enhance adoption • Environmental: Highlight the research results showing the benefits of t disc pulper options to environmental safety, food safety and human health • Market conditions: Availability of disc pulper close to the farmers is essential for their uptake. Consumer demand for pulped coffee • Capacity build farmers on benefits of a disc pulper to create market demand • Policy: Provide enabling policy guiding and supporting the use of disc pulper and review policy from time to time.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES.3 million for a 3-disc pulper
Estimated returns	Better income and nutrition
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	• Employment opportunities exist for youth males and men in performing the task
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Value chain actors in coffee growing areas have reported improved coffee quality and incomes from adoption of the TIMP. Pulped coffee dries faster
Application guidelines for users	KALRO (2019). Coffee (Coffea Arabica and Coffea canephora) Production and Utilization in Kenya. AFA (2022). Robusta Coffee Growers' Manual. Agriculture and Food Authority – Coffee Directorate.
F: Status of TIMP Readiness (1. Ready for up scaling, (2. Requires validation (3. Requires further research	Ready for up-scaling

H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, C. W Kathurima
Partner organizations	• Coffee Co-operative Societies and Unions • Coffee Millers, • Coffee Marketers

3.11.7 Drum Pulper

2.11.7 TIMP Name	Drum Pulper
Category (i.e., technology, innovation or management practice)	Innovation 
A: Description of the technology, innovation or management practice	
Problem addressed	Lack of small pulping units for upcoming farmers where the large pulping units are not available. In absence of pulping units, the farmers dry their coffee as Mbuni, which is coffee of very low quality
What is it? (TIMP description)	This is a small machine used for coffee pulping that also separates the pulp from beans.
Justification	Pulping reduces the mass of coffee bean to be dried. Removal of pulp before fermentation reduces uncontrollable fermentation or rot that can cause loss of quality. Where the large units are not available, there is need to for small pulping units. The farmers can then deliver the dried parchment to the mill thereby getting better prices for their coffee.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee pulpers • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee pulping technologies • Sensitization and training farmers on the benefits of coffee value addition technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of pulping technologies • Participatory on-farm demonstrations by stakeholder
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at county level • Farmers -for up-scaling • Cooperative societies and Estate Managers- Carry out training and inspections
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	High maintenance cost.
Suggestions for addressing the challenges	Provide appropriate financing for regular maintenance.
Lessons learned in up promotion if any	This machine can be easily fabricated by local artisans.
Social, environmental, policy and market conditions necessary for up-scaling	• Social conditions: Involve all gender in drum pulper training to enhance adoption • Environmental: Highlight the research results showing the benefits of drum pulper options to environmental safety, food safety and human health • Market conditions: Availability of disc drum pulper close to the farmers is essential for their uptake. Consumer demand for pulped coffee

	- Capacity build farmers on benefits of a drum pulper to create market demand - Policy: Provide enabling policy guiding and supporting the use of drum pulper and review policy from time to time.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES 70,000/- for a small or medium farm
Estimated returns	Under good management with average production of 10kg of cherry per plant, an acre gives 10,000kg per plant, sold at an average 70sh/kg of dried parchment = approximately KES.700,000 per acre
Gender issues and concerns in development, dissemination, adoption and scaling up	- Women have less access to agricultural information technology and knowledge than men. - Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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	Employment opportunities exist for yVMGs in performing the task
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Readily available in the market and has been used successfully in Bomet, Buret and Baringo
Application guidelines for users	- KALRO (2019). Coffee (<i>Coffea Arabica</i> and <i>Coffea canephora</i>) Production and Utilization in Kenya. - Fufa, B., Etana, M. and Aga, M. (2019). Review on postharvest and green bean coffee processing in Ethiopia. <i>Journal of Natural sciences</i>, 9 (9): 38-42.
F: Status of TIMP Readiness 1. Ready for up scaling, 2. Requires validation 3. Requires further research	Ready for up-scaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization scientists and	KALRO-CRI, Kathurima, C. W, Wayua F O ,and Ndambuki J.M
Partner organizations	Coffee Co-operative Societies and Unions , Coffee Millers and Coffee Marketers

3.11.8 Fully-Washed Processing

2.11.8 TIMP Name	Fully-Washed Processing
Category (i.e., technology, innovation or management practice)	Management Practices
A: Description of the technology, innovation or management practice	
Problem addressed	Improper processing leads to loss in quality hence reduced incomes.
What is it? (TIMP description)	This is the procedure of wet processing starting from pulping, fermentation for approximately 16 hours and proper washing of parchment, soaking and grading.
Justification	Reduced yields and incomes from inappropriate processing practices which have led to under or over-fermentation thus degrading the quality of coffee.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Co-operatives and trade union, 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative washing practices • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee washing technologies • Sensitization and training farmers on the benefits of coffee washing technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of pulping technologies • Participatory on-farm demonstrations by stakeholders • Market preference for fully-washed coffee
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies

	• County Governments – Provide and up-scaling of agricultural research and extension service at county level • Cooperative societies and Estate Managers - Carry out training and inspections
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• The practice uses high volumes of water which may be unavailable in some areas. • The practice is labour intensive.
Suggestions for addressing the challenges	• Ensure efficient harvesting and storage of rain water. • Give incentives and improve work environment.
Lessons learned in up scaling if any	• Process utilizes a lot of water. • The process leads to good quality coffee.
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in washing trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of washing options to environmental safety, food safety and human health • Market conditions: Availability of washing technology close to the farmers is essential for their uptake. Consumer demand for pulped coffee • Capacity build farmers on benefits of a washer to create market demand • Policy: Provide enabling policy guiding and supporting the use of washer and review policy from time to time.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximate costs: - Co-operatives KES 17.84/Kg of cherry, Large estates KES 7.93/Kg.
Estimated returns	Average returns Co-operatives KES 70/Kg of cherry, Large estates KES 100/kg of cherry
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness

VMG related opportunities	Employment opportunities exist for VMGs in performing the task
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Successful promotion of fully washed procedures leads to specialty coffee, where value chain actors have reported increased incomes
Application guidelines for users	1. Ngeywo, J., Egesah, O., Biwott, T. and Waliaula, J. (2016). Gender based determinants of coffee consumption for management of coffee production in Kenya. <i>IJISSET - International Journal of Innovative Science, Engineering & Technology</i> , 3 (1): 206-216.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization scientists and	KALRO-CRI, C W Kathurima C W, Wayua, F O and Ndambul .O
Partner organizations	Coffee Co-operative Societies and Unions, Coffee Millers, coffee Marketers .

3.11.9 Coffee Processing

2.11.9 TIMP Name	Coffee Processing
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem addressed	Low returns due to inappropriate processing due to water scarcity which results in loss of quality or wastage of harvested coffee.
What is it? (TIMP description)	This the procedure of drying uniform red ripe coffee cherries with the mucilage (after pulping) to create a fruity coffee taste.
Justification	There is market demand for differentiated coffees. New niches are coming up and the trends are growing. Hence where water availability is a challenge, the coffee quality can be retained and availed to the market through coffee processing.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Cooperatives, Trade Unions, Processors, Traders, Millers, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee drying technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee drying technologies • Sensitization and training farmers on the benefits of coffee drying technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of drying technologies • Market preference for differentiated coffees
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at county level • Cooperative societies and Estate Managers- Carry out training and inspections
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Murang'a, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Unfavourable weather conditions • Stickiness due to the pulp which makes it difficult to dry • The procedure is labour intensive • Its' hygroscopic nature making it difficult to dry • Risk of deterioration
Suggestions for addressing the challenges	• Use solar dryers (greenhouse type) to enhance drying efficiency • Constant stirring to enhance drying • Use of moisture meter to confirm when beans are dry

Lessons learned in up scaling if any	N/A	
Social, environmental, policy□ and market conditions□ necessary for development and up-scaling	• Social conditions: Involve all gender in training to enhance adoption • Environmental: Highlight the research results showing the benefits of drying options to environmental safety, food safety and human health • Market conditions: Availability of drier close to the farmers is essential for their uptake. Consumer demand for pulped coffee • Capacity build farmers on benefits of a drier to create market demand • Policy: Provide enabling policy guiding and supporting the use of drier and review policy from time to time.	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	Approximately KES 35 per kg cherry	
Estimated returns	Average KES. 120 per kg cherry	
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.	
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.	
VMG related opportunities	Employment opportunities exist for VMGs in performing the task.	
E: Case studies/profiles of success stories		
Success stories from previous similar projects	None so far	
Application guidelines for users		
F: Status ofTIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Requires validation	
G. Gaps identified	Intervention	Responsible institution
Viability of the product not determined	Requires validation	CRI, marketing agents, NGOs
H: Contacts		

Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima C W, Wayua F , Ndambuki
Partner organizations	Coffee Co-operative Societies and unions, Coffee Millers and Coffee Marketers.

3.11.10 Demucilager

2.11.10 TIMP Name	Demucilager
Category (i.e., technology, innovation or management practice)	Technology 
A: Description of the technology, innovation or management practice	
Problem addressed	Requirement of high volumes of water in conventional wet processing machines and quality losses due to inappropriate processing procedures.
What is it? (TIMP description)	A coffee demucilager is a machine used in coffee processing to remove the mucilage from coffee beans. Mucilage is the sticky, gelatinous layer that surrounds the coffee bean inside the cherry.
Justification	Market demand for a cleaner environment, Less demand for elaborate infrastructure and labour and water for processing. The demucilager is often used in the washed (wet) processing method, where the goal is to clean the beans thoroughly before drying. Modern demucilaggers are designed to use less water compared to traditional fermentation methods, making them more environmentally friendly.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, Cooperatives, Trade Unions, AFA, Processors, Traders, Millers, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative pulping technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee pulping technologies • Sensitization and training farmers on the benefits of coffee pulping technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of pulping technologies • Participatory on-farm demonstrations by stakeholders
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at county level • Cooperative societies and Estate Managers- Carry out training and inspections
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Murang'a, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• High initial cost of installation • Needs skilled personnel in use of technology
Suggestions for addressing the challenges	• Linkage with financial institutions • Training of personnel
Lessons learned in up scaling if any	
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in pulp training to enhance adoption • Environmental: Highlight the research results showing the benefits of technology options to environmental safety, food safety and human health • Market conditions: Availability of technology close to the farmers is essential for their uptake. Consumer demand for pulped coffee

	• Capacity build farmers on benefits of a technology to create market demand • Policy: Provide enabling policy guiding and supporting the use of the technology and review policy from time to time	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	Approx. 300,0000 for small ones	
Estimated returns	High incomes due to reduced processing losses, and less water used in processing	
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.	
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.	
VMG related opportunities	Employment opportunities for VMG in performing the task.	
E: Case studies/profiles of success stories		
Success stories from previous similar projects	Successfully used in some co-operative societies e.g. in Ngariama F.C.S which have reported increased income as a result of adopting the TIMP.	
Application guidelines for users	1. Befikadu, D. (2016). On-farm evaluation of mechanical coffee demucilager in Jimma Zone. <i>Journal of Multidisciplinary Engineering Science and Technology</i>, 3(4): 4494-4499 2. Tesfa, M., Sualeh, A. and Mekonen, N. (2021). Assessment of the effectiveness of coffee de-mucilager and driers for physical and sensorial coffee quality. <i>World Journal of Food Science and Technology</i>, 5(2)33-36.	
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for upscaling	
G. Gaps identified	Intervention	Responsible institution
None		
H: Contacts		
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org	
Lead organization and scientists	KALRO-CRI, Kathurima C W, Wayua F, Ndambuki	

Partner organizations	Coffee Co-operative Societies and unions, Coffee miller, coffee markets

3.11.11 Whole fruit processing procedure (naturals)

2.11.11 TIMP Name	Whole fruit processing procedure (naturals)
	
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Conventional processing requires high volumes of water yet some coffee growing areas and factories are faced by water shortage.
What is it? (TIMP description)	The drying of whole fruit in the sun without pulping.
Justification	Where factories/producers do not have sufficient funds for processing infrastructure, drying whole fruit helps reduce wastage of harvested coffee.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, Cooperatives, Trade Unions, AFA, Processors, Traders, Millers, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee processing innovations • A platform for interaction for coffee value chain stakeholders

	• Well organized farmer groups and networks for easier training and adoption of coffee processing technologies • Sensitization and training farmers on the benefits of coffee processing technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of processing technologies • Participatory on-farm demonstrations by stakeholders • Demand for fruity flavours • Appropriate training of wet mills staff on the procedures • Strong partnerships and linkages
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at county level • Cooperative societies and Estate Manages- Carry out training and inspections
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Existing facilities for wet processing still in place • Risk of quality loss if not well executed especially from mould damage.
Suggestions for addressing the challenges	• Training of personnel and value chain actors on the TIMP.
Lessons learned in up scaling if any	• The technology can produce good coffee if properly done
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in processing trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of technology options to environmental safety, food safety and human health • Market conditions: Availability of technology close to the farmers is essential for their uptake. Consumer demand for pulped coffee • Capacity build farmers on benefits of a technology to create market demand • Policy: Provide enabling policy guiding and supporting the use of technology and review policy from time to time. • Availability of market.

D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES 30/per kg
Estimated returns	KES 120/- per Kg of dried cherries
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men • Women and youth have limited access to education, training and extension services than men
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Employment opportunities exist for youth males and men in performing the task
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. KALRO (2019). <i>Coffee (Coffea Arabica and Coffea canephora)</i> Production and Utilization in Kenya. 2. AFA (2022). <i>Robusta Coffee Growers' Manual</i>. Agriculture and Food Authority – Coffee Directorate.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Requires further research
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima, Francis Wayua, James Ndambuki
Partner organizations	Coffee Co-operative Societies and Unions, Coffee Unions and Coffee markets.

3.11.12 Sun drying of fully washed coffee

2.11.12 TIMP Name	Sun drying of fully washed coffee
Category (i.e. technology, innovation or management practice)	Management Practice

	
A: Description of the technology, innovation or management practice	
Problem addressed	Loss of coffee quality and formation of mould due to inappropriate drying practices.
What is it? (TIMP description)	Sun drying of fully washed coffee is a method for drying coffee beans after they have undergone the full washing process. It involves the following processes: - Pre-Drying: The washed coffee beans are often pre-dried to remove excess water, often using mechanical dryers for a short period to reduce the moisture content. Sun Drying: Spreading: The coffee beans are spread out in a thin layer on drying surfaces, such as raised beds, concrete patios, or drying tables. Turning: The beans are regularly turned or raked to ensure uniform drying and to prevent mould or fermentation. This process helps in achieving an even moisture content across all the beans. Monitoring: The beans are closely monitored for moisture content. The ideal moisture content for green coffee beans is around 10-12%. Protection: Coffee parchment is often covered or moved under shelter during the night or in adverse weather conditions to protect them from moisture and contamination.
Justification	Sun drying of fully washed coffee is a crucial step in the post-harvest processing of coffee, significantly impacting the quality and flavour profile of the final product. Sun drying can contribute to the development of complex and desirable flavours in the coffee, as it allows for a slow and natural drying process. Sun drying uses natural solar energy, making it a cost-effective method for drying coffee beans. This method is environmentally friendly as it doesn't rely on fossil fuels or extensive mechanical intervention. Inappropriate drying leads to loss of coffee quality due to formation of moulds leading to mycotoxin contamination.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Trade Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative drying practices • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee drying technologies • Sensitization and training farmers on the benefits of coffee drying technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of drying technologies • Participatory on-farm demonstrations by stakeholders • Market preference for sun-dried fully washed coffee • Sufficient sun hours for proper drying •
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at county level • Cooperative societies and Estate Managers- Carry out training and inspections
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in development and dissemination	• Risk of quality loss of coffee from moulds if not well executed. • The process is negatively affected by bad weather such as less solar radiation and rainy weather.
Suggestions for addressing□ the challenges	• Support improved extension services to ensure process is properly executed • Adopt greenhouse solar dryers
Lessons learned in up scaling if any	• The management practice requires adherence to sequential • process of effective drying • The coffee is affected by bad weather conditions such as rain, mist and the sun

Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in drying trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of drying options to environmental safety, food safety and human health • Market conditions: Availability of drying technologies close to the farmers is essential for their uptake. Consumer demand for pulped coffee • Capacity build farmers on benefits of a drying technologies to create market demand • Policy: Provide enabling policy guiding and supporting the use of drying technologies and review policy from time to time.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES.100 per debe (12 kg) in labour costs
Estimated returns	KES. 840 per debe (12 kg x70 KES)
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	• Employment opportunities exist for youth males and men in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Properly sun-dried coffee usually results into superior cup quality. This has been verified at CRI
Application guidelines for users	1. KALRO (2019). Coffee (<i>Coffea Arabica</i> and <i>Coffea canephora</i>) Production and Utilization in Kenya. 2. AFA (2022). <i>Robusta Coffee Growers' Manual</i>. Agriculture and Food Authority – Coffee Directorate
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Kathurima C W, Wayua F and Ndambuki J M.

Partner organizations	Coffee Co-operative Societies and unions, Coffee Millers and Coffee Marketers.

3.11.13 Greenhouse Driers

2.11.13 TIMP Name	Greenhouse Driers
Category (i.e. technology, innovation or management practice)	Innovation 
A: Description of the technology, innovation or management practice	
Problem addressed	It takes prolonged time for coffee parchment drying due to unfavourable weather conditions.
What is it? (TIMP description)	Sequential drying of parchment coffee in greenhouses that are especially designed for coffee drying.
Justification	Unfavourable weather conditions and high cost of labour when drying coffee. This technology uses the space efficiently.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative drying technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee drying technologies • Sensitization and training farmers on the benefits of coffee drying technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success

	promotion of drying technologies • Participatory on-farm demonstrations by stakeholders • Availability of resources to construct the facility and for dissemination of the innovation •
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scaling of agricultural research and extension service at county level • Cooperative societies and Estate Managers- Carry out training and inspections • Estates farmers – To Up-scale the TIMP • Coffee Marketing Agents - marketing • Financial Institutions - to provide credit to value chain actors to enable acquisition of dryers
C: Current situation and future scaling up	
Counties where already promoted if any	Nandi, Nyeri, Kirinyaga
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Murang'a, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• Inadequate technical know how • Limited access to financing
Suggestions for addressing the challenges	• Technical back-stopping and capacity building of value chain actors. • Group financing of the innovation / availing appropriate financing for construction of the dryers.
Lessons learned in up scaling if any	Cooperate Societies using the innovation have had improved parchment drying efficiency
Social, environmental, policy and market conditions necessary for upscaling	• Coffee societies willingness to adopt the innovation • Availability of the innovation in the market • Affordability of the innovation • Policies encouraging greenhouse solar dryers are implemented • Markets for the dried coffee are developed and expanded.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES.1,000,000.00 for a 30 x 8m size
Estimated returns	Reduced loss, reduced drying time. Hence high income
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for VMGs in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Proper drying has led to improved coffee quality from a number of Co-operative Societies e.g. Kibirigwi FCS
Application guidelines for users	1. Fairtrade Africa /KALRO (2021). Development of Standard Solar Dryers for Quality Coffee Processing. Fairtrade Africa-GIZ Funded Solared Coffee Project 2. AFA (2022). <i>Robusta Coffee Growers' Manual</i>. Agriculture and Food Authority – Coffee Directorate
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, C. W. Kathurima, F. Wayua, J. Ndambuki
Partner organizations	Coffee Co-operative Societies and Unions, Coffee Millers and Coffee Marketers.

3.11.14 Mechanical driers

2.11.14 TIMP Name	Mechanical driers
	
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	• Reduced quality of coffee due to unfavourable weather conditions during drying because of formation of moulds resulting into food safety issues. • High cost of labour incurred during parchment long sun-drying periods.
What is it? (TIMP description)	This is a solar/diesel/electricity-powered equipment for removing moisture from parchment coffee by blowing controlled warm air through the drier. It takes less time compared to sun-drying and is not affected by weather conditions.
Justification	Inappropriate weather during the coffee drying period means inefficient drying and reduced quality of coffee. High cost of labour during drying, leading to reduced returns from sales. This mechanical dryer eliminates mycotoxin contamination of coffee and saves on labour during sun drying of parchment coffee.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative drying technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee drying technologies • Sensitization and training farmers on the benefits of coffee drying technologies

	• Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of drying technologies
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Estate Manage and Unions - Carry out training, inspection and up-scaling of technology • Coffee Marketing Agents - marketing • Wet mill managers - adoption of the TIMP • Financial Institutions - to provide credit to value chain actors to enable acquisition of dryers
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Nyeri
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in dissemination	• High cost of installation and maintenance • Risk of quality loss in case of disruptions
Suggestions for addressing the challenges	• Provide appropriate financing • Regularly service and maintain the machines.
Lessons learned in up scaling if any	The management practice shortens the drying duration
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in drying trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of mechanical drying options to environmental safety, food safety and human health • Market conditions: Availability of mechanical drying technologies close to the farmers is essential for their uptake. Consumer demand for dried coffee • Capacity build farmers on benefits of different drying technologies to create market demand • Policy: Provide enabling policy guiding and supporting the use of drying technologies and review policy from time to time. • Willingness of Coffee Societies to adopt the technology.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately USD 7,000 to fabricate and install the equipment
Estimated returns	Reduced loss, reduced drying time, reduced mycotoxin contamination. Hence high income

Gender issues and concerns in development, dissemination, adoption and scaling up	• Women may not be able to operate the machines. • Women and youth have limited access to finances and may not be able to purchase the machines.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of finances.
VMG related opportunities	• Employment opportunities exist for VMGs in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	This machine is being used in Kibirigwi FCS and it is reducing the time taken to dry coffee to about 9 days from 14 days, hence more outputs and incomes
Application guidelines for users	Installation and operational manuals from manufacturer available
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima, F. Wayua, J. Ndambuki
Partner organizations	Coffee co-operative societies and unions, coffee millers, coffee marketers

3.11.15 2.11.15 Raised drying beds

2.11.15 TIMP Name	Raised drying beds
Category (i.e., technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Drying coffee on the ground leads to contamination of parchment from soil, and causes irregular drying due to poor aeration.

What is it? (TIMP description)	These are drying beds that provide aeration from above and below, with a height of approximately 1m and a width of approximately 1.2 m.
Justification	It ensures good aeration which leads to even drying and resulting into high-quality coffee.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative drying technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee drying technologies • Sensitization and training farmers on the benefits of coffee drying technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of drying technologies • Participatory on-farm demonstrations by stakeholders • Availability of resources to build the drying beds • Sufficient land to build the drying beds.
Partners/stakeholders for scaling up and their roles	• Estates farmers - Up-scaling the TIMP • Estate managers- Training and inspection • Co-operative Societies and Unions - Training and inspection • Extension Staff - Training • Financial institutions – avail credit facilities.
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Murang'a, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma.
Challenges in development and dissemination	• High initial cost for the metallic beds • High maintenance costs for the wooden beds.
Suggestions for addressing the challenges	• Procurement of lowest bidder to construct the beds • Encourage high quality coffee production to meet the extra costs

	through better prices • Link coffee farmers to credit facilities.
Lessons learned in up scaling if any	Metallic beds are more durable and more efficient in parchment drying.
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in drying trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of drying options to environmental safety, food safety and human health • Market conditions: Availability of drying technologies close to the farmers is essential for their uptake. Consumer demand for dried coffee. • Capacity build farmers on benefits of a drying technologies to create market demand Policy: Provide enabling policy guiding and supporting the use of drying technologies and review policy from time to time.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES 40,000/- for the standard 20m x2m metallic beds
Estimated returns	Varies depending on the type of coffee. On average around KES 600,000/- per 40m2 bed
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men in 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for VMGs in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Several Cooperative societies have constructed metallic beds including Ndumberi FCS and Thirikwa FCS, and have reported increased incomes from this technology
Application guidelines for users	1. Coffee production recommendations – CRI 2. CRI Technical circulars 3.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling

G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Kathurima C.W. Wayua, F and Ndambuki J.
Partner organizations	Coffee Co-operative Societies and Unions, Coffee Millers and Coffee Marketers.

3.11.16 Concrete drying surfaces

2.11.16 TIMP Name	Concrete drying surfaces
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	High cost of drying coffee parchment including the cost of constructing the meshed metallic drying beds .
What is it? (TIMP description)	Concrete surfaces under a shade used for drying parchment coffee.
Justification	The concrete surface helps to maintain uniform drying depth resulting in to even drying of coffee. This is a cheaper alternative to construction of drying beds.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative drying technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee drying technologies • Sensitization and training farmers on the benefits of coffee drying technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners

	consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of drying technologies • Participatory on-farm demonstrations by stakeholders • Availability of resources to build the surfaces • Skilled labour for design and construction
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Estate Managers and Unions - Carry out training, inspection and up-scaling of technology • Coffee Marketing Agents - marketing • Wet mill manager, farmers and Estate manager and cooperative • Financial institutions – provide funds for erecting the concrete surfaces
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma
Challenges in development and dissemination	• High initial cost for construction of concrete surfaces • Possibility of quality loss • Unpredictable weather pattern
Suggestions for addressing the challenges	• Avail appropriate financing • Continuous monitoring and stirring of the parchment during drying
Lessons learned in up scaling if any	
Social, environmental, policy and market conditions necessary for development and up-scaling	• Farmers' willingness to adopt the management practice • Favourable weather conditions (adequate sunshine) • Market able to absorb increased supply of coffee
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES. 30,000 /- for 200 m2
Estimated returns	Increased drying efficiency, better quality and hence higher incomes.
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men

Gender related opportunities	Employment opportunities exist for youth males and men in in performing the technology.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for youth males and men in in performing the technology.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Largely practiced in Brazil, where increased outputs and incomes have been reported
Application guidelines for users	AFA (2022). Robusta Coffee Growers' Manual. Agriculture and Food Authority – Coffee Directorate
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up-scaling
H: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, C. W. Kathurima, F. Wayua, J. Ndambuki
Partner organizations	Coffee Co-operative Societies and unions, Coffee Millers and Coffee Marketers.

3.11.17 Multi Storey Raised Drying Beds

2.11.17 TIMP Name	Multi Storey Raised Drying Beds
Category (i.e. technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Lack of adequate drying area or space in the wet mills.
What is it? (TIMP description)	Multistoried roofed and raised drying beds that enable drying of more coffee parchment.
Justification	The practice is efficient in the utilization of space especially where the factory has limited land. The initial cost of construction

	is lower compared to single beds and the roofing provides better drying due to greenhouse effect.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers and Agripreneur.
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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee drying technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee drying technologies • Sensitization and training farmers on the benefits of coffee drying technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of drying technologies • Participatory on-farm demonstrations by stakeholders
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies. • County Governments – Provide and up-scale agricultural research and extension service at county level. • Cooperative societies, Estate Managers and Unions - Carry out training, inspection and up-scaling of the technology. • Coffee Marketing Agents – marketing • Wet mill manager, farmers and Estate manager and cooperative. • Financial institutions – provide funds for erecting the concrete surfaces and erecting the multistorey drying beds.
C: Current situation and future scaling up	
Counties where already promoted if any	None

Counties where TIMPs will be validated	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi, Bungoma.
Challenges in development and dissemination	• High cost of construction of multistorey beds • Risks of cross contamination during drying.
Suggestions for addressing the challenges	• Avail appropriate financing • Ensure construction of quality surfaces to avoid mixing of parchment from different stores.
Lessons learned in up scaling if any	
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in drying trainings to enhance adoption. • Environmental: Highlight the research results showing the benefits of drying options to environmental safety, food safety and human health. • Market conditions: Availability of drying technologies close to the farmers is essential for their uptake. Capacity build farmers on benefits of different drying technologies to create market demand. • Policy: Provide enabling policy to guide and support the use of drying technologies and review policy from time to time.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES.80,000/- for 20m x 2m two story metallic beds
Estimated returns	Increased drying efficiency better quality and hence higher incomes.
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men • Women and youth have limited access to education, training and extension services than men
Gender related opportunities	Employment opportunities exist for youth males and men in performing the technology
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by the VMGs due to lack of awareness
VMG related opportunities	Employment opportunities exist for youth males and men in performing the technology
E: Case studies/profiles of success stories	
Success stories from previous similar projects	
Application guidelines for users	AFA (2022). Robusta Coffee Growers' Manual. Agriculture and Food Authority – Coffee Directorate
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3.	Requires Validation

Requires further research)	
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, C. W. Kathurima C W and Wayua F O
Partner organizations	Coffee Co-operative Societies and unions, Coffee Millers and Coffee Marketers.

3.11.18 2.11.18 Storage Guidelines

2.11.18 TIMP Name	Storage Guidelines
Category (i.e., technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Reduced production, improper storage of parchment coffee resulting in to rewetting/contamination and subsequently loss in coffee quality.
What is it? (TIMP description)	These are guidelines for the design and construction of the store for parchment coffee. The store should have roof insulation, aeration and pallets.
Justification	Maintaining the quality of parchment coffee is important to get obtaining better market prices.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print

Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee storage guidelines • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee storage guidelines • Sensitization and training farmers on the benefits of coffee storage technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of storage technologies • Participatory on-farm demonstrations by stakeholders •
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Estate Managers and Unions - Carry out training, inspection and up-scaling of technology • Coffee Marketing Agents - marketing • Wet mill manager, farmers and Estate manager and cooperative- Scaling up the TIMP.
C: Current situation and future scaling up	
Counties where already promoted if any	Thirty-two coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma.
Challenges in development and dissemination	• High initial cost of construction of the store • Inadequate capacity to follow the guidelines
Suggestions for addressing the challenges	• Sourcing of funds for construction of the store • Capacity build farmers to follow the guidelines.
Lessons learned in up scaling if any	• Proper storage is important to maintain coffee after drying
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in storage trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of storage options to environmental safety, food safety and human health • Market conditions: Availability of storage technologies close to the farmers is essential for their uptake. Consumer demand for dried coffee • Capacity build farmers on benefits of different storage technologies to create market demand

	• Policy: Provide enabling policy guiding and supporting the use of storage technologies and review policy from time to time. • Willingness of Coffee Societies to adopt the technology.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES 1 Million for a 300m2 store
Estimated returns	Reduced losses, better quality and increased income and nutrition
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men in performing the technology
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men • VMGs have limited access to education, training and extension services than men • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for VMG males and men in performing the technology
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Most Co-operative societies have well-constructed stores at their premises, and have reported increased incomes.
Application guidelines for users	1. Coffee Production Recommendations – CRI. 2. Kenya Coffee Platform manual. 3. CRI Technical circulars.
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Kathurima C W.
Partner organizations	Coffee Co-operative Societies and unions, Coffee Millers and Coffee Marketers

3.11.19 Conditioning Bins

2.11.19 TIMP Name	Conditioning Bins
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Uneven moisture in coffee parchment resulting in reduced.
What is it? (TIMP description)	These are roofed structures for evening out parchment moisture. They are made up of concrete or wire mesh and have solar powered fans to enhance air flow.
Justification	This ensures that the moisture content is even to maintain the quality of coffee.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee conditioning technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee conditioning technologies • Sensitization and training farmers on the benefits of coffee conditioning technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of conditioning technologies • Participatory on-farm demonstrations by stakeholders
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies. • County Governments – Provide and up-scale agricultural research and extension service at county level.

	• Cooperative societies, Estate Managers and Unions - Carry out training, inspection and up-scaling of technology. • Coffee Marketing Agents - marketing • Wet mill manager, farmers and Estate managers and cooperative- To scale up the TIMP. • Financial institutions – provide funds for erecting the concrete surfaces and acquire the conditioning bins.
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma.
Challenges in development and dissemination	• High initial cost of construction
Suggestions for addressing the challenges	• Avail appropriate financing options
Lessons learned in up scaling if any	• Proper conditioning improves quality by evening out moisture content of the parchment coffee. • Can be used temporarily for storage of almost dry coffee when drying beds are not adequate.
Social, environmental, policy and market conditions necessary fo development and up-scaling	• Social conditions: Involve all gender in trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of conditioning options to environmental safety, food safety and human health • Market conditions: Availability of Social conditions: Involve all gender in drying trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of conditioning options to environmental safety, food safety and human health • Market conditions: Availability of conditioning technologies close to the farmers is essential for their uptake. • Capacity build farmers on benefits of different conditioning technologies to create market demand • Policy: Provide enabling policy guiding and supporting the use of conditioning technologies and review policy from time to time. • Willingness of Coffee Societies to adopt the technology close to the farmers is essential for their uptake. • Capacity build farmers on benefits of different conditioning technologies to create market demand • Policy: Provide enabling policy guiding and supporting the use of conditioning technologies and review policy from time to time. • Willingness of Coffee Societies to adopt the technology.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES 1,000,000/- for 30m x 10m sized bin

Estimated returns	Better quality hence higher income
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for VMGs in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Co-operative societies have put up coffee parchment conditioning bins, and are reporting increased incomes
Application guidelines for users	1. Coffee production recommendations – CRI 2. Kenya Coffee Platform manual 3. CRI Technical circulars
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, CW Kathurima, F. Wayua, J. Ndambuki
Partner organizations	Coffee Co-operative Societies and unions, Coffee Millers and Coffee Marketers.

3.11.20 Coffee bagging

2.11.20 TIMP Name	Coffee bagging
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Reduced production arising from mishandling of parchment coffee in stores or mills, its contamination and loss of quality.
What is it? (TIMP description)	These are bags, preferably sisal, jute or hermetic that are free from contaminants and provide the correct way of packing parchment coffee to avoid loss of quality.

Justification	Bagging helps maintain integrity of parchment coffee, eases transportation and storage hence increasing incomes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee storage packages • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee storage bags • Sensitization and training farmers on the benefits of coffee storage bags • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of storage bags. • Participatory on-farm demonstrations by stakeholders. • Existence of a functional supply chain of the bags in the target areas (e.g. stocking in local agro-dealer shops).
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies. • County Governments – Provide and up-scale agricultural research and extension service at county level. • Cooperative societies, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology • Coffee Marketing Agents - marketing • Wet mill manager, farmers and Estate manager and cooperative- To scale up the TIMP • Financial institutions – provide funds for purchase of bags.
C: Current situation and future scaling up	
Counties where already promoted if any	32 coffee growing Counties

Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma.
Challenges in development and dissemination	• High cost of storage bags. • Low level of awareness of the benefits of using storage bags. • Unavailability of bags at nearest agro-dealer shops.
Suggestions for addressing the challenges	• Provide appropriate financing to enable acquisition of the bags. Bulk purchase of the bags. • Capacity building of value chain actors on coffee bagging technology. • Strengthen the bags distribution network to farmers.
Lessons learned in up scaling if any	Well bagged coffee maintains its quality in storage and during transportation to the coffee mills.
Social, environmental, policy and market conditions necessary for development and up-scaling	• Willingness of value chain actors to adopt the TIMP • Need for credit arrangement or subsidy to make the bags affordable to majority of value chain actors • Policies to encourage supply of storage bags within easy reach of value chain actors are implemented • Favourable policy encouraging better prices of high quality bags • Market able to absorb increased supply of coffee
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES.500/- per bag for sisal and jute bags
Estimated returns	Increased shelf life of coffee and improved quality hence more income.
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	• Employment opportunities exist for youth males and men in performing the task • Employment opportunities exist for various gender categories to stock and sell the bags
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for VMGs in performing the task and to sell the bags.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Practice has been adopted in many Co-operative societies and estates and they have reported increased incomes.
Application guidelines for users	1. Coffee production recommendations – CRI. 2. Kenya Coffee Platform manual. 3. CRI Technical circulars.

F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Joseph K. Mburu
Partner organizations	Coffee Co-operative Societies, Unions, Coffee Millers and Coffee Marketers.

3.11.21 Green Bean Grading

2.11.21 TIMP Name	Green Bean Grading
Category (i.e., technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Mixed coffee beans of different sizes, shapes and densities that deny growers high prices.
What is it? (TIMP description)	This is the separation of clean coffee beans into different grades namely AA, AB, C, PB, E and T depending on size, shape and density.
Justification	Coffee milling produces beans of different sizes, shapes and densities that need to be separated to meet the preference of consumers and attract good prices.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.

Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative grading technologies. • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of coffee grading technologies • Sensitization and training farmers on the benefits of coffee grading technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments for success promotion of grading technologies • Participatory on-farm demonstrations by stakeholders. • Consumer preference for graded coffee • Compliance of the existing standards
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Estate Managers and Unions - Carry out training, inspection and up-scaling of technology • Coffee Marketing Agents – marketing coffee in various markets • Wet mill manager, farmers and Estate manager and cooperative- To scale up the TIMP. • Dry millers – Milling and grading parchment and coffee
C: Current situation and future scaling up	
Counties where already promoted if any	All coffee growing counties.
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	• Low coffee volumes • Lack of adherence to grading specification
Suggestions for the challenges	• Increased coffee production • Enforce compliance of rules and regulations governing coffee milling and grading.
Lessons learned in up scaling if any	None
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in grading training to enhance adoption. • Environmental: Highlight the research results showing the benefits of grading options to environmental safety, food safety and human health • Market conditions: Availability of grading technologies close to the farmers is essential for their uptake. Consumer demand

	for quality coffee • Capacity build farmers on benefits of different grading technologies to create market demand • Policy: Provide enabling policy guiding and supporting the use of grading technologies and review policy from time to time.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Cost of quality analysis- KES 1,000 per sample
Estimated returns	
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for youth males and men in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Grading of Kenyan coffee has resulted in to getting a premium brand that is known all over the world attracting high prices
Application guidelines for users	1. Coffee growers' handbook. 2. Coffee production recommendation
F: Status of TIMP Readiness	
1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Require validation
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	Coffee Cooperative societies, Estates, Coffee Millers, Coffee traders, Consumers and National and County governments

3.11.22 Coffee Classification

2.11.22 TIMP Name	Coffee Classification
Category (i.e., technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Mixed green coffee beans if not separated gives different tastes for consumers and attract low prices
What is it? (TIMP description)	This is categorization of the quality of raw and roast coffee beans based on size, colour, defects, acidity and flavours either in the field or at processing
Justification	Different coffees have different quality attributes, which when classified, meet different consumer preferences and pricing. Classification therefore offers producers an opportunity to get prime markets
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee innovative classification technologies • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of coffee classification criteria • Sensitization and training farmers on the benefits of coffee classification procedure • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers,

	Service providers and County Governments) for success promotion of coffee classification. • Consumer preference • Availability of Coffee quality laboratories
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology • Coffee Marketing Agents - marketing • Wet mill manager, farmers and Estate managers and cooperative- To scale up the TIMP • Financial institutions – provide funds for classification • Dry millers – Milling and grading parchment coffee • Marketing agents – Market coffee in various markets • Consumers – provide market for the final product • Coffee quality laboratories – testing and grades the coffee into different classes • Coffee Cuppers- Evaluate the quality of coffee
C: Current situation and future scaling up	
Counties where already promoted if any	Counties with quality laboratories
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	Lack of adherence to classification standards.
Suggestions for addressing the challenges	Enforce compliance of rules and regulations governing coffee classification.
Lessons learned in up scaling if any	None
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in trainings to enhance adoption. • Environmental: Highlight the research results showing the benefits of coffee classification options to environmental safety, food safety and human health. • Market conditions: Availability of classification technologies close to the farmers is essential for their uptake. Consumer demand for quality coffee. • Capacity build farmers on benefits of different classification technologies to create market demand. • Policy: Provide enabling policy guiding and supporting the use of classification technologies and review policy from time to time.

	• Willingness of Coffee Societies to adopt the technology.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Establishment of quality laboratories- KES 5 million Capacity building of County Extension staff in eight counties- KES.3.5 million
Estimated returns	
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women have less access to agricultural information, technology and knowledge than men. • Women and youth have limited access to education, training and extension services than men.
Gender related opportunities	Employment opportunities exist for youth males and men 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 than men. • VMGs have limited access to education, training and extension services than men. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by the VMGs due to lack of awareness.
VMG related opportunities	Employment opportunities exist for youth males and men in performing the task.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Kenyan coffee is known for its unique taste, hence fetchers better income
Application guidelines for users	
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	Coffee Co-operative Societies, Estates, Research organizations, Coffee Millers, Coffee traders, Consumers, AFA- Coffee Directorate and National and County governments.

3.11.23 Coffee Hulling

2.11.23 TIMP Name	Coffee Hulling
Category (i.e., technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Low domestic coffee consumption due to inability to process at farm level.
What is it? (TIMP description)	Coffee hulling is the process of removing the outer layer of dried coffee cherries to reveal the green coffee bean inside. The outer layer, known as the husk or hull, consists of the pulp, parchment, and sometimes a thin layer of mucilage that surrounds the bean after it has been dried.
Justification	Coffee hulling is crucial for accessing the green coffee bean, removing unwanted layers, preparing beans for roasting, and ensuring quality and consistency in the final product. It plays a significant role in the overall coffee production process, influencing both the taste and marketability of the coffee. Coffee growing households have not been accessing green coffee beans for their local consumption. Once the coffee is released to the factories for processing, it is no longer easily accessible to the local community
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee hulling technologies. • A platform for interaction for coffee value chain stakeholders.

	• Well organized farmer groups and networks for easier training and adoption of coffee hulling technologies. • Sensitization and training farmers on the benefits of coffee hulling technologies. • Adequate resources to develop publicity materials. • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of coffee hulling technologies. • Participatory on-farm demonstrations by stakeholders • Enhanced domestic coffee drinking culture. • Continuous availability of parchment coffee.
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies. • County Governments – Provide and up-scale agricultural research and extension service at county level. • Cooperative societies, Estate Managers and Unions - Carry out training, inspection and up-scaling of technology. • Coffee Marketing Agents - marketing • Wet mill manager, farmers and Estate manager and cooperative- To scale up the TIMP. • Financial institutions – provide funds for hulling. • Youth groups – Hulling, roasting and sales outlets. • Financial institutions- financing.
C: Current situation and future scaling up	
Counties where already promoted if any	Kirinyaga (Mutira and Rung’eto Co-operative Societies)
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	• Uptake uncertainty • Low coffee drinking culture • Competition from other complementary beverages.
Suggestions for addressing the challenges	• Develop and roll out promotional strategies • Diversify distribution channels • Develop and promote diverse hulling techniques.
Lessons learned in up scaling if any	N/A
Social, environmental, policy and market conditions necessary for development and up-scaling	• Social conditions: Involve all gender in drying trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of hulling options to environmental safety, food safety and human health • Market conditions: Availability of hulling technologies close to the farmers is essential for their uptake. Consumer demand for

	dried coffee • Capacity build farmers on benefits of different hulling technologies to create market demand • Policy: Provide enabling policy guiding and supporting the use of hulling technologies and review policy from time to time. • Willingness of Coffee Societies to adopt the technology.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Huller – KES. 85,000
Estimated returns	10 Kgs per day @ KES 400 for 30 days totaling to KES 120,000
Gender issues and concerns in development and dissemination, adoption and scaling	Men mostly engage in machine operations.
Gender related opportunities	The opportunity is available for all gender.
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs need financial support for the adoption of the practice. • Affirmative institutional support to promote adoption, dissemination and scaling up of the practice. • Establish special Agricultural Innovations Platforms (AIPs) for the VMG.
VMG related opportunities	• Establishment of cottage industries by the VMGs • Training of VMGs to undertake the hulling
E: Case studies/profiles of success stories	
Success stories from previous similar projects	This has led to improved domestic coffee consumption and employment levels in Mutira, Mwirua and Rung'eto cooperative societies.
Application guidelines for users	Develop diverse coffee hulling manuals .
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	Coffee Co-operative Societies and Estates, KEBS and National and County governments.

3.12 Coffee Value Addition

3.12.1 Coffee wine

2.12.1 TIMP Name	Coffee wine
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Loss of income due to limited value added products from coffee.
What is it? (TIMP description)	This is the fermentation of coffee pulp using yeast, either naturally present on the pulp or added, to convert the sugars in the pulp into alcohol and carbon dioxide. Making wine from coffee pulp is an innovative way to utilize coffee waste and create a beverage with distinct flavors and potential market appeal among coffee enthusiasts and experimental wine drinkers alike..
Justification	There are few by-products of coffee. Processing of coffee pulp in to an alcoholic drink offers consumers variety of coffee by products resulting into increased income.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee wine making technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee wine making technologies • Sensitization and training farmers on the benefits of coffee wine technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of coffee wine making technologies • Participatory on-farm demonstrations by stakeholders • Compliancy to available quality standards

Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Estate Manage and Unions –Increase productivity, carry out training, inspection and up-scaling of technology • Coffee Marketing Agents - marketing • Coffee wine distributors - to distribute the coffee wine • KEBS – Set and maintain quality standards • Coffee wine distillers – process alcoholic wine
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be upscaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in dissemination	• High initial capital • Seasonality of the raw materials • Competition from similar products
Suggestions for addressing the challenges	• Provide credit facilities • Training of personnel on wine distillery • Produce large quantities of wine during peak production.
Lessons learnt during its promotion, if any	• Alcoholic coffee drink needs to be commercialized.
Social, environmental, policy and market conditions necessary for up-scaling	• Social conditions: Involve all gender in trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of wine making options to environmental safety, food safety and human health • Market conditions: Create consumer demand for coffee wine and capacity build farmers on benefits of different wine making technologies to create market demand. • Policy: Provide enabling policy guiding and supporting the use of coffee wine and review policy from time to time
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES 5,000 for 16 litres
Estimated returns	Approximately KES 13,000 for 16 litres
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology. • Women may have limited access to education, training and extension services on the technology
Gender related opportunities	Employment opportunities exist for women in making coffee alcoholic drink.

VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology. • VMGs have limited access to training and extension services on the technology. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for some VMGs such as women in making coffee alcoholic drink product for sale
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Coffee alcoholic drink leaflets and manuals
F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Requires validation
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	• Coffee Co-operatives-To ensure coffee productivity is improved • Coffee wine distillers – To process coffee alcoholic • Coffee wine distributors – To market the alcoholic

3.12.2 2.12.2 Coffee Vinegar

2.12.2 TIMP Name	Coffee Vinegar
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Loss of income due to limited value-added products from coffee.
What is it? (TIMP description)	This is a fermented liquid composed of acetic acid and water made from coffee pulp. Coffee vinegar is produced through a fermentation process similar to how other types of vinegar, such as apple cider vinegar or wine vinegar, are made
Justification	Coffee pulp contains 50% of the total coffee cherry therefore the limited use results in to wastage of coffee by-products. Processing the pulp in to coffee vinegar will make use of coffee by products

B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers, Agripreneurs, Consumers, Vinegar manufacturers and distributors.
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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release of different types of coffee vinegar. • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of coffee vinegar technologies. • Sensitization and training farmers on the benefits of coffee vinegar technologies. • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of coffee vinegar technologies.
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Estate Manage and Unions - Carry out training, inspection and up-scaling of technology • Coffee Marketing Agents - marketing • Farmers - Coffee production • Coffee vinegar manufacturers – to produce the vinegar • Distributors - to distribute the vinegar • KEBS – Set and maintain quality standards
C: Current situation and future scaling up	
Counties where already promoted if any	• None
Counties where TIMPs will be up-scaled	• Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.

Challenges in dissemination	• High initial capital • Seasonality of the raw material • Competition from similar products
Suggestions for addressing the challenges	• Through coffee cooperatives credit is availed to small enterprise manufacturers • Training of personnel on vinegar production • Produce large quantities of vinegar during peak production.
Lessons learnt during its promotion, if any	• There is a need to commercialize the coffee vinegar
Social, environmental, policy and market conditions necessary for up- scaling	• Social conditions: Involve all gender in trainings to enhance adoption. • Environmental: Highlight the research results showing the benefits of coffee vinegar to environmental safety, food safety and human health. • Market conditions: Availability of vinegar making technologies close to the farmers is essential for their uptake. Consumer demand for coffee vinegar. • Capacity build farmers on benefits of different vinegar making technologies to create market demand. • Policy: Provide enabling policy guiding and supporting the use of coffee vinegar and review policy from time to time. • Willingness of Coffee Societies to adopt the technology.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES. 6000 /- for 16 litres
Estimated returns	Approximately KES. 10,000 /- for 16 litres
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology • Women may have limited access to education, training and extension services on the technology
Gender related opportunities	Employment opportunities exist for women in making coffee vinegar
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology • VMGs have limited access to training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for some VMGs such as women in making coffee vinegar product for sale.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Coffee vinegar leaflets and brochures
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Requires validation

G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	Coffee Co-operative Societies, Marketers and Distributers.

3.12.3 Coffee Roasting

2.12.3 TIMP Name	Coffee Roasting
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Limited use of coffee roasting technology.
What is it? (TIMP description)	Roasted coffee is made from roasting green coffee beans at temperature of 180 - 250°C for 7 - 20minutes depending on desired colour of the final product.
Justification	Producers and local communities have not been accessing locally produced good quality coffee for their consumption. This management practice will avail high quality coffee to the domestic market.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee roasting technologies. • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of coffee roasting technologies. • Sensitization and training farmers on the benefits of coffee roasting technologies • Adequate resources to develop publicity materials. • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers,

	Service providers and County Governments) for success promotion of roasting technologies. • Participatory demonstrations by stakeholders. • Continuous availability of green coffee cherry.
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level development of policies to guide development and use of coffee value addition technologies. • County Governments – Provide and up-scale agricultural research and extension service at county level. • Cooperative societies, Wet mill manager, Estate Managers and Unions - Carry out training, inspection and up-scaling of technology. • Wet millers – provision of parchment coffee and sales outlets • Youth groups –coffee roasting and sales outlet • Financial institutions- provide funding • Suppliers – provide roasters
C: Current situation and future scaling up	
Counties where already promoted if any	Kirinyaga- (Mutira, Mwirua and Rung’eto cooperative societies)
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	• Low coffee drinking culture • Competition from other complementary beverages
Suggestions for addressing the challenges	• Roll out promotional campaigns • Diversify distribution channels and train local coffee Baristas • Develop and promote traditional roasting and brewing techniques.
Lessons learnt during its promotion, if any	Regular promotion of benefits of consuming coffee should be carried out
Social, environmental, policy and market conditions necessary for upscaling	• Social conditions: Involve all gender in trainings to enhance adoption. • Environmental: Highlight the research results showing the benefits coffee roasting options to environmental safety, food safety and human health. • Market conditions: Capacity build farmers on the benefits of different coffee roasting technologies to create market demand. • Policy: Provide enabling policy guiding and supporting the use of roasted coffee and review policy from time to time. • Willingness of Coffee Societies to adopt the technology.
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Roaster- KES 150,000 • Labour –KES 12,000 per month • Packages- KES 34 per piece.

Estimated returns	Packets sold per day-20 packets per day @ KES 300 for 30 days= KES. 180,000 per month.
Gender issues and concerns In dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology. • Women may have limited access to education, training and extension services on the technology.
Gender related opportunities	Employment opportunities exist for women in roasting coffee
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology • VMGs have limited access to training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for some VMGs such as women in roasting coffee
E: Case studies/profiles of success stories	
Success stories from previous similar projects	• Improved domestic coffee consumption in Mutira, Mwirua and Rung'eto cooperative societies • Mwirua FCS is providing coffee to all members for home consumption
Application guidelines for users	Coffee roasting manuals
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	1. Ready for up scaling
G. Contacts	Institute Director, Coffee Research Institute, P.O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima.
Partner organizations	Coffee Co-operative Societies and Estates, KEBS, National and County governments.

Gaps

1. Low youth involvement
2. Low domestic coffee consumption

3.12.4 Coffee brewing

2.12.4 TIMP Name	Coffee brewing
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Inadequate skills in brewing techniques and limited domestic consumption because of narrow range of coffee tastes

What is it? (TIMP description)	This is the process of preparing coffee beverage using diverse brewing techniques while retaining the quality. 
Justification	Majority of local coffee consumers and outlets lack appropriate brewing techniques resulting in production of poor-quality beverages. Building capacity in different methods of brewing will enhance domestic consumption of coffee in the country.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release coffee brewing technologies • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of coffee brewing technologies. • Sensitization and training farmers on the benefits of coffee brewing technologies • Adequate resources to develop publicity materials. • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of brewing technologies
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level

	• Cooperative societies, Wet mill manager, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology • Financial institutions- provide funding for brewing facilities
C: Current situation and future scaling up	
Counties where already promoted if any	Kirinyaga- (Mutira, Mwirua and Rong'eto FCS)
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties
Challenges in development and dissemination	• Low coffee drinking culture • Lack of information on different brewing techniques • Competition from other complementary beverages.
Suggestions for addressing the challenges	• Roll out promotional campaign strategies • Diversify distribution channels and train coffee Baristas • Develop brochures for brewing techniques • Develop and promote diverse brewing techniques.
Lessons learnt during its promotion, if any	Tere is need to promote consumption of coffee in the local market to trigger demand
Social, environmental, policy and market conditions necessary for upscaling	• Social conditions: Involve all gender in trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of coffee brewing options to environmental safety, food safety and human health • Market conditions: Capacity build farmers on benefits of different coffee brewing technologies to create market demand • Policy: Provide enabling policy guiding and supporting the use of coffee brewing technologies and review policy from time to time. • Willingness of Coffee Societies to adopt the technology
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Coffee maker- KES. 15,000 • Coffee dispenser- KES. 5,000 • Cups – KES. 20 per cup • Labour – KES. 12,000 per month.
Estimated returns	Cups sold per day - 200 per day @ Ksh 20 for 30 days Totaling to KES.120,000 per month
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology. • Women may have limited access to education, training and extension services on the technology.
Gender related opportunities	• Employment opportunities exist for women in the coffee roasting industry.
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology. • VMGs have limited access to training and extension services on the technology • Due to their social status VMGs are often excluded from

	decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for some VMGs such as women in roasting coffee.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	In coffee houses such as Java, Gibson, Savanna.
Application guidelines for users	
F: Status of TIMP	
(1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	Coffee Co-operative Societies and Estates, KEBS and National and County governments.

3.12.5 Coffee Packaging

2.12.5 TIMP Name	Coffee Packaging
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Poor packing reduce coffee shelf life. Inadequate different packaging size and materials limit consumers from accessing processed
What is it? (TIMP description)	Packaging materials aimed at preserving coffee quality  No Description of the TIMP???
Justification	Need to diverse packaging materials and sizes to enhance shelf life, quality and meet consumer requirement.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release of coffee packing technologies • A platform for interaction for coffee value chain stakeholders • Well organized farmer groups and networks for easier training and adoption of coffee packaging technologies • Sensitization and training farmers on the benefits of coffee packaging technologies • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of coffee packaging technologies
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Wet mill manager, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology • Youth groups –brewing the coffee and sale outlet • Suppliers - to provide packaging material • Local communities- coffee consumption.
C: Current situation and future scaling up	
Counties where already promoted if any	Kirinyaga- (Mutira, Mwirua and Rung’eto FCS)
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	• High cost of packaging materials • Diverse consumer requirements in-terms of size, weight and branding • Lack of branding guidelines
Suggestions for addressing the challenges	• Develop and avail appropriate low-cost packaging materials. • Make Packages of different sizes and weights • Develop branding guidelines and acquire bar codes

Lessons learnt during its promotion, if any	A well-presented package is likely to get more prize and attract consumer preference. Package s should be developed with a consumer in mind for adoption
Social, environmental, policy and market conditions necessary for upscaling	• Social conditions: Involve all gender in trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of packaging options to environmental safety, food safety and human health • Market conditions: Consumers demand for well packaged coffee. Capacity build farmers on benefits of different packaging to create market demand. • Policy: Provide enabling policy guiding and supporting the use of packaging technologies and review policy from time to time
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Packaging line- KES 300,000 • Packages- KES 34 per piece • Labour – KES 12,000 per month
Estimated returns	Packets sold per day - 20 packets per day @ KES 300 for 30 days totaling to KES 180,000
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology • Women may have limited access to education, training and extension services on the technology
Gender related opportunities	Employment opportunities exist for women in coffee packaging industry
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology • VMGs have limited access to training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for some VMGs such as women in packaging of coffee.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Jacaranda coffee Brand (KALRO-CRI) and Tira coffee (Mutira FCS) brands.
Application guidelines for users	
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima

Partner organizations	Coffee Co-operative Societies and Estates KEBS National and County governments

3.12.6 Artistic murals from low grade coffees

2.12.6 TIMP Name	Artistic murals from low grade coffees
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem addressed	Inadequate utilization of poor grade coffees.
What is it? (TIMP description)	This are artistic murals made from low grade coffees for interior décor. 
Justification	Alternative use of low-quality coffee beans to for interior décor is an opportunity to enhance farmers' incomes.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers and Agripreneurs. Women and youth groups. MSME's, Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print. •
Critical/essential factors for successful promotion	• Applied Research to continually test, validate and release of making coffee artistic murals technologies.

	• A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of different technologies for making coffee artistic murals. • Sensitization and training farmers on the benefits of making coffee artistic murals. • Adequate resources to develop publicity materials. • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion alternative technologies for using low grade coffee • Participatory demonstrations by stakeholders on alternative use of low grade coffee. • Capacity build youth, women and MSME's on skills and technology on making coffee artistic murals.
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Wet mill manager, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology • Wet millers – provision of parchment coffee and sales outlets • Dry mills –Provide of low-quality beans • Youth, women and SME's groups - crafting and distributing the murals • Consumers –use the murals for interior decor
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi and Kiambu
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	• Continuous availability of low-grade coffee beans • Limited skills in utilization of artistic murals form low grade coffee.
Suggestions for addressing the challenges	• Players to be encouraged to buy enough stocks during the milling season • Develop promotional packages for the murals.
Lessons learnt during its promotion, if any	Involve youths and women in making different coffee artistic murals.

Social, environmental, policy and market conditions necessary for upscaling	• Social conditions: Involve all gender in trainings to enhance adoption • Environmental: Highlight the research results showing the effects of artistic murals to environmental safety, food safety and human health • Market conditions: Capacity build farmers on the availability of different artistic murals to create market demand. • Policy: Provide enabling policy guiding and supporting the use of murals and review policy from time to time
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• Cost of low-grade coffee @ KES 6,000 per 50 kg bag • Accessories – Ksh 100 per artistic mural
Estimated returns	KES 1,000/= per mural
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology. • Women may have limited access to education, training and extension services on the technology
Gender related opportunities	Employment opportunities exist for women in artistic mural making
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technolog. • VMGs have limited access to training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness.
VMG related opportunities	Employment opportunities exist for some VMGs such as women in making coffee artistic murals
E: Case studies/profiles of success stories	
Success stories from previous similar projects	CRI and Goldrock International have successfully developed and sold artistic murals
Application guidelines for users	Leaflets and brochures on coffee mural making.
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	Coffee Co-operative Societies and Estates, KEBS, National and County governments

3.12.7 Extraction of Caffeine

2.12.7 TIMP Name	Extraction of Caffeine
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem addressed	Limited coffee products
What is it? (TIMP description)	Extraction of caffeine from coffee beans for use in pharmaceutical products, dietary supplements and energy drinks.
Justification	Caffeine extraction will diversify processed coffee products. The product can be used in pharmaceutical products, dietary supplements and energy drinks
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	MSME's ,Pharmaceutical companies, Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print.
Critical/essential factors for successful promotion	• Applied Research to continually test, validate technologies for extraction of caffeine from coffee berries • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of different technologies for extraction of caffeine form coffee berries • Sensitization and training farmers on the benefits of extraction caffeine form coffee berries • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of technologies for extraction of caffeine form coffee berries • Participatory demonstrations by stakeholders on alternative use of low grade coffee
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies

	to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Wet mill manager, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology • Dry mills – provision of coffee beans. • Pharmaceutical companies- manufacture of medicine, dietary supplements. • Beverage companies- manufacture of energy drinks. • MSME's – involved in distribution of products
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	• Seasonality of raw materials • Competition from similar products
Suggestions for addressing the challenges	• Players to buy enough raw materials during the milling season • Develop promotional packages for caffeine-based products
Lessons learnt during its promotion, if any	Limited knowledge on caffeine extraction procedures.
Social, environmental, policy and market conditions necessary for upscaling	• Social conditions: Involve all gender in trainings to enhance adoption. • Environmental: Highlight the research results showing the benefits of caffeine to environmental safety, food safety and human health. • Market conditions: Availability of caffeine technologies close to the farmers is essential for their uptake. Consumer demand caffeinated coffee. • Capacity build farmers on benefits of caffeine to create market demand. • Policy: Provide enabling policy guiding and supporting the extraction of caffeine from coffee and review policy from time to time
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Not estimated
Estimated returns	Not estimated
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology. • Women may have limited access to education, training and extension services on the technology.
Gender related opportunities	Employment opportunities exist for youth, men, women in caffeine extraction
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology • VMGs have limited access to training and extension services

	on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for some VMGs such as women in caffeine extraction
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Caffeine extraction protocols manuals.
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Further Research
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Cecilia W. Kathurima
Partner organizations	Coffee Co-operative Societies and Estates, KEBS, National and County governments.

3.12.8 Coffee Husk Briquettes

2.12.8 TIMP Name	Coffee Husk Briquettes
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	There is over reliance on charcoal as a source of energy in most the rural areas. This has led to deforestation and degradation of the environment
What is it? (TIMP description)	Briquettes are compacted blocks of combustible material used as fuel. They are made from coffee husks  
Justification	Dry milling produces over 20% of coffee husks which are by-products and are wasted. This can be used to make coffee briquettes thus conserving the environment. Over reliance on charcoal as a source of energy has led to deforestation, pollution of the environment and contributed to global warming effects

B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Hospitality industry, Marketing agents, Unions, Seed dealers 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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate technologies for making briquettes from coffee • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of different technologies for making briquettes from coffee • Sensitization and training farmers on the benefits of making briquettes from coffee • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of technologies for making briquettes from coffee briquettes
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies • County Governments – Provide and up-scale agricultural research and extension service at county level • Cooperative societies, Wet mill manager, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology • Dry mills – Provide husks • Entrepreneurs - Manufacture the briquettes • Poultry farmers, hoteliers and households- buyers and consumers of the briquettes
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi and Kiambu

Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties.
Challenges in development and dissemination	• Competition from other sources of energy • Limited supply of these briquettes near consumers. •
Suggestions for addressing the challenges	• Develop and roll out promotional campaigns • Diversify distribution channels • Adopt modified cooking Jikos.
Lessons learnt during its promotion, if any	Availing these briquettes near consumers enhances utilization.
Social, environmental, policy and market conditions necessary for upscaling	• Social conditions: Involve all gender in trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of briquettes to environmental safety, food safety and human health • Market conditions: Availability of briquette s close to the farmers is essential for their uptake. • Capacity build farmers on benefits of briquettes to create market demand. • Policy: Provide enabling policy guiding and supporting the use briquettes and review policy from time to time
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• 500 Kg / hour Briquette making machine – KES. 125,000 • Packaging bags - KES. 40/bag
Estimated returns	• KES1,000 per 25 kg bag of briquette.
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology. • Women may have limited access to education, training and extension services on the technology.
Gender related opportunities	• Employment opportunities exist for women in the making and selling of briquettes.
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology. • VMGs have limited access to training and extension services on the technology. • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Employment opportunities exist for some VMGs such as women in briquetes making and selling
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Kipkelion coffee mills is using coffee husks to make briquettes for commercial purposes.
Application guidelines for users	Coffee briquettes making brochures and leaflets

F: Status of TIMP Readiness	
(1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Ready for up scaling
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Joseph K. Mburu
Partner organizations	Coffee Co-operative Societies and Estates, KEBS, National and County governments and Coffee millers.

3.12.9 Coffee Husk as a source of fuel

2.12.9 TIMP Name	Coffee Husk as a source of fuel
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem addressed	Use of charcoal in construction industry has led to deforestation and degradation of the environment.
What is it? (TIMP description)	 Use of coffee husks as a source of energy to cure clay bricks and industrial boilers
Justification	Dry milling produces over 20% of coffee husks which can be used as a source of energy thus reducing the use of charcoal which has greatly contributed to deforestation and degradation of the environment
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents (Public and Private), Research Organizations and Universities, AFA, Processors, Traders, Millers, Cooperative societies, Hospitality industry, Marketing agents, Unions, Agripreneurs molding clay and using molder and Industrial boilers
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 • Digital Platforms– Website, Dashboards, Apps, social media short message services • Mass media – Electronic and print
Critical/essential factors for successful promotion	• Applied Research to continually test, validate technologies for making husks from coffee • A platform for interaction for coffee value chain stakeholders. • Well organized farmer groups and networks for easier training and adoption of different technologies for making coffee husks from coffee • Sensitization and training farmers on the benefits of making coffee husks from coffee • Adequate resources to develop publicity materials • Collaboration among coffee value chain actors and partners consisting of Researchers, Extension agents, Lead farmers, Service providers and County Governments) for success promotion of technologies for making coffee husks from coffee
Partners/stakeholders for scaling up and their roles	• Research organizations (KALRO and other research organizations) – To coordinate and regulate coffee research. • MoALD – Provide and up-scale agricultural research and extension service at the national level; development of policies to guide development and use of coffee value addition technologies. • County Governments – Provide and up-scale agricultural research and extension service at county level. • Cooperative societies, Wet mill manager, Estate Manager and Unions - Carry out training, inspection and up-scaling of technology. • Dry mills – provision of husks. • Tea industries, Clay manufacturers – buyers
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi, Kiambu and Embu
Counties where TIMPs will be up scaled	Nyeri, Embu, Homa Bay, Kericho, Kiambu, Muranga, Kisii, Uasin Gishu, Nandi, Machakos, Nyamira, Tharaka Nithi and Bungoma counties
Challenges in development and dissemination	• Limited supply of the raw material in many areas • Competition from other sources of energy
Suggestions for addressing the challenges	• Increase production of coffee in potential areas • Develop and roll out promotional strategies • Adopt modified boilers
Lessons learnt during its promotion, if any	Huge competition from other sources of energy and high transportation costs from mills resulting to low adoption.
Social, environmental, policy and market conditions necessary for upscaling	• Social conditions: Involve all gender in trainings to enhance adoption • Environmental: Highlight the research results showing the benefits of using coffee husks to environmental safety, food

	safety and human health • Market conditions: Availability of coffee husks close to the farmers is essential for their uptake. • Capacity build farmers on benefits of coffee husks to create market demand • Policy: Provide enabling policy guiding and supporting the use coffee husks and review policy from time to time
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	
Estimated returns	KES.90.00 per Kg
Gender issues and concerns in dissemination, adoption and scaling up	• Women may have less access to information, technology and knowledge on the technology. • Women may have limited access to education, training and extension services on the technology
Gender related opportunities	Employment opportunities exist for women in coffee husks selling
VMG issues and concerns in dissemination, adoption and scaling up	• VMGs may have less access to agricultural information, technology and knowledge on the technology • VMGs have limited access to training and extension services on the technology • Due to their social status VMGs are often excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities exist for some VMGs such as selling of coffee husks as source of energy
E: Case studies/profiles of success stories	
Success stories from previous similar projects	• Affordable energy source • Improved employment levels
Application guidelines for users	Develop user brochures
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up scaling
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Joseph K. Mburu
Partner organizations	Coffee Co-operative Societies, Estates, KEBS, National and County governments, Coffee millers and MSME's

3.13 Mechanization of Coffee Production Activities

3.13.1 Bulldozer

TIMP Name	Bulldozer
Category (i.e., technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• Slow and tedious processes of bush clearing, in a commercialized coffee commodity • Manual bush clearing delays job finishing leading to late planting • High cost of manual labour • High drudgery level
What is it? (TIMP description) (	Crawler bulldozer, also called crawler dozer or briefly bulldozer, is a tracked earthmoving machine with a front-mounted blade. It's widely used in civil engineering, mining, and construction. With the least 178 horsepower and a minimum operating weight of 18300 kg. A bulldozer is an earthmoving machine designed to push large quantities of rubble, soil, sand and other loose materials. They are used by farmers as tractors to plough and clear land. Over time, dozers have evolved to accommodate a variety of environments and applications with high levels of efficiency.  Bulldozer Source: https://www.google.com/url
Justification	This bulldozer is ideal for traversing dense and irregular terrain since the tracks give it great traction. This heavyweight is great for moving heavy materials from one area to another. They also have rippers that assist with crushing and clearing dense terrain.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Coffee farmers, researchers, agri-preneurs
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 servicesStakeholder
Critical/essential factors for successful promotion	• Grading: Also called land leveling, grading creates a level base. • Finish grading: Dozers are also fitting for finish grading, which involves leveling off an inch or two of an already-graded surfaces. • Removing materials and obstructions: clean a job site with a dozer to remove extra earth, dirt, rocks, sand or rubble. • Spreading materials: For landscaping or grading, dozers are useful for spreading soil, sand and other materials dumped from heavy machinery.
Partners/stakeholders for scaling up and their roles	KALRO, ATDC, AMS, Universities, Contractors, Bulldozer dealers NGO supporting farmers for dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Nyeri, , Murang'a, Kiambu, Machakos, Embu, Meru and Tharaka Nithi
Challenges in dissemination	• Lack of the machines • Small size of land to be established • High initial cost for small-scale farmers to own or hire crawler bulldozers
Suggestions for addressing the challenges	• Centralized hire serve providers • Form farmer cooperatives for collective ownership
Lessons learned in up scaling if any	• Hastens the speed of bush clearing • Increases land for coffee cultivation • Leaves land less vulnerable to soil erosion
Social, environmental, policy and market conditions necessary for development and up scaling	• Creation of awareness on the importance of mechanization in the community • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs Shantui D6	KES 18,000,000
Estimated returns	KES 7,000 hour after paying round trip of KES 1,000 kilometre
Gender issues and concerns in development, dissemination, adoption and scaling up	• Men perform most of the land clearing and ploughing activities therefore the implement will reduce their work burden • Women and youth have limited access credit to purchase the Crawler bulldozer • Women and youth have limited access to education, training and extension services than men • Women have less access t agricultural information, technology and knowledge
Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement

	Affirmative action opportunities such as the women and youth enterprise fund exist for them to access the required credit
VMG issues and concerns in development, dissemination, adoption and scaling up	- VMGs may have limited access to credit to purchase the farm implements - VMGs may have limited access to training and extension services. - Due to their social status VMGs may be excluded from decision making in development and dissemination activities. - There is low adoption by VMGs due to lack of awareness
VMG related opportunities	- Opportunities exist for unemployed youth in operating the implement - Affirmative action opportunities such as the women and youth enterprise fund exists for VMGs to access the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as wheat and rice
Application guidelines for users	- Demonstrations and training - User manuals https://www.mantracgroup.com/en-ke/api/new-products/d11-dozers/
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535
Lead organization and scientists	KALRO, Egerton University Nasiremba W. W, 0733812953
Partner organizations	Local Fabricators

3.13.2 Wheeled Excavator

2.13.2 TIMP Name	Wheeled Excavator
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	- Slow and tedious processes of cut-off excavation, in a commercialized coffee commodity - Manual bush clearing cut-off excavation delays job finishing leading to late planting - High cost of manual labour - High drudgery level
What is it? (TIMP description)	An Excavator is heavy construction equipment consisting of a boom, dipper, bucket and cab on a rotating platform known as

	the "house". The house sits atop an undercarriage with tracks or wheels. They are a natural progression from the steam shovels and often mistakenly called power shovels. All movement and functions of a hydraulic excavator are accomplished through the use of hydraulic fluid, with hydraulic cylinders and hydraulic motors. Due to the linear actuation of hydraulic cylinders, their mode of operation is fundamentally different from cable-operated excavators which use winches and steel ropes to accomplish the movements.  Wheeled Excavator Source: Nasiremba W. KALRO Katumani
Justification	This heavyweight is great for moving heavy materials from one area to another. This excavator is ideal for traversing dense and irregular terrain since the tracks give it great traction. They also have rippers that assist with crushing and excavating dense terrain.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers • 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 services
Critical/essential factors for successful promotion	• Excavators are typically used for digging excavations and for trenching purposes. • Their versatility and effectiveness make them vital at agricultural sites
Partners/stakeholders for scaling	KALRO, ATDC, AMS, Universities,

up and their roles	Contractors, Bulldozer dealers NGO supporting farmers for dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Nyeri, Meru, Murang'a
Challenges in dissemination	• Lack of the machines • Small size of land to be established • High initial cost for small-scale farmers to own or hire crawler bulldozers
Suggestions for addressing the challenges	• Centralized hire serve providers • Form farmer cooperatives for collective ownership
Lessons learned in up scaling if any	• Hastens the speed of bush clearing • Increases land for coffee cultivation • Leaves land less vulnerable to soil erosion
Social, environmental, policy and market conditions necessary for development and up scaling	• Creation of awareness on the importance of mechanization in the community. • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs Volvo excavator wheeled 20 ton	KES 8,000,000
Estimated returns	KES 10,000/ hour after paying round trip of KES 1,000.00/kilometre
Gender issues and concerns in development, dissemination, adoption and scaling up	• Men perform most of the land clearing and cultivation activities therefore the implement will reduce their work burden. • Women and youth have limited access credit to purchase the wheeled excavator. • Women and youth have limited access to education, training and extension services than men. • Women have less access to agricultural information, technology and knowledge.
Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exists for them to access the required credit.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to credit to purchase the farm implements. • VMGs may have limited access to training and extension services. • Due to their social status VMGs may be excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness.
VMG related opportunities	• Opportunities exist for unemployed youth in operating the implement.

	Affirmative action opportunities such as the women and youth enterprise fund exists for VMGs to access the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as wheat and rice
Application guidelines for users	1. Demonstrations and training 2. User manuals 3. https://www.cat.com/en_US/products/new/equipment/excavators/wheel-excavators.html
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535
Lead organization and scientists	KALRO, Egerton University Nasiremba W. W, 0733812953
Partner organizations	Local Fabricators

3.13.3 Wheeled Tractor

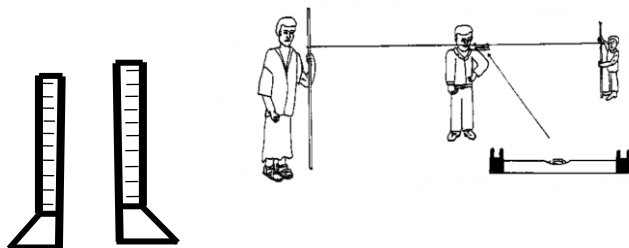
2.13.3 TIMP Name	Wheeled Tractor
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	- Slow and tedious processes of seedbed preparation, in the commercialized Coffee commodity - Drudgery and fatigue - Low output - Inefficiency and inconsistency of work. - Untimeliness - High cost of manual labour
What is it? (TIMP description)	A tractor is an engineering vehicle specifically designed to deliver a high tractive effort (or torque) at slow speeds, for the purposes of hauling a trailer or machinery such as that used in agriculture. Most commonly, the term is used to describe a farm vehicle that provides the power and traction to mechanize agricultural tasks, especially (and originally) tillage, trailer towing, planting, weeding, ridging, planting, spraying, harvesting, ground grading and much more agricultural functions. Agricultural implements may be towed behind, mounted behind or in front of the tractor and the tractor may also provide a source of power if the implement is mechanized.

	It is therefore fitted with various equipment at alternate times for easing farm operations  Wheeled tractor Source: Nasirembe W. KALRO Katumani)
Justification	A Tractors is an essential necessity of farming as it provides machine power for performing farm applications. In addition to routine farm activities, it is efficient, timely, consistent, releases labour and reduces cost as compared to manual labour.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers • 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 servicesStakeholder
Critical/essential factors for successful promotion	• Tractors are typically used for land preparation. • Their versatility and effectiveness make them vital at agricultural sites
Partners/stakeholders for scaling up and their roles	KALRO, ATDC, AMS, Universities, Contractors, Bulldozer dealers NGO supporting farmers for dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu

Counties where TIMP will be up scaled	Nyeri, Meru, Murang'a
Challenges in dissemination	• Lack of the machines • Small size of land to be established • High initial cost for small-scale farmers to own or hire crawler bulldozers
Suggestions for addressing the challenges	• Centralized hire serve providers • Form farmer cooperatives for collective ownership
Lessons learned in up scaling if any	• Hastens the speed of land preparation • Increases land for coffee cultivation • Leaves land less vulnerable to soil erosion when ploughed along the contour
Social, environmental, policy and market conditions necessary for development and up scaling	• Creation of awareness on the importance of mechanization in the community. • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs Volvo excavator wheeled 20 ton	KES 6,000,000
Estimated returns	KES 7,000/ ha
Gender issues and concerns in development, dissemination, adoption and scaling up	• Men perform most of the land ploughing activities therefore the implement will reduce their drudgery of work • Women and youth have limited access credit to purchase the wheeled tactor • Women and youth have limited access to education, training and extension services than men • Women have less access to agricultural information, technology and knowledge.
Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exists for them to access the required credit
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to credit to purchase the farm implements • VMGs may have limited access to training and extension services • Due to their social status VMGs may be excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Opportunities exist for unemployed youth in operating the implement • Affirmative action opportunities such as the women and youth enterprise fund exists for VMGs to access the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as wheat and rice
Application guidelines for	• Demonstrations and training

users	• User manuals
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535
Lead organization and scientists	KALRO, Egerton University Nasirembe W. W, 0733812953
Partner organizations	Local Fabricators

3.13.4 Line level

2.13.4 TIMP Name	Line level
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	• It's difficult to set out straight lines on the field. • It's difficult to see a point on the ground from a distance
What is it? (TIMP description)	A line level consists of two poles, between which a length of string is suspended. A spirit level is hung on the string. The level is the type used by builders, but has small hooks at either end. The poles should be of even height (about 1.5 m) and the string (about 2 mm in diameter) and precisely 10 metres in length. A notch is made in each pole at exactly the same height (say 1.4 m above ground level) and the ends of the string tied around these notches. The centre of the string (5 m from each end) is marked and the level itself is suspended there.  Line level Source: KALRO-Katumani

Justification	The line level is a simple surveying instrument which can be used to lay out contours and gradients, and also to measure the slope of land. It is simple to operate and is easier to transport than other similar surveying tools such as the A-frame. It is especially quick and very accurate when used properly. However, a line level does require three people to operate it.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers, • surveyors • engineers • agripreneurs/contractors
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 servicesStakeholder
Critical/essential factors for successful promotion	Efficiency, Low cost, Portable
Partners/stakeholders for scaling up and their roles	KALRO, Universities, Survey equipment dealers, construction contractors
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Murang'a, Nyeri
Challenges in dissemination	• Lack of survey equipment • Lack of technical ability to use the equipment
Suggestions for addressing the challenges	• Train stakeholders on how to use survey equipment • Avail equipment to the stakeholders
Lessons learned in up scaling if any	• Ease of setting out straight lines on the field. • Ease of seeing a point on the ground from a distance
Social, environmental, policy and market conditions necessary for development and up scaling	• Creation of awareness on the importance of mechanization in the community. • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	KES 2,500.00
Estimated returns	KES 500.00/ha

Gender issues and concerns in development, dissemination, adoption and scaling up	• Gender friendly and affordable equipment • Require orientation for all gender. • Up-scaling should target all the gender
Gender related opportunities	• Creates employment especially for youth • Reduces drudgery for women farmers as well as men
VMG issues and concerns in development, dissemination, adoption and scaling up	• Facilitation to access information • Affordability and easy to maintain equipment
VMG related opportunities	Can create employment for VMG at local level
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Soil and water conservation has enabled increased production in other crops such as wheat and rice
Application guidelines for users	1. Demonstrations and training 2. User manuals 3. https://www.johnsonlevel.com/News/LineLevels
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535
Lead organization and scientists	KALRO, Egerton University Nasiremba W. W, 0733812953
Partner organizations	Local Fabricators

3.13.5 Line level

2.13.5 TIMP Name	Hand held hole drill
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	High and increasing cost of manual labour. Manual digging increases the cost of making planting holes. It is a slow and tedious processes. It is also difficult to prepare uniformly spaced contour holes. Delayed operation lead to late planting
What is it? (TIMP description)	Hole digger is an engine driven machine that augers holes in rows at equal distances as desired mechanically and economically. It also can be used for hole making for electric poles and farm hedges. It is best suited for tree

	plantations. It can auger down to about 90cm deep and have a consistent diameter in just 30 seconds.  (Source: https://www.google.com/url?
Justification	Has High Efficiency and when well-adjusted, the plough atomically seeks the desired depth. It is Versatile. The various models have different features that enable high efficiency in preparation of the land. Enables weed Control, Pest Control and Improved Soil Health.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers, • surveyors • engineers • agripreneurs/contractors
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 servicesStakeholder
Critical/essential factors for successful promotion	• Hole diggers are typically used for boring coffee seedling holes. • Their versatility and effectiveness make them vital at agricultural sites
Partners/stakeholders for scaling up and their roles	KALRO, ATDC, AMS, Universities, Contractors, Bulldozer dealers NGO supporting farmers for dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Nyeri, Meru, Murang'a

Challenges in dissemination	• Lack of the power hole drills • Small size of land to be established • High initial cost for small-scale farmers to own or hire power hole drills hitched tractors
Suggestions for addressing the challenges	• Centralized hire serve providers • Form farmer cooperatives for collective ownership
Lessons learned in up scaling if any	• Hastens the speed of hole drilling • Increases land for coffee cultivation • Conserves moisture in the soil
Social, environmental, policy and market conditions necessary for development and up scaling	• Creation of awareness on the importance of mechanization in the community. • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs Volvo excavator wheeled 20 ton	KES 98,000.00
Estimated returns	KES 150.00/ hole
Gender issues and concerns in development, dissemination, adoption and scaling up	• Men perform the coffee hole planting digging activities therefore the implement will reduce their work burden. • Women and youth have limited access credit to purchase the implement • Women and youth have limited access to education, training and extension services than men. • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exists for them to access the required credit
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to credit to purchase the farm implements • VMGs may have limited access to training and extension services • Due to their social status VMGs may be excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness
VMG related opportunities	• Opportunities exist for unemployed youth in operating the implement • Affirmative action opportunities such as the women and youth enterprise fund exist for VMGs to access the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as wheat and rice
Application guidelines for	1. Demonstrations and training

users	2. User manuals 3. https://www.alibaba.com/showroom/hand-hole-digging-machine.html
F: Status of TIMP readiness (1-ready for upscaling; 2- requires validation; 3-requires further research)	Requires validation
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535
Lead organization and scientists	KALRO, Egerton University Nasirembe W. W. W, 0733812953
Partner organizations	Local Fabricators

3.13.6 Tractor Hole Drill

2.13.6 TIMP Name	Tractor Hole Drill
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	High and increasing cost of manual labour. Manual digging increases the cost of making planting holes. It is a slow and tedious processes. It is also difficult to prepare uniformly spaced contour holes. Delayed operation lead to late planting.
What is it? (TIMP description)	Hole digger is a power take off (PTO) driven machine that augers holes in rows at equal distances as desired mechanically and economically. It also can be used for hole making for electric poles and farm hedges. It is best suited for tree plantations. It can auger down to about 90cm deep and have a consistent diameter in just 30 seconds.  Tractor hole drill

	Source: B.S. Tractors Pvt Ltd
Justification	The auger makes a definite and uniform hole diameters and depths as desired, selected from the auger specifications. Users spend 50 times shorter a time and as little as 90ml of fuel to auger a hole. It is augers as it removes detached soil forming a much neater hole, with a well-defined circumference. Holes can be made at pre-defined point by driving the compact tractor. It is easy to use.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers, • surveyors • engineers • agripreneurs/contractors
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 servicesStakeholder
Critical/essential factors for successful promotion	• Hole drills are typically used for land preparation. • Their versatility and effectiveness make them vital at agricultural sites
Partners/stakeholders for scaling up and their roles	KALRO, ATDC, AMS, Universities, Contractors, Bulldozer dealers NGO supporting farmers for dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Nyeri, Meru, Murang'a
Challenges in dissemination	• Lack of the mould hole drills • Small size of land to be established • High initial cost for small-scale farmers to own or hire mould board ploughs hitched tractors
Suggestions for addressing the challenges	• Centralized hire serve providers • Form farmer cooperatives for collective ownership
Lessons learned in up scaling if any	• Hastens the speed of hole drilling • Makes identical holes
Social, environmental, policy and market conditions	• Creation of awareness on the importance of mechanization in the community

necessary for development and up scaling	• Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs Volvo excavator wheeled 20 ton	KES 450,000.00
Estimated returns	KES 50.00/ ha
Gender issues and concerns in development, dissemination, adoption and scaling up	• Men perform most of the coffee planting holes digging activities therefore the implement will reduce their work burden. • Women and youth have limited access credit to purchase the implement. • Women and youth have limited access to education, training and extension services than men • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exists for them to access the required credit
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to credit to purchase the farm implements • VMGs may have limited access to training and extension services • Due to their social status VMGs may be excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness.
VMG related opportunities	• Opportunities exist for unemployed youth in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exists for VMGs to access the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as wheat and rice
Application guidelines for users	1. Demonstrations and training 2. User manuals 3. https://www.tractor.co.ke/product/post-hole-digger/
F: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535

Lead organization and scientists	KALRO, Egerton University Nasirembe W. W. W, 0733812953
Partner organizations	Local Fabricators

3.13.7 Back Pack weeder

2.13.7 TIMP Name	Back Pack weeder
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	High and increasing cost of manual labour. Manual digging increases the cost of making planting holes. It is a slow and tedious processes. It is also difficult to prepare uniformly spaced contour holes. Delayed operation lead to late planting.
What is it? (TIMP description)	Backpack weigh about 6Kgs. It's Carried on your Back like a Backpack and its blades are directed to the weeding area and has capability of weeding about 1 ha of land in a day which is equivalent to the amount of work done by 10 People on the same farm in a day. A feature, apart from the issue of their easy transportation, is that it keeps operators balance and while working, the operator focuses more on work and eliminate weeds than stability.  Back Pack weeder Source: B.S. Tractors Pvt Ltd
Justification	• It's cost effective compared to Manpower • Weeding is the most tedious seasons in farming and employing 10 farm workers will definitely cost more. • Ease of use to work with • Tremendously increases agricultural and horticultural working area
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers,

	• surveyors • engineers • agripreneurs/contractors
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 servicesStakeholder
Critical/essential factors for successful promotion	• Back pack weeders are typically used for weed removal • Their versatility and effectiveness make them vital at agricultural sites
Partners/stakeholders for scaling up and their roles	KALRO, ATDC, AMS, Universities, Contractors, small agricultural implement dealers NGO supporting farmers for dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Nyeri, Meru, Murang'a
Challenges in dissemination	• Lack of Back pack weeders • Small size of land to be established • High initial cost for small-scale farmers to own or hire Back pack weeders
Suggestions for addressing the challenges	• Centralized hire serve providers • Form farmer cooperatives for collective ownership
Lessons learned in up scaling if any	• Hastens the speed of weeding
Social, environmental, policy and market conditions necessary for development and up scaling	• Creation of awareness on the importance of mechanization in the community. • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs Volvo excavator wheeled 20 ton	KES 25,000.00
Estimated returns	KES 2,000.00/ ha
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women perform most of the crops weeding activities therefore the implement will reduce their work burden. • Women and youth have limited access credit to purchase the implement. • Women and youth have limited access to education, training and extension services than men. • Women have less access to agricultural information,

	technology and knowledge.
Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exists for them to access the required credit.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs have may limited access to credit to purchase the farm implements. • VMGs may have limited access to training and extension services. • Due to their social status VMGs may be excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness.
VMG related opportunities	• Opportunities exist for unemployed youth in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exists for VMGs to access the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as wheat and rice
Application guidelines for users	1. Demonstrations and training 2. User manuals 3. https://www.alibaba.com/showroom/backpack-weeder.html
F: Status of TIMP readiness (1-ready for upscaling; 2- requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535
Lead organization and scientists	KALRO, Egerton University Nasirembe W. W. W, 0733812953
Partner organizations	Local Fabricators

3.13.8 Motorised Sprayer

2.13.8 TIMP Name	Motorised Sprayer																																																																								
Category (i.e. technology, innovation or management practice)	Technology																																																																								
A: Description of the technology, innovation or management practice																																																																									
Problem to be addressed	Slow and tedious processes of manual spraying of Coffee; The height of the tree requires a long projectile spray which cannot be attained by a manual knapsack; Coffee has a high number of pests that invade leaf, flowers and nut.																																																																								
What is it? (TIMP description)	A motorized sprayer is a device used to spray a liquid, where sprayers are commonly used for projection of the chemical, weed killers, crop performance materials, pest maintenance chemicals, as well as manufacturing and production line ingredients. In agriculture, a sprayer is a piece of equipment that is used to apply herbicides, pesticides, and fertilizers on agricultural crops. Sprayers are man-portable units typically backpacks with spray guns. They are used to control; weeds that can harbour insects by use of herbicides, insect pests that can cause diseases by the use of insecticides as well as pesticides. Control of fungal diseases by the use of fungicides. Application of micronutrients on the plants. Motorised Sprayer <table><caption>Nozzle Guide for Band and Directed Spraying</caption><thead><tr><th></th><th>Early Flat Fan</th><th>Medium Flat Fan</th><th>Wide Flat Fan</th><th>Full Cone</th><th>Disc and Core Cone</th></tr></thead><tbody><tr><td>Herbicides</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Pre-emergence</td><td>Very Good</td><td>Good</td><td>Very Good</td><td>Good</td><td></td></tr><tr><td>Post-emergence Contact</td><td>Good</td><td>Very Good</td><td>Good</td><td></td><td></td></tr><tr><td>Post-emergence Systemic</td><td>Very Good</td><td>Good</td><td></td><td></td><td></td></tr><tr><td>Fungicides</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Contact</td><td></td><td>Good</td><td></td><td>Good</td><td>Very Good</td></tr><tr><td>Systemic</td><td></td><td>Very Good</td><td></td><td></td><td>Good</td></tr><tr><td>Insecticides</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Contact</td><td>Very Good</td><td>Very Good</td><td>Very Good</td><td></td><td>Very Good</td></tr><tr><td>Systemic</td><td></td><td></td><td></td><td></td><td>Good</td></tr><tr><td>Growth Regulators</td><td>Good</td><td></td><td></td><td>Very Good</td><td></td></tr></tbody></table>		Early Flat Fan	Medium Flat Fan	Wide Flat Fan	Full Cone	Disc and Core Cone	Herbicides						Pre-emergence	Very Good	Good	Very Good	Good		Post-emergence Contact	Good	Very Good	Good			Post-emergence Systemic	Very Good	Good				Fungicides						Contact		Good		Good	Very Good	Systemic		Very Good			Good	Insecticides						Contact	Very Good	Very Good	Very Good		Very Good	Systemic					Good	Growth Regulators	Good			Very Good	
	Early Flat Fan	Medium Flat Fan	Wide Flat Fan	Full Cone	Disc and Core Cone																																																																				
Herbicides																																																																									
Pre-emergence	Very Good	Good	Very Good	Good																																																																					
Post-emergence Contact	Good	Very Good	Good																																																																						
Post-emergence Systemic	Very Good	Good																																																																							
Fungicides																																																																									
Contact		Good		Good	Very Good																																																																				
Systemic		Very Good			Good																																																																				
Insecticides																																																																									
Contact	Very Good	Very Good	Very Good		Very Good																																																																				
Systemic					Good																																																																				
Growth Regulators	Good			Very Good																																																																					
Justification	Pest reduce yields up to 98% and are a major menace in agricultural production. Before Coffee forms a canopy, broad leafed weeds compete with Coffee seedling for nutrients and light greatly reducing their yield. Manual sprayers are labour intensive while spraying labour is too expensive. It has lower pressure reducing its efficiency hence a motorized knapsack comes in handy.																																																																								
B: Assessment of dissemination and scaling up/out approaches																																																																									
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers, • surveyors • engineers • agripreneurs/contractors																																																																								

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 servicesStakeholder
Critical/essential factors for successful promotion	• Applied and adaptive research to test, validate and release improved cabbage varieties • A platform for interaction of Coffee value chain stakeholders • Use by Farmers
Partners/stakeholders for scaling up and their roles	KALRO, ATDC, AMS, Universities, Contractors, small agricultural implement dealers NGO supporting farmers for dissemination
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMP will be up scaled	Nyeri, Meru, Murang'a
Challenges in dissemination	• Lack of motorized sprayers • Small size of land to be established • High initial cost for small-scale farmers to own or hire sprayers
Suggestions for addressing the challenges	• Centralized hire serve providers • Form farmer cooperatives for collective ownership
Lessons learned in up scaling if any	• Hastens the speed of spraying
Social, environmental, policy and market conditions necessary for development and up scaling	• Creation of awareness on the importance of mechanization in the community. • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs Volvo excavator wheeled 20 ton	KES 55,000.00
Estimated returns	KES 600.00/ ha
Gender issues and concerns in development, dissemination, adoption and scaling up	• Men perform most of the spraying activities therefore the implement will reduce their drudgery of work • Women and youth have limited access credit to purchase the motorized sprayer • Women and youth have limited access to education, training and extension services than men • Women have less access to agricultural information, technology and knowledge

Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement • Affirmative action opportunities such as the women and youth enterprise fund exists for VMGs to access the required credit
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to credit to purchase the farm implements • VMGs may have limited access to training and extension services • Due to their social status VMGs may may be excluded from decision making in development and dissemination activities • There is low adoption by VMGs due lack of awareness.
VMG related opportunities	• Opportunities exist for unemployed youth males in operating the implement • Affirmative action opportunities such as the women and youth enterprise fund exist for VMGs to access the required credit
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as wheat and rice
Application guidelines for users	1. Demonstrations and training 2. User manuals 3. https://www.motorisedknapsacksprayer.co.ke/
F: Status of TIMP readiness (1-ready for upscaling; 2- requires validation; 3-requires further research)	Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katamani@kalro.org Phone: 0711369535
Lead organization and scientists	KALRO, Egerton University Nasirembe W. W. W, 0733812953
Partner organizations	Local Fabricators

3.13.9 Mechanical Coffee harvesting

2.13.8 TIMP Name	Mechanical Coffee harvesting
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem addressed	High cost of harvesting and labour unavailability

What is it? (TIMP description)	Use of mechanical coffee harvesters  Mechanical coffee harvester Source: https://tchibo.us/blogs/academy/journey-of-coffee-harvesting
Justification	High cost of manual coffee harvesting
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Farmers, • Researchers, • Extension staff, • Wet mills managers • 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 servicesStakeholder
Critical/essential factors for successful promotion	• Large scale farming
Partners/stakeholders for scaling up and their roles	• Large scale farmers – up-scaling • Estate managers- Training and inspection • Extension staff-Training
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be validated	Kiambu and Nyeri county
Challenges in dissemination	• Lack of uniformity in ripening • Small farm holdings

	• Inhibitory machinery cost
Suggestions for addressing the challenges	Use of irrigation to enhance uniform flowering
Lessons learnt during its promotion, if any	Difficult to adopt given the widespread small holder farms
Social, environmental, policy and market conditions necessary for up-scaling	• Creation of awareness on the importance of mechanization in the community • Include all gender groups in research, and validation. • Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Approximately KES.3 million
Estimated returns	
Gender issues and concerns in development, dissemination, adoption and scaling up	• Women perform most of the crops harvesting activities therefore the implement will reduce their work burden. • Women and youth have limited access credit to purchase the implement. • Women and youth have limited access to education, training and extension services than men • Women have less access to agricultural information, technology and knowledge
Gender related opportunities	• Employment opportunities exist for youth males and males in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exist for them to access the required credit.
VMG issues and concerns in development, dissemination, adoption and scaling up	• VMGs may have limited access to credit to purchase the farm implements. • VMGs may have limited access to training and extension services. • Due to their social status VMGs may be excluded from decision making in development and dissemination activities. • There is low adoption by VMGs due lack of awareness.
VMG related opportunities	• Opportunities exist for unemployed youth in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exist for VMGs to access the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. Operation manual 2. https://guentercoffee.com/en/blogs/coffee-knowledge/how-is-coffee-harvested

F: Status of TIMP Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Requires validation
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Joseph K. Mburu
Partner organizations	Braz Afric Ltd

3.13.10 Selective coffee harvesting machine

2.13.9 TIMP Name	Selective coffee harvesting machine
Category (i.e., technology, innovation or management practice)	Innovation
A: Description of the technology, innovation or management practice	
Problem addressed	High cost of harvesting and labour unavailability
What is it? (TIMP description)	A machine which can harvest ripe coffee cherries selectively
Justification	Coffee berries do not generally mature all at once and berries in several stages of development are found on any given tree. Harvesting coffee using machines is currently not being practiced in Kenya. The coffee harvesting machines used in countries like Brazil do not select the coffee but harvest everything. KALRO-CRI could work with fabricators to get a machine which can harvest selectively just like in manual harvesting. After fabrication, the machine will be tested before it is recommended for use by coffee farmers.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Researchers, • Farmers, • Extension staff, • wet mills managers • 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 servicesStakeholder
Critical/essential factors for successful promotion	Large scale farming
Partners/stakeholders for scaling up and their roles	- Large scale farmers - up scaling - Estate managers- Training and inspection - Extension Staff-Training - Manufacturers
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be validated	Kiambu and Nyeri counties
Challenges in dissemination	- Unpredictable weather pattern - Lack of uniformity in ripening - Small farm holdings - High cost of machine
Suggestions for addressing the challenges	- Use of irrigation to enhance uniform flowering - Fabrication of machines appropriate for smallholdings - Purchase through cooperatives
Lessons learnt during its promotion, if any	- Difficult to adopt locally given the widespread small holder farms - Non-uniform ripening pattern of coffee
Social, environmental, policy and market conditions necessary for up-scaling	- Creation of awareness on the importance of mechanization in the community - Include all gender groups in research, and validation - Favourable policies on cost of agricultural mechanization
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Varies with capacity
Estimated returns	Varies with capacity
Gender issues and concerns in development, dissemination, adoption and scaling up	- Women perform most of the crops harvesting activities therefore the implement will reduce their work burden - Women and youth have limited access credit to purchase the implement - Women and youth have limited access to education, training and extension services than men - Women have less access to agricultural information, technology and knowledge
Gender related opportunities	- Employment opportunities exist for youth males and males in operating the implement. - Affirmative action opportunities such as the women and youth enterprise fund exists for them to access the required credit.
VMG issues and concerns in development, dissemination, adoption and scaling up	- VMGs may have limited access to credit to purchase the farm implements. - VMGs may have limited access to training and extension services. - Due to their social status VMGs may be excluded from decision

	making in development and dissemination activities.
VMG related opportunities	• There is low adoption by VMGs due lack of awareness. • Opportunities exist for unemployed youth in operating the implement. • Affirmative action opportunities such as the women and youth enterprise fund exist for VMGs to access the required credit.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	1. Operation manual 2. https://tchibo.us/blogs/academy/journey-of-coffee-harvesting
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Requires further Research
Lead organization and scientists	KALRO-CRI, Joseph K. Mburu
G. Contacts	
Contacts	Institute Director, Coffee Research Institute, P. O. Box 4-00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Partner organizations	Suppliers, Coffee cooperative unions, Millers, Marketers

3.14 Coffee Farming Business and Marketing

3.14.1 Online Coffee Marketing

2.14.1 TIMP Name	Online Coffee Marketing
Category (i.e., technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Low coffee productivity due to the market inaccessibility among the smallholder farmers. The smallholder farmers have limited use of technologies among the smallholder farmers while linking to markets, leading to poor market access and constraints in marketing channels, skills and market information.

What is it? (TIMP description)	This refers to the online marketplace that provides buyers and sellers with an avenue to meet and exchange goods and services. These can include a variety of online platforms, tools, and content delivery systems.
Justification	Producers commonly use traditional coffee marketing systems which have limited market research and information leading to depressed and delayed coffee prices. Online marketing is increasingly becoming mandatory for businesses of all types. This high adaptability of internet marketing is an important benefit that businesses can take advantage of to provide their consumers with the best shopping experience. Consumers use a variety of online methods for finding, researching, and eventually making purchasing decisions. Internet marketing reduces costs
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Producers, • consumers, • ICT service providers • MSMEs
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 services
Critical/essential factors for successful promotion	• Connectivity to ICT platforms
Partners/stakeholders for scaling up and their roles	• Coffee farmers – Coffee production • Consumers –Purchase of coffee • ICT service providers – develop websites and E-market space • MSMEs - buys and sells coffee on the E-market platforms
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi and Kiambu
Counties where TIMPs will be up scaled	kiambu, Murang'a, Nyeri Machakos, Embu, Embu, Tharaka Nithi and Meru
Challenges in development and dissemination	• Unavailability of internet connectivity • Risk of non-compliance to contract obligations on either party. • Limited ICT exposure

Suggestions for addressing the challenges	• Expand ICT networks connectivity • Adopt bank guarantees and letters of credit • Training and promotion of ICT
Lessons learnt during its promotion, if any	• None
Social, environmental, policy and market conditions necessary for upscaling	• Suitable policies by the National and County government to support the initiative • Buy- in by producers • Sensitization on the availability of the ICT platforms
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be estimated
Estimated returns	To be estimated
Gender issues and concerns in development and dissemination, adoption and scaling	• Women have less access to the required tools such as phones and computer than men. • Women are more illiterate and therefore cannot use the ICTs compared with men.
Gender related opportunities	• Opportunities exist for youth to use the ICT tools since most of them are highly literate and have phones or computers.
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs have less access to the required tools such as phones and computers. • VMGs are more illiterate and therefore cannot use the ICTs.
VMG related opportunities	• Opportunities exist for youth to use the ICT tools since most of them are highly literate and have access to phones or computers.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Online marketing manuals
F: Status of TIMP	
Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Requires validation
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Joan Kamau
Partner organizations	• Coffee Co-operative Societies and Estates • National and County Governments • AFA-Coffee Directorate • National Coffee Exchange

3.14.2 Central Coffee Auction System

2.14.2 TIMP Name	Central Coffee Auction System
Category (i.e., technology, innovation or management practice)	Management practice 
A: Description of the technology, innovation or management practice	
Problem addressed	Low coffee productivity due to the monopolistic coffee trade, depressed prices and lack of transparency in coffee marketing
What is it? (TIMP description)	A platform where coffee is offered for sale through auction to enhance coffee prices and transparency in coffee trade.
Justification	Most of the Kenyan coffee is exported and consumed overseas hence the need to create a platform where producers can avail their coffee for bidding by buyers from all corners of the globe.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee farmers, • Marketing agents • Traders
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 services
Critical/essential factors for successful promotion	• Stakeholder involvement • Enabling business and policy environment
Partners/stakeholders for scaling up and their roles	• Coffee farmers –coffee production • Marketing agents - coffee marketing
	• Kenya Coffee Traders Association (KCTA) –trade • coffee at the NCE • Coffee dealers – purchase coffee at the auction • AFA- Coffee Directorate- regulation • Nairobi Coffee Exchange (NCE)- Provide coffee auction platform
C: Current situation and future scaling up	
Counties where already promoted if any	Nairobi, Kericho, Nyeri, Bungoma and Meru

Counties where TIMPs will be up scaled	Kiambu, Murang'a, Nyeri Machakos, Embu Tharaka Nithi and Meru
Challenges in development and dissemination	- Limited Network connectivity - Risk of interference (Hacking) of the system - Limited knowledge on online marketing systems
Suggestions for addressing the challenges	- Expand network coverage - Monitoring and feedback from stakeholders - Training and promotion on online marketing systems
Lessons learnt during its promotion, if any	None
Social, environmental, policy and market conditions necessary for upscaling	- Social – acceptable processes - Environmental - Favourable business environment for fee marketing - Policy conditions – Supporting policy - Market conditions – Competitive price
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be estimated
Estimated returns	To be estimated
Gender issues and concerns in development and dissemination, adoption and scaling	Women also have limited participation in the coffee auction platform
Gender related opportunities	Opportunities exist for coffee farmers who are mostly men to benefit from higher profit margins through the auction platform
VMG issues and concerns in development and dissemination, adoption and scaling up	- VMGs are widely discriminated in the auction platform. - VMGs also have limited participation and influence in auction platform.
VMG related opportunities	VMGs stand to benefit with higher profit margins through auction platform.
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Screens connected to NCE have been installed at Kericho, Bungoma, Nyeri and Meru Counties for the farmers to follow the transparent auction proceedings
Application guidelines for users	- Coffee Research Institute. (2020). Coffee Production Recommendations. - Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness	
(1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for up-scaling
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Simon Ikunda

Partner organizations	• Coffee Co-Operative Societies and Estates • National and County Governments • AFA-Coffee Directorate • National Coffee Exchange • KCTA

3.14.3 Direct Sales System

2.14.3 TIMP Name	Direct Sales System
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Low coffee productivity due to the inadequate direct networks with consumers denying producers the chance of negotiating for better coffee prices and also lack of negotiated contracts with buyers.
What is it? (TIMP description)	A marketing system where producers by pass the auction and establish direct contact with buyers overseas to directly sell their coffee, especially the large-scale coffee growers who produce and market their production
Justification	Most of the Kenyan coffee is sold through the auction system and denies producers and consumers the chance of developing a direct contact which may enable them negotiate terms in regard to price and quality hence the need for direct sales system
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee Co-operative Societies and Estates • Coffee Marketing agents • Coffee consumers
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 services
Critical/essential factors for successful promotion	• Stakeholder involvement • Enabling policy and political environment

Partners/stakeholders for scaling up and their roles	• Coffee Co-operative Societies and Estates – Coffee production • Coffee Millers –coffee processing • Marketing agents - Coffee marketing
	AFA- Coffee Directorate- regulation
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu
Counties where TIMPs will be up scaled	Kiambu, Murang'a, Nyeri Machakos, Embu, Tharaka Nithi and Meru
Challenges in development and dissemination	Possibility of lack transparency between the buyers and sellers
Suggestions for addressing the challenges	• Bench mark with auction prices • Develop legal contracts • Enforcement of rules and regulations governing direct sales.
Lessons learnt during its promotion, if any	• Direct sales offer competitive marketing of coffee
Social, environmental, policy and market conditions necessary for upscaling	• Favourable policy environment • Favourable business environment •
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be estimated
Estimated returns	To be estimated
Gender issues and concerns in dissemination, adoption and scaling up	• Women have less access to direct sales marketing than men • Women have less access to and control of income accruing from direct coffee sales
Gender related opportunities	• Opportunities exist for women to benefit from higher profit margins through direct sales
VMG issues and concerns in dissemination, adoption and scaling up	• Women have less access to direct sales marketing than men • Women have less access to and control of income accruing from direct coffee sales
VMG related opportunities	• Opportunities exist for VMGs living with disability to benefit from higher profit margins through direct sales
E: Case studies/profiles of success stories	
Success stories from previous similar projects	High coffee prices realized by the producers. In the year 2019/20 about 15 % of coffee was sold through the direct marketing system at higher premiums?
Application guidelines for users	1. Coffee Research Institute. (2020). Coffee Production Recommendations. 2. Coffee Research Institute. (2017). Coffee Growers Handbook.
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3.Requires further research)	Ready for up-scaling

G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Simon Ikunda
Partner organizations	• Coffee Co-operative Societies and Estates • National and County Governments • AFA-Coffee Directorate • National Coffee Exchange • KCTA

3.14.4 Contract production model

2.14.4 TIMP Name	Contract production model
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Low productivity due to market failure in coffee production, leading to low income and poor quality
What is it? (TIMP description)	Contract farming is the investment by the private companies, extending lines of credit to producers in the form of farming inputs and technical assistance. Under contract farming terms, contractors commit themselves to buy the entire product at an agreed price. On the other hand, producers avail desired produce for sale.
Justification	Contract farming is a contractual arrangement between producers and buyers of a farm product. The contract can either be oral or written, and will specify one or more conditions of production and marketing of an agricultural product. In essence, contract farming commits the farmer to produce a certain commodity at a certain time for an agreed price and, in return, the contractor undertakes to buy the commodity, and may provide agricultural extension and other services to producers in order to satisfy production requirements in terms of quality and quantity. The benefits of contract farming to farmers are market access, increased incomes, reduction in the risk of price fluctuations, credit and financial intermediation, timely provision of inputs, monitoring and labour incentives, reduction of production risk, introduction of higher-value crops, improved collective bargaining, household spill-over benefits and improved access to extension. A written contract farming is recommended.
B: Assessment of dissemination and scaling up/out approaches	

Users of TIMP	• Producers, • consumers, • MSMEs
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 services
Critical/essential factors for successful promotion	• The strength of the contractors
Partners/stakeholders for scaling up and their roles	• Coffee farmers – Coffee production • Consumers –Purchase of coffee • MSMEs - buys and sells coffee on the E-market platforms • Contractors – buyers of coffee
C: Current situation and future scaling up	
Counties where already promoted if any	None
Counties where TIMPs will be up scaled	Kiambu, Murang’a, Nyeri Machakos, Embu, Embu, Tharaka Nithi and Meru
Challenges in development and dissemination	• Risk of non-compliance to milling obligations on either party • Levels of transparency
Suggestions for addressing the challenges	• Risk of non-compliance to contract obligations on either party – Open participation • Levels of transparency – Recoding keeping and frequent analysis
Lessons learnt during its promotion, if any	• None
Social, environmental, policy and market conditions necessary for upscaling	• Suitable policies by the National and County government to support the initiative • Buy- in by producers
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be estimated
Estimated returns	To be estimated
Gender issues and concerns in development and dissemination, adoption and scaling	• Women have less access to knowledge and information on contract farming than men. • Women have less access to land for farming than men. • Women have less access to credit required to purchase the required inputs for contract farming
Gender related opportunities	• Opportunities exist for women to access the required credit through the women enterprise funds

	• Opportunities exist for youths to enter into contract farming through renting of land for farming for increased profit margins
VMG issues and concerns in development and dissemination, adoption and scaling up	• VMGs have less access to knowledge and information on contract farming than men • VMGs have less access to credit required to purchase the required inputs for contract farming • VMGs have less access to land for farming than men.
VMG related opportunities	• Opportunities exist for VMGs to access the required credit through the Uwezo funds • Opportunities exist for youth to enter into contract farming through renting of land for farming for increased profit margins
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Organized production and marketing of coffee
Application guidelines for users	Current Agricultural Laws
F: Status of TIMP	
Readiness (1. Ready for up scaling, 2. Requires validation, 3. Requires further research)	Requires validation
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org
Lead organization and scientists	KALRO-CRI, Joan Kamau
Partner organizations	• Coffee Co-operative Societies and Estates • National and County Governments • AFA-Coffee Directorate • National Coffee Exchange

3.14.5 Strategic planning

2.14.5 TIMP Name	Strategic planning
Category (i.e., technology, innovation or management practice)	Management practices
A: Description of the technology, innovation or management practice	
Problem addressed	Low coffee productivity due to unplanned priority areas to be addressed in the coffee production and marketing. This leads to lack of the strategic objectives, lack of production targets, losses and market failure
What is it? (TIMP description)	The strategic plan entails the strategic focus areas, the objectives and the expected outcomes. The main strategic areas are stakeholders' involvement, services to the stakeholders, financial resource mobilization and institutional capacity building.
Justification	The strategy sets out the priority areas to be addressed. The proposed actions and targets are aligned to contribute to the involvement of social-economical welfare of coffee producers while at the same time contributing to climate change mitigation and adaptation, youth and women empowerment, sustainable agriculture production and productivity
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Coffee Co-operative Societies and estate farmers • Wet mills • Marketing agents • Agripreneurs
Approaches to be used in dissemination	• Create awareness • Training • Lobbying
Critical/essential factors for successful promotion	• Availability of stakeholders • Involvement of stakeholders • The adequacy of the strategic areas
Partners/stakeholders for scaling up and their roles	• Coffee Co-operative Societies and estate farmers – Coffee production • Wet mills- to receive and weigh cherry from producers • Coffee Marketing agents –market coffee
C: Current situation and future scaling up	
Counties where already promoted if any	Kiambu, Kericho and Kirinyaga
Counties where TIMPs will be up scaled	Kiambu, Murang'a, Nyeri Machakos, Embu Tharaka Nithi and Meru
Challenges in development and dissemination	• Harmonization of the strategic areas • Availability of supporting policies • Diversity of the stakeholders

Suggestions for addressing the challenges	• Harmonization of the strategic areas – Sensitization of stakeholders • Availability of supporting policies – County policy • Diversity of the stakeholders – Sensitization of stakeholders
Lessons learnt during its promotion, if any	• Implementation of the strategic plan 2018-2022
Social, environmental, policy and market conditions necessary for upscaling	• Suitable institutional to support the initiative • Buy-in by the stakeholders
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be estimated
Estimated returns	To be estimated
Gender issues and concerns in development and dissemination, adoption and scaling	• Inadequate representation of youth and women when coming up with strategic plans.
Gender related opportunities	• Opportunities exist for adequate women and youths' representation in the strategic plans formulation through the two thirds gender rule
VMG issues and concerns in development and dissemination, adoption and scaling up	• Inadequate representation of VMGs when coming up with strategic plans
VMG related opportunities	• Opportunities exist for adequate women and youths' representation in the strategic plans formulation through the two thirds gender rule
Gender issues and concerns in dissemination, adoption and scaling up	• Involvement of women and youth in the development and implementation of the strategic plan
Gender related opportunities	• Benefits to all stakeholders
VMG issues and concerns in dissemination, adoption and scaling up	• Inclusive strategic areas and objectives
VMG related opportunities	Benefits distribution to the VMGs
E: Case studies/profiles of success stories	
Success stories from previous similar projects	Implementation of the coffee strategic plan for the revitalization
Application guidelines for users	User manuals
F: Status of TIMP Readiness (1. Ready for up scaling, 2, Requires validation, 3. Requires further research)	Ready for Upscaling
G. Contacts	Institute Director, Coffee Research Institute, P. O. Box 4- 00232, Ruiru. Email director.cri@kalro.org Website www.kalro.org

Lead organization and scientists	KALRO-CRI, Joan Kamau
Partner organizations	• Coffee Co-Operative Societies and Estates • National and County Governments • AFA-Coffee Directorate

3.15 Agricultural Policy Options

3.15.1 County Integrated Development Plan

2.15.1 TIMP Name	County Integrated Development Plan
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Low coffee productivity due to limited participation of the smallholder coffee farmers during County development planning.
What is it? (TIMP description)	The County Integrated Development Planning builds a plan for each county in Kenya to be implemented in five years. The planning process is participatory, involving the development stakeholders in the county. It is during this planning period where the issues in Coffee production, marketing and processing are considered.
Justification	In the Counties where the coffee value chain creates wealth among the smallholder farmers, centralization of the farmers' agency and voices during the County Integrated Development Planning is needed. Failure to plan for coffee production would lead to less optimization of opportunities.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Farmers • Traders • Processing industries • Extension • NGOs • Research institutions • Policy makers
Approaches to be used in Dissemination	• Farmer field and business Schools (FFBS) • Agricultural Innovation Platforms (AIP) • Meetings • Radio • Television • Social media (WhatsApp, Facebook, twitter) • Internet • Farmers' groups
Critical/essential factors for successful promotion	• Availability of stakeholders • Availability of agricultural policies and specific coffee-based policies

	• Issues in coffee business • Specific policy objective statement
Partners/stakeholders for scaling up and their roles	• Farmers – Demanding coffee policies to support production and marketing • County extension staff - Sensitization of farmers • NGOs – Sensitization of farmers • Private sector (local traders and exporters) – Demanding coffee policies to support production and marketing • Research institutions – Sensitization of stakeholders
C: Current situation and future scaling up	
Counties where already promoted if any	Machakos and Kirinyaga
Counties where TIMPs will be upscaled	Nyeri, Kiambu, Murang'a, Kirinyaga, Embu, Machakos, Meru and Tharaka Nithi
Challenges in development and dissemination -	• Disorganization and scattered farmers • Small-scale farming • Inadequate information to stakeholders on the agricultural policies whether National or County • Poorly established coffee value chain • Coffee production are specific to agro-ecological zones and not all the Counties in Kenya grow coffee
Suggestions for addressing the challenges	• Disorganization and scattered farmers – Formation of producer organizations as an institution • Small-scale farming – Policies for increasing productivity • Inadequate information to stakeholders on the agricultural policies whether National or County – Sensitization of stakeholders • Poorly established coffee value chain – strengthening coffee value chain • Coffee production are specific to agroecological zones and not all the Counties in Kenya grow coffee – Diversification of coffee
Lessons learned in upscaling if any	None
Social, environmental, policy and market conditions necessary for development and upscaling	• Social conditions – Acceptability of the policies • Environmental conditions – lack of a comprehensive land use policy • Policy conditions – Lacking specific coffee policy, market conditions - Poor market infrastructure
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	To be estimated
Estimated returns	To be estimated
Gender issues and concerns in development and dissemination, adoption and scaling	• Inadequate representation of youth and women in the development process of the county integrated plans • Inadequate representation of youth and women in the policy of validation process
Gender related opportunities	• Opportunities exist for women and youths to participate in the policy cycle since the constitution supports their

	participation
VMG issues and concerns in development and dissemination, adoption and scaling up	• Inadequate representation of VMGs in the development process of the county integrated plans • Inadequate representation of VMGs in the policy of validation process.
VMG related opportunities	• Opportunities exist for VMGs to participate in the process of developing the county integrated development plans
E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Training factsheets, manuals and power point slides are available
F: Status of TIMP Readiness (1. Ready for upscaling, 2. Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization/scientists	KALRO-CRI, Jane Cheserek, James Gimase
Partner organizations	Ministry of Agriculture and Livestock Development (MoALD) Agriculture and Food Authority (AFA) County Governments Coffee marketers Other coffee industry stakeholders

Gaps

1. Adoption of policy options
2. Equity distribution among the stakeholders
3. Productivity levels among the smallholder farmers
4. Farmer accessibility to production inputs

3.15.2 Policy Instruments related to coffee

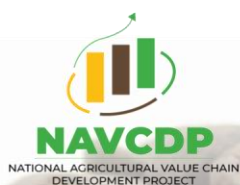
2.15.2 TIMP Name	Policy Instruments related to coffee
Category (i.e., technology, innovation or management practice)	Management practice
A: Description of the technology, innovation or management practice	
Problem addressed	Low coffee productivity due to the failure of existing policy instruments to support the smallholder farmers' issues in coffee production and marketing. Therefore, weak policy instruments have led to the market failure for both inputs and outputs
What is it? (TIMP description)	These are policy instruments which are the means to achieve policy objectives. For the coffee production, some of the policy instruments include subsidy in the inputs and also minimum price for the coffee outputs.
Justification	Without policy instruments, coffee productivity will remain low. It is very likely that a particular policy instrument, although designed primarily to have an efficiency, distributive, or stability effect, will also have some impact on the other objectives related to coffee production.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Farmers • Traders • Processing industries • Extension • NGOs • Research institutions • Policy makers
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 services
Critical/essential factors for successful promotion	Availability of policy objectives, availability of policy instruments
Partners/stakeholders for scaling up and their roles	• Farmers – beneficiaries of policy instruments • County extension staff - Sensitization of farmers • NGOs – Sensitization of farmers • Private sector (local traders and exporters) – beneficiaries • Research institutions – Sensitization of stakeholders
C: Current situation and future scaling up	
Counties where already promoted, if any	

Counties where TIMPs will be upscaled	Nyeri, Kiambu, Murang'a, Kirinyaga, Embu, Machakos, Meru and Tharaka Nithi
Challenges in development and dissemination -	• Disorganized and scattered farmers • Small-scale farming • Inadequate information to stakeholders on the agricultural policies whether at National or County level • Poorly established coffee value chain • Coffee production is specific to agro-ecological zones and not all the Counties in Kenya grow coffee
Suggestions for addressing the challenges	• Disorganized and scattered farmers – Formation of producer organizations as an institution • Small-scale farming – Policies for increasing productivity • Inadequate information to stakeholders on the agricultural policies whether National or County – Sensitization of stakeholders • Poorly established coffee value chain – strengthening coffee value chain • Coffee production is specific to agro-ecological zones and not all the Counties in Kenya grow coffee – Diversification of coffee
Lessons learned in upscaling if any	• None
Social, environmental, policy and market conditions necessary for development and upscaling	• Social conditions – Low understanding of policy instruments • Environmental conditions – lack of a comprehensive land use policy • Policy conditions – Lacking specific coffee policy • Market conditions - Poor market infrastructure
• D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	• To be estimated
Estimated returns	• To be estimated
Gender issues and concerns in development and dissemination, adoption and scaling	• Inadequate representation of youth and women in policy development forums at all levels. • Inadequate representation of youth and women in the policy of validation process.
Gender related opportunities	• Opportunities exist for adequate youth representation in the policy formulation and validation process if they focus and strategize well.
VMG issues and concerns in development and dissemination, adoption and scaling up	• Inadequate representation of VMGs in policy development forums at all levels. • Inadequate representation of VMGs in the policy of validation process.
VMG related opportunities	• Opportunities exist for VMGs participation in all levels of policy formulation since there are policy frameworks to support their participation.
Gender issues and concerns in development and dissemination, adoption and scaling	• Inadequate representation of youth and women in policy development forums at all levels. • Inadequate representation of youth and women in the policy of validation process.

E: Case studies/profiles of success stories	
Success stories from previous similar projects	None
Application guidelines for users	Training factsheets, manuals and power point slides are available
F: Status of TIMP Readiness (1. Ready for upscaling, 2. Requires validation, 3. Requires further research)	Ready for upscaling
G: Contacts	
Contacts	Institute Director, Coffee Research Institute, P.O Box 4-00232, Ruiru Email: Director.cri@kalro.org Website: www.kalro.org
Lead organization/scientists	KALRO-CRI, Jane Cheserek, James Gimase
Partner organizations	• Ministry of Agriculture and Livestock Development (MoALD) • Agriculture and Food Authority (AFA) • County Governments • Coffee marketers • Other coffee industry stakeholders

Gaps

1. Validation of policy instruments
2. Equity distribution among the stakeholders
3. Farmer accessibility to production inputs markets
4. Farmers accessibility to output markets



National Agricultural Value Chain Development Project (NAVCDP)

Ministry of Agriculture and Livestock Development

Capital Hill, Cathedral Road, Nairobi

P. O. Box 8073-00200 Kenya

info@navcdp.go.ke

www.navcdp.go.ke



Kenya Agricultural and Livestock Research Organization

KALRO Secretariat

P O Box 57811-00200

Nairobi, KENYA

Email: directorgeneral@kalro.org

Tel. No(s): +254-722206986/ +254-733333223

Web: www.kalro.org