





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



Muniu F.K., Menza M.K., Mwashumbe S.K., Ondiko C.N., Danda K.M., Ndubi J.M., Wandera F.M., Mwangi H.W., Wayua F.O., Nasirembe W.W., Mzingirwa A.M., Wambua J.M., Otieno M., Ndambuki J., Pole F.N., Mutoko M.C., Momanyi V., Kamau G.M., Maingi M.N., Kirigua V.O. and Wasilwa L.A.







INVENTORY OF CLIMATE SMART AGRICULTURE TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES FOR COCONUT VALUE CHAIN

National Agricultural and Rural Inclusive Growth Project (NARIGP)

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 2021. 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: directorgeneral@kalro.org Tel. No(s): +254-722206986/733332223

Compiled by: Muniu F.K., Menza M.K., Mwashumbe S.K., Ondiko C.N., Danda K.M., Ndubi J.M., Wandera F.M., Mwangi H.W., Wayua F.O., Nasirembe W.W., Mzingirwa A.M., Wambua J.M., Otieno M., Ndambuki J., Pole F.N., Mutoko M.C., Momanyi V., Kamau G.M., Maingi M.N., Kirigua V.O. and Wasilwa L.A.

Editors: Ouda J.O., Mukundi K.T., Nyabundi K.W., Mwirigi M., Maina F., Maina P., Ayemba J., Wanyama H.N., Kedemi R.M. and Muniu F.K.

Editing and Publication Coordination: Kirigua V.O. and Guto S.

Design and layout: Nyaola E. and Mnene N.

Typesetting: Kibwage P.N. and Sungu E.

FOREWORD

The National Agricultural and Rural Inclusive Growth Project (NARIGP) tasked the Kenya Agricultural and Livestock Research Organization (KALRO) to develop and deliver context specific Technologies, Innovation and Management Practices (TIMPs) that can be deployed in climate smart agriculture interventions. This document provides a detailed inventory of TIMPs that have been developed in *Coconut* value chain.

Extensive information from research and background data has been reviewed to help in development of this TIMPs inventory. 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 uniform outline that ensures all aspects of the TIMPs are fully covered in a 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. This TIMPs inventory is therefore to be used in conjunction with the respective Coconut ToT Manual. The adoption and use of this TIMPs inventory is expected to contribute to increased productivity and profitability for improved incomes.

I am greatly indebted to the value chain experts and all those who participated in the preparation of this inventory of TIMPs document. 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 and Rural Inclusive Growth Project (NARIGP) is funded by the Government of Kenya and the World Bank. The project runs for five years and is implemented in 21 Counties in the country at an approximate cost of KES 22 billion. The project development objective is "To increase agricultural productivity and profitability of targeted rural communities in selected Counties, and in the event of an Eligible Crisis or Emergency, to provide immediate and effective response." To achieve the objective, the project is promoting adoption of climate smart agricultural Technologies, Innovations and Management Practices (TIMPs).

The project comprises of four (4) components: Component 1 involves strengthening (i) communitylevel institutions' ability to identify and implement investments that improve their agricultural productivity, food security and nutritional status, and (ii) linkages to selected value chains and producer organizations. Component 2 deals with strengthening producer organizations and value chains development by building capacity to support members of targeted rural communities, which include Common Interest Groups (CIGs) and Vulnerable and Marginalized Groups (VMGs). Component 3 undertakes strengthening the capacity of County governments to support communityled development initiatives identified under Components 1 and 2. Component 4 is on project coordination, management, monitoring and evaluation.

Kenya Agricultural and Livestock Research Organization (KALRO) in conjunction with partners in the National Agricultural Research Systems (NARS) and Consultative Group for International Agricultural Research (CGIAR) compiled inventories of TIMPs of prioritized value chains as an initial step towards promotion of their adoption. Of these, 13 are crop-based. They include roots and tubers (potato and sweetpotato); pulses (bean, green gram and cowpea); vegetables (tomato and indigenous vegetables); cereals (sorghum), nuts (macadamia and coconut) and fruits (banana, mango and avocado). The four (4) animal production-based value chains are apiculture, indigenous chicken (meat and eggs), dairy (cattle) and red meat (sheep and goats). In addition, there are three (3) cross cutting themes on pastures and fodder, natural resource management, and animal health.

The TIMPs were categorized into those ready for up scaling and those requiring validation. In addition, gaps that required further research were identified for subsequent development of TIMPs. This manual focuses on TIMPs that are ready for upscaling Coconut value chain. It should be used in training County extension staff, service providers, community based facilitators and lead farmers. Those trained are expected to cascade the training to beneficiaries in the targeted smallholder farming, agro-pastoral and pastoral communities in the 21 project Counties of Kirinyaga, Kiambu, Murang'a, Nakuru, Bungoma, Trans Nzoia, Nandi, Vihiga, Kisii, Nyamira, Migori, Homa Bay, Makueni, Meru, Kitui, Embu, Kilifi, Kwale, Narok, Samburu and Turkana.

The National Project Coordination Unit is grateful to all who participated in the development and production of this manual for the *Coconut* value chain. It is my hope that Counties and other users will adopt and optimally use the manual to increase productivity and profitability, which in the overall will improve the livelihood of the targeted farming communities.

John Kimani National Project Coordinator National Agricultural and Rural Inclusive Growth Project

TABLE OF CONTENTS

FOI	REWO	RD	ii
PRF	EFACE	Ε	iii
ABI	BREVI	ATIONS AND ACRONYMS	. viii
1.	DEI	FINITION OF TERMS AND SUMMARY TABLES OF COCONUT	
	TEC	CHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES	1
1.	1 D	efinition of terms	1
1.	2 Si	ummary of Inventory of TIMPs in the Coconut Value Chain	2
1.	3 Sı	ummary of Status of TIMPs in Coconut Value Chain	3
2.	DET	FAILED COCONUT VALUE CHAIN TIMPs	9
2	1 C	OCONUT VARIETIES	
2.	211	East African Tall	10
	212	Dwarf Coconut	13
	213	Hybrid Coconut	15
C	2.1.0	OCONIT SEED SYSTEMS	10
۷.	2 0	Direct Planting	10 10
	2.2.1.	Coconut Nursery establishment	01
	2.2.2	Soud salastion	20 22
	2.2.3.	Seed pairing	25 25
	2.2.4.	Seed placement	25 70
•	2.2.3.		
2.	3 G S	OOD AGRICULTURAL PRACTICES AND FOOD SAFETY MANAGEMENT YSTEMS	29
	2.3.1.	Food Safety Management System: Hazard Analysis Critical Control Points Plan	ı for
		Coconut Value Chain in Kenya	29
	2.3.2.	Good Agricultural Practices for Coconut	32
2.	4 A	GRONOMIC MANAGEMENT PRACTICES	
	2.4.1.	Site Selection for orchard establishment	
	242	Land Preparation	
	243	Spacing and orchard establishment	38
	244	Intercropping	41
	245	Coconut Crown Cleaning	43
	2.4.6.	Fertilizer Application	44
2	5 5	OII FERTILITY MANAGEMENT	17
2.	251	Integrated Manure Management	- / /7
	2.5.1.	Integrated Soil Fertility Management	/+ /0
	2.5.2.	Rapid Soil Testing	- 7 51
2	2.5.5.		
2.	6 S(OIL AND WATER MANAGEMENT	54
	2.6.1.	Grass strips	54
	2.6.2.	<i>Lat</i> Pits	
	2.6.3.	Retention ditches.	
	2.6.4.	Kain water harvesting systems (water pond)	61
	2.6.5.	Mulching	64
	2.6.6.	Green Legume cover crop	67
	2.6.7.	Coconut Intercropping	69

2.6.8.	Conservation Agriculture	71
2.6.9.	Coconuts and Agroforestry	74
2.6.10.	Drip irrigation systems for small scale farmers	76
2.7 CR	OP HEALTH INTEGRATED MANAGEMENT OF PESTS	79
2.7.1.	Integrated Management of Rhinoceros beetle in Coconut	79
2.7.2.	Integrated management of Termites (Coptotermes formosanus) in Coconut	81
2.7.3.	Integrated Management of Correid bug (Pseudotheraptus wayi) in coconut	
2.7.4.	Integrated management Mealybugs in Coconut	86
2.7.5.	Integrated management of coconut scale (Aspidiotus destructor) in Coconut	
2.7.6.	Integrated Pest Management of African palm weevils (<i>Rhynchophorus phe</i>	<i>penicis</i>) in
2.7.7.	Integrated Management of Bole rot disease (Marasmielus infescocophilus) in	Coconut
2.7.8.	Integrated pest management Lethal Yellowing Disease (Phytoplasma) in Cod	
2.7.9.	Integrated pest management of Bud rot disese (Phytophthora palmivora) in G	Coconut
		97
2.7.10.	Integrated management of Eriophyid mite in coconut orchards	100
2.7.11.	Integrated Management of Leaf rot	102
2.7.12.	Coconut Integrated Weed Management	105
2.7.13.	Coconut Intercropping System	
2.7.14.	Cover cropping for Coconut weed management	112
2.7.15.	Mulching	115
2.7.16.	Herbicide (chemical) Weed Control	118
2.7.17.	Rapid Response to Invasive weed species	121
2.7.18.	Solarisation Bed for Weed Control	124
2.7.19.	Stale seed bed for Weed Control	126
2.7.20.	Transplanting Coconut for weed control	129
2.7.21.	Mechanical weeding	132
2.7.22.	Crop Rotation in Coconut	135
2.7.23.	Mowing to control weeds in Coconut	137
2.7.24.	Biological Control in Coconut	140
2.7.25.	Safe Use of herbicides in Coconut cropping systems	142
2.8 HA	RVEST AND POSTHARVEST MANAGEMENT	146
2.8.1.	Maturity indices	146
2.8.2.	Coconut harvesting	148
2.8.3.	De-husking and de-husking machine	150
2.8.4.	Drying of copra	152
2.8.5.	Copra grading	154
2.9 VA	LUE ADDITION IN COCONUT	156
2.9.1.	Virgin coconut oil	156
2.9.2.	Grated coconut	158
2.9.3.	Coconut milk and coconut cream	
2.9.4.	Coconut flour	161
2.9.5.	Tender coconut water (Madafu)	
2.9.6.	Snow ball tender coconut	165
2.9.7.	Tender coconut kernel products	166
2.9.8.	Mature coconut water	168

2.9.9.	Palm wine / Toddy (mnazi)	170
2.9.10.	Coconut vinegar	172
2.9.11.	Coconut fibre	173
2.9.12.	Coconut fibre rope	175
2.9.13.	Door mat from coconut fibre	176
2.9.14.	Coco peat	178
2.9.15.	Coconut shell ear ring	180
2.9.16.	Coconut shell hair clip	182
2.9.17.	Coconut shell bangles	183
2.9.18.	Coconut shell cups	185
2.9.19.	Coconut shell belt	186
2.9.20.	Coconut shell doll	188
2.9.21.	Coconut shell charcoal/activated carbon	190
2.10 ME	CHANIZATION OF COCONUT PRODUCTION ACTIVITIES	192
2.10.1.	Power tiller	
2 10 2	Four-wheeled Tractor 50Hp	194
2 10 3	Mouldboard Plough	196
2.10.0.	Harrow	198
2.10.1.	Seed drill	200
2.10.5.	Motorised Spraver	202
2.10.0.	Coconut harvesting tool	204
2.10.7.	Coconut harvesting stick	207
2.10.0.	Coconut harvesting climbing gear	209
2.10.7.	Coconut harvesting Robot	211
2.10.10.	Tractor mounted telescopic hoist	213
2.10.11.	Coconut de-husking tool	215
2.10.12.	Coconut de-husking machine	217
2.10.13.	Coconut grating tool	210
2.10.14.	Electric coconut grating equipment	
2.10.10.		
2.11 Coc	Conut Value Chain Business and marketing	223
2.11.1.	Models for market-oriented production of Coconut products and by-products	223
2.11.2.	Developing business plans for the coconut enterprise/business	226
2.11.3.	Collective marketing of coconut products and by-products: the case of Orga Marketing Groups	228
2.11.4.	Profitability analysis: Performance Evaluation/Measures for the Coconut product by-products business	is and231
2.11.5.	Participatory market research for coconut products and by-products	233
2.11.6.	An approach for developing and scaling up of a sustainable coconut enterprise	236
2.11.7.	Developing an online/E-Marketing platform for Coconut products and by-produc	ets
		239
2.11.8.	An Entrepreneurial model for Coconut products and by-products marketing	241
2.12 Agr	ricultural Policy options influencing coconut enterprise	244
2.12.1.	Regional and National Agricultural policy framework and strategies supportin	g the
	Coconut sub-sector	244
2.12.2.	Policy options influencing coconut products and by-products producers and actors	other 246
2.12.3.	Policy Instruments influencing the Coconut value chain	249

2.12.4.	Policy cycle process and implementation at county level for the Coconut value chain
2.12.5.	Policy validation customization for the coconut value chain
2.12.6.	Registration and licensing of functional stakeholsers and stakeholders' operations.256
2.12.7.	Regulation of Coconut production, processing and market provisions for coconut products, by-products and processes

List of Tables

Table 1. Summary of the coconut value chain TIMPs	.2
Table 2. Number of coconut TIMPs ready for up-scaling, requiring validation or further research	.3
Table 3. Inventory of coconut TIMPs by Category and Status	.4

ABBREVIATIONS AND ACRONYMS

AAK	Agrochemical Association of Kenya
AFA	Agriculture and Food Authority
ASALs	Arid and Semi-Arid Lands
CABI	Centre for Agriculture and Bioscience International
CARD	Community Action for Rural Development
CBO	Community Based Organization
CCPs	Critical control points
CSA	Climate Smart Agriculture
FFB	Farmer Field Business Schools
FPEAK	Fresh Produce Exporters Association of Kenya
FSMS	Food Safety Management System
GAP	Good Agricultural Practices
GHG	Green House Gases
HACCP	Hazard Analysis Critical Control Points
IDM	Integrated Disease Management
IMM	Integrated Manure Management
INRM	Integrated Natural Resource Management
IPM	Integrated Pest Management
ISFM	Integrated Soil Fertility management
IWM	Integrated Weed Management
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KALRO	Kenya Agricultural and Livestock Research Organization
KEFRI	Kenya Forestry Research Institute
KEPHIS	Kenya Plant Health Inspectorate Services
KIRDI	Kenya Industria Research Development Institute
MESPT	Micro-Enterprises Support Programme Trust
MoALFC	Ministry of Agriculture, Livestock, Fisheries and Cooperatives
NARIGP	National Agricultural and Rural Inclusive Growth Project
NARS	National Agricultural Research Systems
NGO	Non-Governmental Organizations
NOCD	Nuts and Oil Directorate
PCPB	Pesticide Control Products Board
TIMPs	Technologies, Innovations and Management Practices
ToTs	Training of Trainers
VMGs	Vulnerable and Marginalized Groups

1. DEFINITION OF TERMS AND SUMMARY TABLES OF COCONUT TECHNOLOGIES, INNOVATIONS AND MANAGEMENT PRACTICES

1.1 DEFINITION OF TERMS

Technology: This is an output of a research process which is beneficial to the target clientele (mainly farmers for NARIGP'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 a recommendation on a practice that is considered necessary for a technology to achieve its optimum output. It includes different agronomic practices (seeding rates, fertilizer application rates, spatial arrangements, planting period, land preparation and watering regimes), crop protection for crops and feed rations and disease control for livestock.

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

1.2 SUMMARY OF INVENTORY OF TIMPS IN THE COCONUT VALUE CHAIN

The inventory process identifie 111 TIMPs comprising 52 technologies 5 innovations and 54 management practices, distributed among the 12 sub-themes, as indicated in the table below.

Sub-Theme	Technologies	Innovations	Management Practices
Improved varieties	3	0	0
Coconut seed systems	3	0	2
Coconut GAP and Food Safety	0	0	2
Agronomic management practices	1	0	5
Soil Fertility Management	0	1	2
Soil and Water Management	1	0	9
Crop Health	5	3	16
Postharvest management	2	0	3
Coconut Value addition	22	1	0
Mechanization of production activities	15	0	0
Coconut business and Marketing	0	0	8
Agricultural Policy	0	0	7
Total	52	5	54

Table 1. Summary of the coconut value chain TIMPs

1.3 SUMMARY OF STATUS OF TIMPS IN COCONUT VALUE CHAIN

The inventory process resulted in a total of 72 TIMPs that are ready for up-scaling, 38 TIMPs that require validation and one TIMPs that require further research in the sub-themes, as indicated in Table 2.

Table 2.	Number	of	coconut	TIMPs	ready	for	up-scaling,	requiring	validation	or	further
research											

Sub-Theme	Ready for up-scaling	Require validation	Further Research
Improved varieties	2	1	0
Coconut seed systems	5	0	0
Coconut GAPs and Food Safety	2	0	0
Agronomic management practices	5	1	0
Soil Fertility Management	2	1	0
Soil and Water Management	9	1	0
Coconut Crop health	11	12	1
Postharvest management	4	1	0
Coconut Value addition	20	3	0
Mechanization of production activities	6	9	0
Coconut business and Marketing	6	2	0
Agricultural Policy	0	7	0
Total	72	38	1

Table 3. Inventory of coconut TIMPs by Category and Status						
TIMPs Sub-	TIMPs Title	TIMPs	Status			
Theme		category				
2.1 Improved	2.1.1. East African Tall	Technology	Ready for upscaling			
Coconut varieties	2.1.2. Dwarf Coconut	Technology	Ready for upscaling			
	2.1.3. Hybrid Coconut	Technology	Requires validation			
2.2 Coconut seed system	2.2.1. Direct Planting	Management practice	Ready for upscaling			
	2.2.2. Coconut Nursery establishment	Management practice	Ready for upscaling			
	2.2.3. Seed selection	Technology	Ready for upscaling			
	2.2.4. Seed pairing	Technology	Ready for upscaling			
	2.2.5. Seed placement	Technology	Ready for upscaling			
2.3 Good Agricultural Practices and Food	2.3.1. Food Safety Management System: Hazard Analysis Critical Control Points Plan for Coconut Value Chain in Kenya	Management practice	Ready for upscaling			
Safety Management Systems	2.3.2. Good Agricultural Practices for Coconut	Management Practice	Ready for Upscaling			
2.4 Agronomic management	2.4.1. Site selection for orchard establishment	Management Practice	Ready for upscaling			
practices	2.4.2. Land preparation	Technology	Ready for upscaling			
	2.4.3. Spacing and orchard establishment	Management Practice	Ready for upscaling			
	2.4.4. Intercropping	Management practice	Ready for up-scaling			
	2.4.5. Coconut Crown Cleaning	Management practice	Requires validation			
	2.4.6. Fertilizer Application	Management practice	Ready for up-scaling			
2.5 Soil fertility management	2.5.1. Integrated Manure Management	Management practice	Ready for upscalling			
	2.5.2. Integrated Soil Fertility Management	Management practice	Ready for upscalling			
	2.5.3. Rapid Soil Testing	Innovation	Requires validation			
2.6 Soil and water management	2.6.1. Grass strips	Management practice	Ready for upscaling			
	2.6.2. Zai pits	Management practice	Ready for upscaling			
	2.6.3. Retention ditches	Management practice	Requires validation			
	2.6.4. Rain water harvesting systems (water pond)	Management practice	Ready for upscaling			

Table 3. Inventory of coconut TIMPs by Category and Status					
	2.6.5. Mulching	Management practice	Ready for upscaling		
	2.6.6. Green legume cover crop	Management practice	Ready for upscaling		
	2.6.7. Coconut Intercropping	Management practice	Ready for upscaling		
	2.6.8. Conservation Agriculture	Management practice	Ready for upscaling		
	2.6.9. Coconuts and Agroforestry	Management practice	Ready for upscaling		
	2.6.10. Drip irrigation systems for small scale farmers	Technology	Ready for upscaling		
2.7 Coconut Crop Health	2.7.1. Integrated Management of Rhinoceros beetle in Coconut	Management Practices	Ready for up scaling		
	2.7.2. Integrated management of Termites (<i>Coptotermes formosanus</i>) in Coconut	Management practices	Ready for up scaling		
	2.7.3. Integrated Management of Correid bug (<i>Pseudotheraptus wayi</i>) in coconut	Management practices	Ready for up scaling		
	2.7.4. Integrated management Mealybugs in Coconut	Management practices	Ready for up scaling		
	2.7.5. Integrated management of coconut scale (<i>Aspidiotus destructor</i>) in Coconut	Management practices	Ready for up scaling		
	2.7.6. Integrated Pest Management of of African palm weevils (<i>Rhynchophorus</i> <i>phoenicis</i>)in Coconut	Management practices	Ready for up scaling		
	2.7.7. Integrated Management of Bole rot disease (<i>Marasmielus infescocophilus</i>) in Coconut	Management practices	Ready for up scaling		
	2.7.8. Integrated pest management Lethal Yellowing Disease (Phytoplasma) in Coconut	Management practices	Ready for up scaling		
	2.7.9. Integrated pest management of Bud rot disese (<i>Phytophthora palmivora</i>) in Coconut	Management practices	Ready for up scaling		
	2.7.10. Integrated management of Eriophyid mite in coconut orchards	Innovation	Requires validation		
	2.7.11. Integrated Management of Leaf rot	Innovation	Requires validation		
	2.7.12. Coconut Integrated Weed Management	Technology	Ready for upscaling		
	2.7.13. Coconut Intercropping System	Technology	Ready for upscaling		
	2.7.14. Cover cropping for Coconut management	Technology	Requires validation		
	2.7.15. Mulching	Innovation	Requires validation		

Table 3. Inventory of coconut TIMPs by Category and Status					
	2.7.16. Herbicide (chemical) Weed Control	Technology	Requires validation		
	2.7.17. Rapid Response to Invasive weed species	Technology	Requires validation		
	2.7.18. Solarisation Bed for Weed Control	Management practice	Requires validation		
	2.7.19. Stale seed bed for Weed Control	Management Practice	Ready for upscaling		
	2.7.20. Transplanting Coconut for weed control	Management Practice	Requires validation		
	2.7.21. Mechanical weeding	Management practice	Requires validation		
	2.7.22. Crop Rotation in Coconut	Management practice	Requires validation		
	2.7.23. Mowing to control weeds in Coconut	Management Practice	Ready for Upscaling		
	2.7.24. Biological control in Coconut	Management practice	Ready for up-scaling		
	2.7.25. Safe Use of herbicides	Management practice	Ready for upscaling		
2.8. Weed	2.8.1. Maturity indices	Technology	Requires validation		
Management	2.8.2. Coconut harvesting	Technology	Ready for up-scaling		
	2.8.3. De-husking and de-husking	Management	Ready for up-scaling		
	machine	practices			
	2.8.4. Drying of copra				
	2.8.5. Copra grading	Technology	Ready for up-scaling		
2.9 Coconut Value	2.9.1. Virgin coconut oil	Technology	Ready for up-scaling		
Addition	2.9.2. Grated coconut	Technology	Ready for up-scaling		
	2.9.3. Coconut milk and coconut cream				
	2.9.4. Coconut flour	Technology	Ready for up-scaling		
	2.9.5. Tender coconut water (Madafu)	Technology	Ready for up-scaling		
	2.9.6. Snow ball tender coconut	Technology	Ready for up-scaling		
	2.9.7. Tender coconut kernel products	Technology	Requires validation		
	2.9.8. Products Derived from Coconut Water of Mature Coconuts	Innovation	Requires validation		
	2.9.9. Palm wine / Toddy (mnazi)	Technology	Ready for up-scaling		
	2.9.10. Coconut vinegar	Technology	Requires validation		
	2.9.11. Coconut fibre	Technology	Ready for upscaling		
	2.9.12. Coconut fibre rope	Technology	Ready for upscaling		
	2.9.13. Door mat from coconut fibre	Technology	Ready for upscaling		
	2.9.14. Coco peat	Technology	Ready for upscaling		

Table 3. Inventory of coconut TIMPs by Category and Status				
	2.9.15. Coconut sh.ell ear ring	Technology	Ready for upscaling	
	2.9.16. Coconut shell hair clip	Technology	Ready for upscaling	
	2.9.17. Coconut shell bangles	Technology	Requires validation	
	2.9.18. Coconut shell cups	Technology	Requires validation	1
	2.9.19. Coconut shell belt	Technology	Requires validation	1
	2.9.20. Coconut shell doll	Technology	Requires validation	_
	2.9.21. Coconut shell charcoal / activated	carbon		Т
2.10 Machanization of	2.10.1. Power tiller	Technology	Requires validation	
Coconut	2.10.2. Four-wheeled Tractor 50Hp	Technology	Requires validation	_
production	2.10.3. Mouldboard Plough	Technology	Requires validation	-
activities	2.10.4. Harrow	Management practice	Ready for upscaling	
	2.10.5. Seed drill	Management practice	Ready for upscaling	
	2.10.6. Motorised Sprayer	Management Practices	Ready for upscaling	
	2.10.7. Coconut harvesting tool	Management Practices	Ready for upscaling	
	2.10.8. Coconut harvesting stick	Management Practices	Ready for upscaling	
	2.10.9. Coconut harvesting climbing gear	Management Practices	Ready for upscaling	
	2.10.10. Coconut harvesting Robot	Management Practices	Requires validation	
	2.10.11. Tractor mounted telescopic hoist	Management Practices	Ready for upscaling	
	2.10.12. Coconut de-husking tool	Management Practices	Requires validation	
	2.10.13. Coconut de-husking machine	Management Practices	Requires validation	
	2.10.14. Coconut grating tool	Management Practices	Requires validation	
	2.10.15. Electric coconut grating equipment	Management Practices	Requires validation	
2.11 Coconut Value Chain Business and marketing	2.11.1. Models for market-oriented production of coconut products and by- products	Management Practices	Requires validation	
	2.11.2. Developing business plans for the Coconut enterprise/business	Management practice	Requires validation	
	2.11.3. Collective marketing of coconut products and by-products: a case of	Management practice	Requires validation	1

Table 3. Inventory of coconut TIMPs by Category and Status			
	Organized Marketing Groups for the coconut sub-sector		
	2.11.4. Profitability analysis: Performance evaluation/measures for the Coconut products and by-products business	Management Practices	Ready for upscaling
	2.11.5. Participatory market research for coconut products and by-products	Management Practices	Ready for upscaling
	2.11.6. An approach for developing and scaling up of a sustainable coconut enterprise	Management Practices	Ready for upscaling
	2.11.7. Developing an online/E- Marketing platform for Coconut products and by-products	Management Practices	Requires validation
	2.11.8. An Entrepreneurial model for Coconut products and by-products marketing	Management Practices	Ready for upscaling
2.12. Agricultural Policy options influencing Coconut enterprise	2.12.1. The Regional and National Agricultural policy framework for the Coconut Sub-sector	Management Practices	Requires validation
	2.12.2. Policy options influencing coconut products and by-products producers and other actors	Management Practices	Requires validation
	2.12.3. Policy Instruments influencing the coconut value chain	Management Practices	Requires validation
	2.12.4. Policy Cycle process and implementation at county level for the Coconut value chain	Management Practices	Requires validation
	2.11.5 Policy Validation and Customization for the Coconut Value Chain	Management Practices	Requires validation
	2.12.6. Registration and licensing of functional stakeholders and their operations	Management practice	Requires validation
	2.12.7. Regulation of Coconut production, processing and market provision for coconut products, by- products and processes	Management practice	Requires validation



Figure 1. Coconut production suitability map

2.1 COCONUT VARIETIES

2.1.1. East African Tall	
Category (i.e. technology, innovation or management practice)	Characteristic tree shape and Nut clusters of East African Tall Coconut Variety
A: Description of the techno	blogy, innovation or management practice
Problem to be addressed	Low yields in coconut and low oil content
What is it? (TIMP description)	East African Tall coconut is a variety which grows best along the Coastal lowlands of about 0-600 m above sea level. It has the following characteristics; green to brown petioles, economic life span of 50 years, enlaged and ball shaped stem at the base, medium to large nuts, produces 12-18 leaves per year, a life span of up to 80 years, age at first fruiting is 5-7 years, high oil content and high nuts yields of up to 140 nuts per year.
Justification	Yield of coconut varieties is dependent on suitability of the target product and the genetic potential of the variety. EAT has relatively high oil content and a wide range of products (mature coconuts, tender coconut (madafu), brooms, coconut wood, palm wine, coconut thatch, husks, fibre, briquettes, tooth picks, door mats and coco peat).
B: Assessment of dissemina	tion and scaling up/out approaches
Users of TIMP	Farmers, Processors, Nursery operators, Traders, Researchers, Extension service providers.
Approaches used in dissemination	 Coconut Innovation Platforms Coconut Farmer Field and Business Schools On-farm and on-station research trials and demonstrations Training workshops, seminars, meetings Field days Coconut festivals Agricultural shows MoALFC/Public and Private extension providers Farmer research networks Farmer to farmer extension Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms
Critical/essential factors for successful promotion	 Determination of suitability in non coconut traditional areas Research Extension Liason fora Positive interaction between Farmers and Processors Mechanism for interaction of coconut value chain stakeholders Clean planting material availability Good Marketing Models and path ways County and central government support Funding for research

2.1.1. East African Tall		
Partners/stakeholders for	• KALRO, National Agricultural Research Systems (NARS) and International	
scaling up and their roles	research organizations-research	
	• Market/processors players to create a demand and pull production	
	• Farmers/farmer groups-exchange of information	
	• County governments, national government - for policy, awareness and	
	dissemination	
	• NGOs for farmer organization and mobilization	
	Registered nursery operators for clean seedling production	
	 Banks donors credit facilitators for financial solutions 	
C: Current situation and fu	ture scaling up	
Counties where already	Kilifi Kwale Lamu Mombasa Tana River and Taita Taveta	
promoted if any	Kinn, Kwale, Land, Montousa, Tana Kivor and Tana Tavou	
Counties where TIMP will	Kilifi and other suitable areas	
be up scaled	Kinn and other suitable areas	
Challenges in dissemination		
Chanenges in dissemination	• Lack of a mechanism to facilitate interaction of VC stakeholders	
	Inadequate/Poor distribution of planting materials	
Suggestions for addressing	Establish coconut innovation platforms	
the challenges	• Involve County governments, extension and Nursery operators	
	• Engagement of wider range of stakeholders	
	• Promotion of the variety in the suitable areas	
	Promote value addition and consumption in local food systems	
	Promote marketing models that encourage collective production and marketing	
Lessons learned in	• Chances of successful upscaling are higher when diverse value chain prayers	
upscaling if any	collaborate in an innovation platform	
	Training of agro dealers is necessary	
	Farmers participatory approach works	
Social, environmental,	• Creation of awareness on the nutritional benefits of the variety.	
policy and market	• Harmonious and collaborative interaction of diverse value chain players in	
conditions necessary for	coconut innovation platforms	
development and upscaling	• It is an already "a climate change ready crop" due to its wide adaptation ability	
	• Organized marketing channels critical for benefits to be derived from the	
	technology	
	• Enabling policy and policy review from time to time	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	KES 5000 per acre (40 seedlings per acre spaced at 9m x 9m). This is the cost of	
	purchasing seedlings, which is 13.3 % of the cost of establishing and bringing the	
	crop to yielding.	
Estimated returns	The net present value (NPV) of Coconut was estimated at KES 114820 per acre for	
	nuts, makuti and toddy, and KES 275266 for nuts and makuti. Benefit cost ratio	
	(BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti	
	alone, and 108% with toddy production.	
Gender issues and concerns	• Since coconut is a cash crop its regarded as a man's enterprise. Women and	
in development.	vouth may have less access to productive resources such as credit labour land	
dissemination, adoption and	and quality seedlings than men	
scaling up	• The technology may not be adopted if the gender targeted (especially women) is	
	overburdened with other responsibilities	
	• Women may not have time and mobility to attend extension activities far from	
	home or held at times when they are performing other roles e.g. domestic. This	
	of note at times when and, are performing outer fores e.g. domestic. This	

2.1.1. East African Tall		
	disadvatages them on awareness of such new varieties	
	• Women have less access to agricultural information, technology and knowledge	
	than men	
Gender related	Opportunities for men in commercializing coconut technology	
opportunities	Opportunities for men in coconut production and marketing	
	• Opportunities for youths in transportation of the produce to the market	
	Women and children mainly involved in harvesting and dehusking	
VMG issues and concerns	• VMGs have limited access to productive resources such as land, credit and	
dissemination adoption and	quality seedings than men Due to their social status VMCs are often evoluded from decision making in the	
scaling up	• Due to their social status visios are often excluded from decision making in the development and dissemination activities	
seaming up	• VMCs have less access to agricultural information, technology and knowledge	
	than men	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	Opportunities for youths exist in commercializing the technology	
	• Opportunities in harvesting processes since harvesting is done form the ground	
	Opportunities for youths in transportation of the produce to the market	
E: Case studies/profiles of success stories		
Success stories from	Increased planting of EAT coconut in coastal counties of Kilifi, Kwale and Lamu	
previous similar projects	under the Coconut Revitalization Programme	
Application guidelines for	How to Produce Quality Coconuts (A brief reference manual for Kenyan Farmers).	
users		
F: Status of TIMP reading	ess (1-ready for upscaling;, 2- Ready for upscaling (1)	
requires validation; 3-require	s further research)	
G. Contacts		
Contacts	Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Francis K. Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe,	
scientists	Ali Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.	
Partner organizations	KALRO-Mtwapa, KALRO-Matuga, MoALFC, Agricultural University Colleges,	
	AFA	

Research Gaps

• Research to release more superior coconut varieties

• Validation and promotion of the variety in the new target areas of coconut cultivation

2.1.2. Dwarf Coconut	
Category (i.e. technology,	
innovation or management	
practice)	
	Characteristic tree shape and Nut clusters of Dwarf Coconut Variety
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Low yields and quality of coconut water
What is it? (TIMP	Dwarf coconut is a variety with petioles and nuts of bright colours of green vellow pink and
description)	orange, it produces 20-22 leaves per year, has a life span of up to 40 years, age at first
	fruiting is 3-4 years, economic life span of less than 50 years, stem size and shape are thin,
	with a cylindrical or tapering base, produces small to medium nut size and has relatively low
	oil content. Has sweet coconut water (madafu).
Justification	Valued for its sweet coconut water (madafu) and delicious kernel (flesh) and planted
	as ornamental.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Farmers, Processors, Nursery operators, Traders, Researchers, Extension service
	providers.
Approaches used in	Coconut Innovation Platforms
dissemination	Coconut Farmer Field and Business Schools
	• On-farm and on-station research trials and demonstrations
	• Training workshops, seminars, meetings
	• Field days
	Agricultural shows
	MoALFC/Public and Private extension providers
	• Farmer research networks
	• Farmer to farmer
	 Mass media – Agricultural programs Descriptional restancials (nearty days days days days days days days day
	 Promotional materials (posters/brochures/leanets, manuals) Digital platforms
	• Digital platforms
Critical/assential factors	• Descent to test and and validate variety suitability in non account traditional
for successful promotion	• Research to test and and validate variety suitability in non coconut traditional
for successful promotion	Research Extension Lisson for
	 Positive ineraction between Farmers and Processors
	 Mechanism for interaction of coconut value chain stakeholders
	 Clean planting material availability
	 Good Marketing Models and path ways
	County and central government support
	 Funding to research, validate and promote new coconut varieties
Partners/stakeholders for	• KALRO, National Agricultural Research Systems (NARS) and International

2.1.2. Dwarf Coconut		
scaling up and their roles	research organizations	
	• Market/processors players to create a demand and pull production	
	• Farmers/farmer groups to adopt and produce	
	• County governments, central governments e.g. Chiefs, Agricultural Extension	
	(Formal and informal) for policy, awareness and dissemination	
	NGOs for farmer organizing and mobilization	
	Registered nurseries for clean seedling production	
	• Financial institutions (banks, donors, credit facilitators) for financial solutions	
C: Current situation and fi	iture scaling up	
Counties where already	Kilifi, Kwale, Lamu, Mombasa, Tana River and Taita Taveta	
promoted if any		
Counties where TIMP will	All suitable areas including new areas of cultivation such as Kisumu, Busia, Makueni	
Challenges in	• Lack of a mechanism to facilitate interaction of VC stakeholders	
dissemination	• Inadequate/Poor distribution of planting materials	
	Low use of good agronomic practices	
	Unorganized marketing channels	
Suggestions for addressing	• Establish coconut innovation platforms	
the chanenges	• Involve County governments, extension and Nursery operators	
	• Engagement of wider range of stakeholders	
	• Information dissemination on production practices	
	• Promotion of the variety in the suitable areas	
	• Promote value addition and consumption in local food systems	
Lassons loornad in	Promote marketing models that encourage conective production and marketing	
unscaling if any	• Chances of successful upscaling are higher when diverse value chain prayers collaborate in an innovation platform	
upscanng ir any	Training of agro dealers necessary	
	 Farmers participatory approach works 	
Social, environmental.	 Creation of awareness on the nutritional benefits of the variety 	
policy and market	 Harmonious and collaborative interaction of diverse value chain players in 	
conditions necessary for	coconut innovation platforms	
development and upscaling	• It is an already "a climate change ready crop" due to its wide adaptation ability	
	• Organized marketing channels critical for benefits to be derived from the	
	technology	
	• Enabling policy and policy review from time to time	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	KES 32000 per acre (80 seedlings per acre spaced at 7m x 7m). This is the cost of	
	purchasing seedlings, which is 17.6 % of the cost of establishing and bringing the	
	crop to yielding.	
Estimated returns	The net present value (NPV) of Coconut was estimated at KES 114820 per acre for	
	three products (nuts, Makuti, toddy) and KES 275266 for nuts and makuti. Benefit	
	cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts	
	and makuti alone, and 108% with toddy production.	
Gender issues and concerns	• Since coconut a cash crop, its regarded as a man's enterprise, Women and youth	
in development,	may have less access to productive resources such as credit, labour, land and	
dissemination, adoption	quality seedlings than men	
and scaling up	• The technology may not be adopted if the gender targeted (especially women) is	
	overburdened with other responsibilities	

2.1.2. Dwarf Coconut		
	 Women may not have time and mobility to attend extension activities far from home or held at times when they are performing other roles e.g. domestic. This disadvatages them on awareness of such new varieties Women have loss access to agricultural information, technology and knowledge 	
	than men	
Gender related	Opportunities for men in commercializing coconut technology	
opportunities	Opportunities for men in coconut production and marketing	
	• Opportunities for youths in transportation of the produce to the market	
	Women and children mainly involved in harvesting and dehusking	
VMG issues and concerns	• VMGs have limited access to productive resources such as land, credit and	
discomination adoption	quanty seedings than men	
and scaling up	• Due to their social status VMGs are often excluded from decision making in the development and dissemination activities	
	• VMGs have less access to agricultural information, technology and knowledge	
	than men	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	Opportunities for youths exist in commercializing the technology	
	• Opportunities in harvesting processes since harvesting is done form the ground	
	Opportunities for youths in transportation of the produce to the market	
E: Case studies/profiles of success stories		
Success stories from	Increased planting of EAT coconut in coastal counties of Kilifi, Kwale and Lamu under the Coconut Revitalization Programme	
Application guidelines for	How to Produce Quality Coconuts (A brief reference manual for Kanyan Fermars)	
users	The to Froduce Quality Cocondis (A one) reference manual for Kenyan Parmers)	
F: Status of TIMP readiness (1-ready for upscaling;, 2- Ready for upscaling		
requires validation; 3-require	es further research)	
G. Contacts		
Contacts	The Institute Director, KALRO-Mtwapa, P.O. Box 16-80109, Mtwapa	
	email: director.icri@kalro.org, mobile 0202024751	
Lead organization and	KALRO, Francis Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe, Ali	
scientists	Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.	
Partner organizations	KALRO-Mtwapa, KALRO-Matuga, MoALFC, agricultural university colleges, AFA.	

2.1.3. Hybrid Coconut	
Category (i.e. technology, innovation or management practice)	Characteristics of Hybrid Coconut Variety Nut Cluster
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low yields in coconut

2.1.3. Hybrid Coconut	
What is it? (TIMP description)	Hybrid Coconut is a newly introduced variety under evaluation. Has petioles and nuts of bright colours of green, yellow, pink, orange, produces 20-22 leaves per year, has a life span of Up to 50 years, age at first fruiting is 2.5- 3 years, economic life span of less than 50 years, stem size and shape are thin, with a cylindrical or tapering base, medium to large nut size and relatively high oil content. Yields of up to 300 nuts per year.
Justification	Yield of coconut varieties is dependedent on suitability of the target zones and the genetic potential of the variety.
B: Assessment of dissemina	tion and scaling up/out approaches
Users of TIMP	• Farmers, Processors, Traders, Researchers, Extension service providers.
Approaches used in dissemination	 Coconut Innovation Platforms Coconut Farmer Field and Business Schools On-farm and on-station research trials and demonstrations Training workshops, seminars, meetings Field days Agricultural shows MoALFC/County Extension officers Farmer research networks Farmer to farmer Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms
	•
Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles	 Research to release and validate any new coconut varieties Positive ineraction between Farmers and Processors Mechanism for interaction of coconut value chain stakeholders Clean planting material availability Good seed system (Nurseries) to ensure quality Well organized farmer groups and networks Good Marketing Models and path ways County and central government support Funding to research, validate and promote new coconut varieties Collaboration between all partners and stakeholders Adequate facilitation KALRO, National Agricultural Research Systems (NARS) and International research organizations Market/processors players to create a demand and pull production Farmers/farmer groups to adopt and produce County governments, central governments e.g. Chiefs, Agricultural Extension (Formal and informal) for policy, awareness and dissemination
	 NGOs for farmer organizing and mobilization Registered nurseries for clean seedling production Financial institutions (banks, donors, credit facilitators) for financial solutions
C: Current situation and fu	ture scaling up
Counties where already promoted if any	Kilifi, Kwale, Lamu, Mombasa, Tana River and Taita Taveta
Counties where TIMP will	All suitable areas including new areas of cultivation such as Kisumu, Busia, Makueni

2.1.3. Hybrid Coconut		
be up scaled	and Tharaka Nithi	
Challenges in	• Lack of a mechanism to facilitate interaction of VC stakeholders	
dissemination	Inadequate/Poor distribution of planting materials	
	Wide scope of possible production areas	
	Low use of agronomic practices	
	Unorganized marketing channels	
Suggestions for addressing	Establish coconut innovation platforms	
the challenges	• Involve County governments, extension and Nursery operators	
	• Engagement of wider range of stakeholders	
	• Information dissemination on production practices	
	• Promotion of the variety in the suitable areas	
	• Promote value addition and consumption in local food systems	
	• Promote marketing models that encourage collective production and marketing	
Lessons learned in	• Chances of successful upscaling are higher when diverse value chain pravers	
upscaling if any	collaborate in an innovation platform	
	• Training of agro dealers necessary	
	• Farmers participatory approach works	
Social, environmental,	 Creation of awareness on the nutritional benefits of the variety. 	
policy and market	• Harmonious and collaborative interaction of diverse value chain players in	
conditions necessary for	coconut innovation platforms	
development and upscaling	• It is an already "a climate change ready crop" due to its wide adaptation ability	
	• Organized marketing channels critical for benefits to be derived from the	
	technology	
	• Enabling policy and policy review from time to time	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 40000 per acre (80 seedlings per acre spaced at 7m x 7m). This is the cost of	
	purchasing seedlings, which is 17.6 % of the cost of establishing and bringing the	
	crop to yielding.	
Estimated returns	The net present value (NPV) of Coconut was estimated at KES 114820 per acre for	
	three products (nuts, Makuti, toddy) and KES 275266 for nuts and makuti. Benefit	
	cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts	
	and makuti alone, and 108% with toddy production.	
Gender issues and concerns	• Since coconut is a cash crop, its regarded as a man's enterprise, Women and	
in development,	youth may have less access to productive resources such as credit, labour, land	
dissemination, adoption	and quality seedlings than men	
and scaling up	• The technology may not be adopted if the gender targeted (especially women) is	
	overburdened with other responsibilities	
	• Women may not have time and mobility to attend extension activities far from	
	home or held at times when they are performing other roles e.g. domestic. This	
	disadvatages them on awareness of such new varieties	
	• Women have less access to agricultural information, technology and knowledge	
	than men	
Gender related	Opportunities for men exist in commercializing coconut technology	
opportunities	• Opportunities for men exists in coconut production and marketing	
	• Opportunities for youths in transportation of the produce to the market	
	Women and children mainly involved in harvesting and dehusking	
VMG issues and concerns	• VMGs have limited access to productive resources such as land, credit and	
in development,	quality seedlings than men	

2.1.3. Hybrid Coconut		
dissemination, adoption	• Due to their social status VMGs are often excluded from decision making in the	
and scaling up	development and dissemination activities	
	• VMGs have less access to agricultural information, technology and knowledge	
	than men	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	• Opportunities for youths exist in commercializing the technology	
	• Opportunities in harvesting processes since harvesting is done form the ground	
	• Opportunities for youths in transportation of the produce to the market	
E: Case studies/profiles of success stories		
Success stories from	Variety is under on-station evaluation at KALRO Matuga and Mtwapa, also under	
previous similar projects	on-farm evaluation in Kilifi, Kwale and Lamu Counties	
Application guidelines for	How to Produce Quality Coconuts (A brief reference manual for Kenyan Farmers)	
users		
F: Status of TIMP readiness (1-ready for upscaling;, 2- requires validation; 3-requires further research)		
G. Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org 0202024751	
Lead organization and	KALRO, Francis K. Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe,	
scientists	Ali Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.	
Partner organizations	KALRO-Mtwapa, KALRO-Matuga, MESPT, MoALFC, Pwani University, AFFA	
	(NOCD).	

2.2 COCONUT SEED SYSTEMS

2.2.1. Direct Planting	
Category (i.e. technology,	Management Practice
innovation or management	
practice)	
A: Description of the technology, innovation or management practice	
Problem to be addressed	Low uptake of seedlings due to transplanting shock.
What is it? (TIMP	Quality seeds selected from elite mother plants are planted in well dug planting holes
description)	from where they germinate and grow, without need for further transplanting.
Justification	This method of planting guarantees high growth vigour in the initial development
	stages of the coconut.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	• Farmers
	Other research organizations/institutions (universities)
Approaches used in	Farmer Field and Business Schools (FFBS)
dissemination	• AIP
	On-farm and on-station research trials and demonstrations

2.2.1. Direct Planting	
	• Training workshops, seminars, meetings
	• Field days
	MoALFC/Extension officers
	• Farmer research networks
	• Farmer to farmer
	Mass media – Agricultural programs
	• Promotional materials (posters/brochures/leaflets, manuals)
	Digital platforms
Critical/essential factors	• Research to test, validate and release the developed management practices
for successful promotion	• A platform for interaction of coconut value chain stakeholders
	• Development of good seed systems to backstop community and rural nurseries
	County and central government support
	• Funding to research, validate and promote seedling production
	Field Demonstrations
Partners/stakeholders for	KALRO, NARS for capacity building
scaling up and their roles	• Farmers/farmer groups to adopt and use
	• County governments, central governments e.g. Chiefs, Agricultural Extension
	(Formal and informal) for policy, awareness and dissemination
	• Financial institutions (banks, donors, credit facilitators) for financial solutions
C: Current situation and fu	iture scaling up
Counties where already	Kilifi, Kwale, Lamu and Taita-Taveta
promoted if any	
Counties where TIMP will	Kwale, Mombasa, Kilifi, Tana-River, Lamu, Taita-Taveta, Tharaka Nithi, Lake Basin
be up scaled	of Kisumu, Baringo, Busia, Siaya, Migori.
Challenges in	• Lack of knowhow by nursery operators
dissemination	• Unwillingness of farmers/nursery operators to procure quality seed nuts
	Limited number of nurseries willing to propagate coconut
Suggestions for addressing	• Train farmers/nursery operators on seed selection, use of correct media
the challenges	• Information dissemination on importance of using good seed nuts to increase
	yield
	Involve County governments, extension, and seed companies
Lessons learned in	Partnership is important in technology dissemination
upscaling if any	• Involvement of farmers in technology transfer
Social, environmental,	Important in the local diet – Swahili dishes
policy and market	• Environmentally friendly resilient and climate smart. Coconut is an evergreen
conditions necessary for	perennial crop that protects the soil from erosion, thereby, maintaining soil
development and upscaling	structure and microbial activity.
	• There is availability of market: domestic and international for coconuts and
	coconut products
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs	KES 2000 per acre for EAT coconut
Estimated returns	The net present value (NPV) of Coconut was estimated at KES 114820 per acre for
	three products (nuts, Makuti, toddy) and KES 275266 for nuts and makuti. Benefit
	cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts
	and makuti alone, and 108% with toddy production.
Gender issues and concerns	Planting of coconut is done by all gender though it is limited to the land availability
in development	and ownership.

2.2.1. Direct Planting	
,dissemination, adoption	
and scaling up	
Gender related	Employment opportunities for youth especially digging of holes for planting.
opportunities	
VMG issues and concerns	• VMGs have limited access to productive resources (i.e. land, credit, and quality
in development,	seeds) than men
dissemination, adoption	• VMGs have less access to agricultural information, technology and knowledge
and scaling up	than men
	• Due to their social status VMGs are often excluded from decision making in
	development and dissemination activities
VMC related apportunities	Inere is low adoption by VMGs due lack of awareness
VMG related opportunities	Opportunities for the viviG as skilled service providers.
Success stories from	• Increased acreage in coconut production in Kilifi county
previous similar projects	Existence of young coconut orchards
Application guidelines for	Coconut planting guides
users	Coconut Farming handbook
F: Status of TIMP	Ready for upscaling
readiness (1-ready for	
upscaling;, 2-requires	
further research)	
C Contosts	
G. Contacts	The Institute Director KALDO Manager D.O. Day 16 90100 Manage
Contacts	The Institute Director, KALKO-Mitwapa; P.O. Box 10-80109, Mitwapa
	E-mail: director.icri@kalro.org 0202024751
Lead organizations and	KALRO, Francis Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe, Ali
scientists	Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.
Partner organizations	Pwani University, <u>info@pu.ac.ke</u> . S. Muti; H. Saha.
	Coast Development Authority, Mr. Kombe

2.2.2. Coconut Nursery	establishment
Category (i.e. technology,	Management Practice
innovation or management	
practice)	
A: Description of the technology, innovation or management practice	
Problem to be addressed	unavailability of quality planting materials
What is it? (TIMP description)	Raising of high quality coconut seedlings in nurseries under high level management until they attain the transplanting stage.

2.2.2. Coconut Nursery establishment	
Justification	Coconut nurseries are a reliable source of quality and certified planting materials for orchard establishment, Good management practices and monitoring of the seedlings ensures uniformity and availability of planting materials.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	• Farmers
	• Nursery operators
	• Other research organizations/institutions (universities)
Approaches used in	• FFBS
dissemination	• AIP
	On-farm and on-station research trials and demonstrations
	Training workshops, seminars, meetings
	• Field days
	MoALFC/Extension officers
	• Farmer research networks
	• Farmer to farmer
	Mass media – Agricultural programs
	Promotional materials (posters/brochures/leaflets, manuals)
	Digital platforms
Critical/essential factors	• Research to test, validate and release the developed management practices
for successful promotion	• A platform for interaction of coconut value chain stakeholders
	• Development of good seed systems to backstop community and rural nurseries
	Seedling availability and accessibility via community and rural nurseries
Partners/stakeholders for	• KALRO, NARS for capacity building
scaling up and then roles	• Nursery operators for quality coconut seed multiplication
	• Farmers/farmer groups to adopt and produce
	• County governments, central governments e.g. Chiefs, Agricultural Extension (Formal and informal) for policy, awareness and dissemination
	• NGOs to take up coconut seedlings production e.g. Micro-Enterprises Support
	Programme Trust (MESPT), for farmer organization and mobilization
C. Current situation and f	• Financial institutions (banks, donors, credit facilitators) for financial solutions
Counting where already	Kilifi Kwala, Lomy and Taita Tayata
promoted if any	Kinn, Kwale, Lamu and Talla-Tavela
Counties where TIMP will	Kwale, Mombasa, Kilifi, Tana-River, Lamu, Taita-Taveta, Tharaka Nithi, Lake Basin
be up scaled	of Kisumu, Baringo, Busia, Siaya, Migori
Challenges in	Lack of know-how by nursery operators
dissemination	• Unwillingness of farmers/nursery operators to procure quality seed nuts
	Limited number of nurseries willing to propagate coconut
Suggestions for addressing	• Train farmers/nursery operators on seed selection, use of correct media
the challenges	• Information dissemination on importance of using good seed nuts to increase
	yield
	Involve County governments, extension, and seed companies
Lessons learned in	Partnership is important in technology dissemination
upscaling if any	Involvement of farmers in technology transfer
Social, environmental,	• Important in the local diet – Swahili dishes
policy and market	• Environmentally friendly resilient and climate smart. Coconut is an evergreen
conditions necessary for	perennial crop that protects the soil from erosion, thereby, maintaining soil

2.2.2. Coconut Nursery establishment	
development and upscaling	structure and microbial activity.
	• There is availability of market: domestic and international for coconuts and
	coconut products
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	KES 100 per seedling (EAT)
	KES 400 per (Dwarf coconut)
Estimated returns	KES 60,000 per 1,000 seedlings (EAT)
	KES 300,000 per 1000seedlings (Dwarf coconut)
Gender issues and concerns	• The running of nurseries and handling of specialized tools seems to more of the
in development	men and youth dominated compared to women
,dissemination, adoption	• All genders have equal opportunities except that nurseries being capital intensive,
and scaling up	women and youth may not access resources for this, particularly if the source is
	within the household
Gender related	• Employment opportunities for youth as tree service providers in tree grafting as
opportunities	well as transporting the produce to the market
VMG issues and concerns	• VMGs have limited access to productive resources (i.e. land, credit, and quality
in development,	seeds) than men
dissemination, adoption	• VMGs have less access to agricultural information, technology and knowledge
and scaling up	than men
	• 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 as skilled service providers as the operations are not labour intensive.
E: Case studies/profiles of	success stories
Success stories from	KALRO nurseries
previous similar projects	Private nurseries
	Increased uptake of KALRO coconut seedlings
	Technology adoption among private players and NGOs is increasing
Application guidelines for	Coconut planting guides
users	Coconut Farming handbook
F: Status of TIMP reading	ess (1-ready for upscaling;, 2-requires Ready for upscaling
validation; 3-requires further	research)
G. Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org 0202024751
Lead organizations and	KALRO, Francis K. Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe,
scientists	Ali Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.
Partner organizations	Pwani University, info@pu.ac.ke. S. Muti; H. Saha.
	Coast Development Authority, Mr. Kombe

2.2.3. Seed selection	
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Poor germination percentage
What is it? (TIMP	This involves choosing of mature nuts for seed from a desired coconut mother plant
description)	,free from pests and diseases
Justification	Choosing of nuts for seedling production ensure uniformity and quality planting material from known mother plants for increased yields
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	 Farmers Nursery operators Other research organizations/institutions (universities)
Approaches used in	• FFBS
dissemination	• AIP
	On-farm and on-station research trials and demonstrations
	Training workshops, seminars, meetings
	• Field days
	MoALFC/Extension officers
	• Farmer research networks
	Farmer to farmer
	 Mass media – Agricultural programs Bromotional materials (posters/brochures/leaflets_manuals)
	 Digital platforms
Critical/essential factors	 Research to test, validate and release the developed technology
for successful promotion	• A platform for interaction of coconut value chain stakeholders
	• Development of good seed systems to backstop community and rural nurseries
	Seedling availability and accessibility via community and rural nurseries
Partners/stakeholders for	KALRO, NARS for capacity building
scaling up and their roles	Nursery operators for quality coconut seed multiplication
	• Farmers/farmer groups to adopt and produce
	• County governments, central governments e.g. Chiefs, Agricultural Extension
	(Formal and informal) for poncy, awareness and dissemination
	organization and mobilization
	 Financial institutions (banks, donors, credit facilitators) for financial solutions
C: Current situation and fu	uture scaling up
Counties where already	Kilifi, Kwale, Lamu and Taita-Taveta
promoted if any	
Counties where TIMP will	Kwale, Mombasa, Kilifi, Tana-River, Lamu, Taita-Taveta, Tharaka Nithi, Lake Basin

2.2.3. Seed selection	
be up scaled	of Kisumu, Baringo, Busia, Siaya, Migori.
Challenges in	Lack of know-how by nursery operators.
dissemination	
Suggestions for addressing	• Train farmers/nursery operators on seed selection, use of correct media
the challenges	• Information dissemination on importance of good seed nuts to increase yield
Lessons learned in	• Partnership is important in technology dissemination
	Involvement of farmers in technology transfer
Social, environmental,	• Important in the local diet – Swahili dishes
policy and market	• Environmentally friendly resilient and climate smart. Coconut is an evergreen
development and upscaling	structure and microbial activity
de verophient und apseuring	• There is availability of market: domestic and international for coconuts and
	coconut products
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs	KES 100 per seedling of EAT coconut
	KES 400 per seedling of Dwarf coconut
Estimated returns	KES 60,000 per 1,000 seedlings
	KES 300,000 Per1000 seedlings
Gender issues and concerns	• The running of nurseries and handling of specialized tools seems to more of the
in development	Men and youth dominated compared to women
and scaling up	• All genders have equal opportunities except that nurseries being capital intensive, Women and youth may not access resources for this particulary if the source is
	within the household
Gender related	• Employment opportunities for youth as tree service providers in tree grafting as
opportunities	well as transporting the produce to the market
VMG issues and concerns	• VMGs have limited access to productive resources (i.e. land, credit, and quality
in development,	seeds) than men
and scaling up	• VMGs have less access to agricultural information, technology and knowledge than men
und seuning up	• 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 as skilled service providers as the operations are not labour intensive.
E: Case studies/profiles of success stories	
Success stories from	KALRO nurseries
previous similar projects	Private nurseries
	 Increased uptake of KALRO coconut seedlings Technology adoption among private players and NCOs is increasing
Application guidelines for	 Technology adoption among private players and NGOS is increasing Cocoput planting guides
users	 Coconut Farming handbook
F: Status of TIMP readine	ess (1-ready for upscaling: 2-requires Ready for upscaling
validation; 3-requires further	research)
G. Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org 0202024751
Lead organizations and	KALRO, Francis Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe, Ali

2.2.3. Seed selection	
scientists	Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.
Partner organizations	Pwani University, <u>info@pu.ac.ke</u> . S. Muti; H. Saha
	Coast Development Authority, Mr. Kombe

2.2.4. Seed pairing	
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Low germination of coconut seed nuts when seeded directly in normal soil media.
What is it? (TIMP description)	This involves identification of the point of emergency of the shoot and the position of the roots. To hasten germination, slice the seed nut a bit and remove part of the husk on one end at the side of the three eyes. Soaking of the seed nut in water for two days to weaken the outer coat.
Justification	Coconut usually germinates in 3-4 months, this technology reduce to 2-3
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	 Farmers Nursery operators Other research organizations/institutions (universities)
Approaches used in dissemination	 FFBS AIP On-farm and on-station research trials and demonstrations Training workshops, seminars, meetings Field days MoALFC/Extension officers Farmer research networks Farmer to farmer Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms
Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles	 Research to test, validate and release the developed technology A platform for interaction of Coconut value chain stakeholders Development of good seed systems to backstop community and rural nurseries Seedling availability and accessibility via community and rural nurseries KALRO, NARS for capacity building Nursery operators for quality coconut seed multiplication Farmers/farmer groups to adopt and produce County governments, National government e.g. Chiefs, Agricultural Extension (Formal and informal) for policy, awareness and dissemination

2.2.4. Seed pairing			
	• NGOs (e.g. MESPT) to take up Coconut seedlings production for farmer		
	organization and mobilization		
	Banks, donors, credit facilitators for financial solutions		
C: Current situation and fu	iture scaling up		
Counties where already	Kilifi, Kwale, Lamu and Taita-Taveta		
promoted if any			
Counties where TIMP will	Kwale, Mombasa, Kilifi, Tana-River, Lamu, Taita-Taveta, Tharaka Nithi, Lake Basin		
be up scaled	of Kisumu, Baringo, Busia, Siaya, Migori.		
Challenges in	Lack of know-how by nursery operators.		
Suggestions for addressing	• Train farmers/nursery operators on seed selection, use of correct media		
the chanenges	• Information dissemination on importance of using good seed nuts to increase		
Lessons learned in	Pertnership is important in technology discomination		
upscaling if any	 Involvement of farmers in technology transfer 		
	• Involvement of farmers in technology transfer		
Social, environmental,	• Important in the local diet – Swahili dishes		
policy and market	• Environmentally friendly resilient and climate smart. Coconut is an evergreen		
development and upscaling	perennial crop that protects the soil from erosion, thereby, maintaining soil		
development and upscaling	• There is availability of market, domestic and international for accounts and		
	• There is availability of market, domestic and international for coconuts and coconut products		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations		
Basic costs	KES 100 per seedling of EAT coconut		
	KES 400 per seedling of Dwarf coconut		
Estimated returns	KES 60 000 per 1 000 seedlings		
Listinated retains	KES 300 000 Per1000 seedlings		
Gender issues and concerns	• The running of purseries and handling of specialized tools seems to more of the		
in development	Men and youth dominated compared to women		
, dissemination, adoption	 All genders have equal opportunities except that nurseries being capital intensive. 		
and scaling up	Women and youth may not access resources for this, particulary if the source is		
	within the household		
Gender related	• Employment opportunities for youth as tree service providers in tree grafting as		
opportunities	well as transporting the produce to the market		
VMG issues and concerns	• VMGs have limited access to productive resources (i.e. land, credit, and quality		
in development,	seeds) than men		
dissemination, adoption	• VMGs have less access to agricultural information, technology and knowledge		
and scaling up	than men		
	• Due to their social status VMGs are often excluded from decision making in		
	development and dissemination activities		
VMG related opportunities	• There is low adoption by VMGs due tack of awareness		
E: Case studies/profiles of	Opportunities as skilled service providers as the operations are not fabour intensive.		
E: Case studies/promes of	Success stories		
Success stories from	KALRO nurseries		
previous similar projects	Private nurseries		
	Increased uptake of KALRO Coconut seedlings		
	• Technology adoption among private players and NGOs is increasing		
2.2.4. Seed pairing			
---	---	--	--
Application guidelines for	es for • Coconut planting guides		
users	Coconut Farming handbook		
F: Status of TIMP readiness (1-ready for upscaling;, 2-requires Ready for upscaling			
validation; 3-requires further	research)		
G. Contacts			
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa		
	E-mail: director.icri@kalro.org, 0202024751		
Lead organizations and	KALRO, Francis Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe, Ali		
scientists	Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.		
Partner organizations	Pwani University, info@pu.ac.ke. S. Muti; H. Saha.		
	Coast Development Authority, Mr. Kombe		

2.2.5. Seed placement				
Category (i.e. technology,	Technology			
innovation or management				
practice)				
A: Description of the techn	ology, innovation or management practice			
Problem to be addressed	Delayed sprouting			
What is it? (TIMP	This is Laying the nuts end to end or side by side in the trench, at 45° angle with the			
description)	broadest side of the nut at the bottom; and the front end (with eyes) lower such that			
	the water wets the shoot			
Justification	Placing of the nuts at 45° angle ensures equal distribution of the water inside the nut and enhance precocity.			
B: Assessment of dissemina	ation and scaling up/out approaches			
Users of TIMP	• Farmers			
	Nursery operators			
	Other research organizations/institutions (universities)			
Approaches used in	• FFBS			
dissemination	• AIP			
	On-farm and on-station research trials and demonstrations			
	Training workshops, seminars, meetings			
	• Field days			
	MoALFC/Extension officers			
	Farmer research networks			
	Farmer to farmer			
	Mass media – Agricultural programs			
	Promotional materials (posters/brochures/leaflets, manuals)			
	Digital platforms			

2.2.5. Seed placement	
Critical/essential factors	• Research to test, validate and release the developed technology
for successful promotion	• A platform for interaction of Coconut value chain stakeholders
	• Development of good seed systems to backstop community and rural nurseries
	• Seedling availability and accessibility via community and rural nurseries
Partners/stakeholders for	KALRO, NARS for capacity building
scaling up and their roles	Nursery operators for quality coconut seed multiplication
	• Farmers/farmer groups to adopt and produce
	• County governments, central governments e.g. Chiefs, Agricultural Extension
	(formal and informal) for policy, awareness and dissemination
	• NGOs to take up Coconut seedlings production e.g. MESPT, for farmer
	organization and mobilization
	Banks, donors, credit facilitators for financial solutions
C: Current situation and fu	iture scaling up
Counties where already	Kilifi, Kwale, Lamu and Taita-Taveta
promoted if any	
Counties where TIMP will	Kwale, Mombasa, Kilifi, Tana-River, Lamu, Taita-Taveta, Tharaka Nithi, Lake Basin
be up scaled	of Kisumu, Baringo, Busia, Siaya, Migori.
Challenges in	Lack of know-how by nursery operators.
dissemination	
Suggestions for addressing	Train farmers/nursery operators on seed selection, use of correct media
the challenges	Information dissemination on importance of using good seed nuts to increase yield
Lessons learned in	Partnership is important in technology dissemination
upscaling if any	• Involvement of farmers in technology transfer
Social, environmental,	• Important in the local diet – Swahili dishes
policy and market	• Environmentally friendly resilient and climate smart. Coconut is an evergreen
conditions necessary for	perennial crop that protects the soil from erosion, thereby, maintaining soil
development and upscaling	structure and microbial activity.
	• There is availability of market: domestic and international for coconuts and
	coconut products
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs	KES 100 per seedling of EAT coconut
	KES 400 per seedling of Dwarf coconut
Estimated returns	KES 60,000 per 1,000 seedlings
	KES 300,000 Per1000 seedlings
Gender issues and concerns	• The running of nurseries and handling of specialized tools seems to more of the
in development	Men and youth dominated compared to women
, dissemination, adoption	• All genders have equal opportunities except that nurseries being capital intensive
and scaling up	Women and vouth may not access resources for this, particularly if the source is
	within the household
Gender related	Employment opportunities for youth as tree service providers in tree grafting as well
opportunities	as transporting the produce to the market
VMG issues and concerns	• VMGs have limited access to productive resources (i.e. land, credit, and quality
in development,	seeds) than men
dissemination, adoption	• VMGs have less access to agricultural information, technology and knowledge
and scaling up	than men
	• Due to their social status VMGs are often excluded from decision making in
	development and dissemination activities

2.2.5. Seed placement			
	• There is low adoption by VMGs due lack of awareness		
VMG related opportunities	Opportunities as skilled service providers as the operations are not labour intensive.		
E: Case studies/profiles of s	success stories		
Success stories from	KALRO nurseries		
previous similar projects	Private nurseries		
	Increased uptake of KALRO Coconut seedlings		
	Technology adoption among private players and NGOs is increasing		
Application guidelines for	Coconut planting guides		
users	Coconut Farming handbook		
F: Status of TIMP readiness (1-ready for upscaling;, 2-requires Ready for upscaling			
validation; 3-requires further research)			
G. Contacts			
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa		
	E-mail: director.icri@kalro.org, 0202024751		
Lead organizations and	KALRO, Francis K. Muniu, Finyange Pole, Mwalimu Menza, Stella Mwashumbe,		
scientists	Ali Mzingirwa, Kengo Danda, Clotilda Nekesa. Violet K. and Wasilwa L.		
Partner organizations	Pwani University, <u>info@pu.ac.ke</u> . S. Muti; H. Saha.		
	Coast Development Authority, Mr. Kombe		

2.3 GOOD AGRICULTURAL PRACTICES AND FOOD SAFETY MANAGEMENT SYSTEMS

2.3.1. Food Safety Management System: Hazard Analysis Critical Control Points Plan for Coconut		
Value Chain in Keny	ya	
Category (i.e. technology,	Management Practice	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	The presence of chemical and biological hazards in the Coconut value chain in Kenya	
	have a direct effect on consumers' health thereby constantly increasing demand for	
	high quality of the crop and it's by products from consumers and public health	
	departments in counties. These hazards have direct economic consequences affecting	
	families, communities and industries subsisting on the Coconut value chain in Kenya.	
	This leads to reduced productivity of the active population. Biological	
	contaminations reported on this value chain include presence of <i>Escherichia coli</i> ,	
	Salmonella spp., Aspergillus flavus and Aspergillus parasiticus. The chemical	
	hazards due to mycotoxins, heavy metal contaminations and uncontrolled pesticide	
	use have previously been detected which has been attributed to neurological	
	disorders, on set of cancer and birth defects to the consumers.	
What is it? (TIMP	Food safety management system (FSMS) through HACCP in Coconut is a system of	
description)	food safety monitoring and control based on the systematic identification and	
	assessment of various hazards. It is a preventive, rather than a reactive, tool that	
	places the protection of the Coconut products supply from biological, chemical and	
	physical hazards into the hands of food management systems. The HACCP system is	
	designed to minimize the risk of food safety hazards by identifying the hazards,	
	establishing controls and monitoring these controls. When this HACCP concept is	
	applied to the management of likely adverse health effects resulting from exposure to	
	hazards in the Coconut value chain, a wholesome and safe Coconut products supply	

2.3.1. Food Safety Management System: Hazard Analysis Critical Control Points Plan for Coconut				
Value Chain in Keny				
	can be maintained improving on trade and health within and without Kenya borders.			
Justification	The only important tool kit to assure food safety through monitoring in the coconut value chain is HACCP. This critical tool is already incorporated into the Codex Alimentarius of the world as well as into the national public health food safety legislations of Kenya. This HACCP approach can be applied to all stages of the Coconut value chain process, ranging from production to processing, transportation, retail in commercial establishments and/or direct utilization by the consumer. Through its application, food safety charts in the Coconut value chain will easily be identified through critical control points. This will set limitation values for monitoring so that action can be taken if the set point values of hazards are out of the defined range required. In this Coconut value chain, the proposed FSMS that will be adopted, hazards would be minimized in every phase of production, harvesting, processing, distribution and consumption making Coconut products safe for consumption by Kenyans. The key elements will be identified that will be used or modified to reduce hazards formation in all steps of production to consumption.			
B: Assessment of dissemina	ation and scaling up/out approaches			
Users of TIMP	Coconut value chain actors from farmers, traders, food vendors and consumers.			
Approaches used in dissemination	 The entire Coconut value chain will be evaluated by determining contamination hazards in primary production systems and available control methods for; Chemical, physical and biological contaminants Knowledge on production and post-harvest systems Experience in implementation of ICM and IPM Experience with principles and practice of HACCP GAP, GMP and GHP Knowledge of the target market demands on safety This HACCP information generated and built on seven principles and actions Conduct of hazard analysis and identification of preventive measures Identification of critical control points (CCPs) Establishment of critical limits for monitoring of each CCP Establishment of record keeping Establishment of verification procedures This will be used by stakeholders to address the hazard problems along the Coconut value chain in Kenya. Dissemination of this generated information will be done through; The national and county level, common interest groups discussions, field days, exhibitions, radio, TV and digital platforms 			
Critical/essential factors for successful promotion	 For successful promotion of food safety management system through HACCP in the Coconut value chain; A team of experts composed of HACCP specialist, food scientist, microbiologist, representative of the Coconut growers, public health officer, and a quality control and safety specialist from the Kenya Bureau of Standards will be formulated. Distribution of the printed HACCP plan to Coconut value chain actors for implementation in order to reduce hazards. 			
Partners/stakeholders for scaling up and their	 Institutions with IPM and ICM programs Institutions responsible for legislating in food safety, regulations and sale of 			

2.3.1. Food Safety Management System: Hazard Analysis Critical Control Points Plan for Coconut		
Value Chain in Keny	ya	
respective roles. C: Current situation and fu	 pesticides Institutions with the required analytical testing Training institutions with extension programs to producers and other actors on the chain Producers and exporters associations. County extension staff Universities (Public and Private) NGOs Private sector Processors and local traders 	
Counties where already	Kilifi, Kwale, Lamu	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in development and dissemination	Inadequate funds to reach value chain actors	
Suggestions for addressing the challenges	Funding of dissemination platforms	
Lessons learned in upscaling, if any	The coconut value chain in Kenya is willing to adopt the HACCP plan if well engaged.	
Social, environmental, policy and market conditions necessary for development and up- scaling	The policies and laws in public health in place in Kenya are supportive to the use of HACCP Plan in Coconut value chain.	
D: Economic, gender, vulne	erable 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 high levels of illiteracy than men, hence are not educated enough to read the GAP Women have less access to agricultural information, technology and knowledge than men Men dominant decisions at the household and national levels 	
Gender related opportunities	Employment opportunities for youth in cotton production and marketing through ICT.	
VMG issues and concerns in development, dissemination, adoption and scaling up	 The elderly have high levels of illiteracy than men, hence are not educated enough to the GAP VMGs have less access to agricultural information, technology and knowledge 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 youth in production and marketing through ICT.	
• E: Case studies/profiles	of success stories	
Success stories	Coconut processors have successfully applied for export market	
Application guidelines for	HACCP plan for Coconut.	

2.3.1.	Food Safety	Management	System: Ha	azard Analysis	Critical	Control Points	Plan for Coconut
V	alue Chain ir	ı Kenya					

users			
F: Status of TIMP Readiness (1. Ready for upscaling; 2. Ready for upscaling			
Requires validation; 3. Requires further research)			
• G: Contacts			
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa		
	E-mail: director.icri@kalro.org, 0202024751		
Lead organization and	KALRO - Njoro, J. N. Ndung'u; KALRO-PTC Mr. Anthony Nyaga, KALRO -		
scientists	Kakamega, F. Wayua; KALRO- Njoro: B. Wanjiku		
Partner organizations	MoALFC, AFA, Fresh Produce Exporters Association of Kenya (FPEAK), PCPB,		
	Agrochemical Association of Kenya (AAK), Kenya Plant Health Inspectorate		
	Services (KEPHIS), County governments, NGO's and Universities.		

2.3.2. Good Agricultural	Practices for Coconut
Category (i.e. technology,	Management practice
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	The increased trade from demand for more food with the increased global population has also led to unscrupulous growers and traders using unsafe methods in production and in the other value chain processes. This not only results in unsafe low quality food but also unsustainable production systems through the misuse of resources such as land, water, manure, fertilizers, crop protection products among others. In addition, there have been concerns about the impact of crop production to environment, worker safety and produce traceability to ensure food safety and good ethical practices, both in the domestic and export market. Implementing Good Agricultural Practices (GAP) during on-farm production and post-production processes resulting in safe agricultural products is of immense importance for ensuring a safe food supply system globally.
What is it? (TIMP description)	 It is a systematic process of implementing a standardized production system globally designed to reassure consumers about how food is produced on the farm, pre-farm gate or on-farm standards. It is not about a specific crop production but the process through which production takes.
Justification	The evolving food industry and changes in consumer food preferences, feeding habits and practices has increased the volume of crops produce, leading to increased complexity in the distribution systems, thereby increasing the opportunities for exposure to contamination. Additionally, increased global trade and consumer demand for pre packed food for convenience has increased the potential for microorganisms' multiplication and the risk of exposure of diseases to the consumers. Changing social demographics in Kenya with the increase in the number of the elderly, children, pregnant women and immune compromised persons has also led to a likely exposure to food borne hazards for the vulnerable. Good Agricultural Practices (GAP) is based on the principals of risk prevention, risk analysis, sustainable agriculture (by means of Integrated Pest Management (IPM) and Integrated Crop Management (ICM) to continuously improve farming systems. There is need for reinforcement through transparent open systems from the farm to the table, including all inputs (including fertilizers, plant protection products, water and

2.3.2. Good Agricultural	Practices for Coconut		
	soil) and all value chain players including providers of logistics and equipment.		
B: Assessment of dissemina	ition and scaling up/out approaches		
Users of TIMP	All Coconut value chain players including producers, extension staff, processors, transporters and market outlet operators including wholesale and retail chains		
	domestic markets and farm gate handlers		
Approaches to be used in	• FFBS		
dissemination	On-farm experimentation and dissemination		
	• field days		
	• shows		
	• Farmer to farmer communication		
	• Leaflets		
	Larger plot demonstrations.		
Critical/essential factors	Policy support from government particularly the enforcement of KS1758 fresh		
for successful promotion	produce domestic scope standard and it passing the current public participation stage.		
Partners/stakeholders for	Producer organizations		
scaling up and their roles	• NGOs		
	• MoALFC		
	Private extension providers		
C. Current situation and f	CoG and other value chain players		
C: Current situation and it	nure scaling up		
counties where already	None		
Counting and any TDAD avill	17:1:6		
be up seeled	KIIIII		
Challenees in			
dissomination	• Lack/inadequate knowledge on the benefits GAP		
dissemination	• Lack of legislative mechanisms to support the GAP, in particular the domestic		
	• The perception that GAP is oppressive rather than supportive		
Recommendations for	• The perception that OAF is oppressive rather than supportive		
addressing the challenges	Continuous training of farmers, extension start and other value chain players		
Lessons learned in	The low number of stakeholders aware of GAP		
upscaling, if any			
Social, environmental,	Supportive policy of national and county governments to promote adaption of GAP.		
policy and market			
conditions necessary			
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations			
Basic costs	To be determined		
Estimated returns	To be determined		
Gender issues and concerns	Most small scale production systems are centered on women and hence it's them who		
in development	suffer from the detriments of poor processes; for example improper application of		
,dissemination, adoption	pesticides results in more women suffering from complications than the men in		
and scaling up	small-scale holdings. This means that adaption of GAP will increase the benefits of		
~	good nealth to the women and those who work more on the farm.		
Gender related	Job opportunity for unskilled women and youth due to systematic method of the		
opportunities	processes.		
VMG issues and concerns	• Requires a lot of movement on the farm to maintain records and processes		
in development,	verification		

2.3.2. Good Agricultural	Practices for Coconut		
dissemination, adoption	• Unfriendly dissemination methods and documents, illiteracy, poverty, market		
and scaling up	access problems		
VMG related opportunities	There will be enhanced productivity of smaller parcels of land to the advantage of		
	youth who normally have no access to larger parcels.		
E: Case studies/profiles of s	success stories		
Success stories from	None		
previous similar projects			
Application guidelines for	KS 1758 Horticulture Code of Practice		
users			
F: Status of TIMP readiness (1. Ready for upselling; 2. Ready for upscaling			
Requires validation; 3. Requires further research			
G: Contacts			
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email:		
	director.icri@kalro.org, Phone: 0712557178		
Lead organization and	KALRO: Nyaga, A., Ndung'u, J., Wayua, F., Muniu, F.K., Mwashumbe, S.K.,		
scientists	Wasilwa, L and Kirigua, V.		
Partner organizations and	MoALFC, AFA, FPEAK, PCPB, AAK, KEPHIS, CoG, NGOs and universities.		
their roles			

2.4 AGRONOMIC MANAGEMENT PRACTICES

2.4.1. Site Selection for orchard establishment		
Category (i.e. technology, innovation or management practice)	Management Practice	
Hybrid Coconut ochard at KALRO-Matuga		
A: Description of the techni	ology, innovation of management practice	
Problem to be addressed	Limited suitable areas for growing of coconut	
What is it? (TIMP description)	Selection of suitable areas for coconut production. Coconut gows well in equatorial climate with abundant sunlight, mean temperature of 27°C and high humidity of at least 70-80%. Ideal altitude for coconut growing is 0-600 metres above sea level. For optimal growth and productivity, coconut requires mean annual of 1200-2300 mm per annum of well distributed rainfall. Coconut can tolerate drought spells but yields will be depressed. The soils must be deep and well drained. Coconut can does well in coastal sandy soils, alluvial soils and reclaimed marshy lowlands. Coconut can tolerate intermittent water logging. Coconut can also tolerate salinity. The optimum Soil pH range is 5.0-6.0. The Slope of the land should not exceed 20 degrees.	
Justification	Growing coconut in unsuitable agro-climatic zone and unsuitable sites results in poor yields of low quality and wastage of resources. Production has predominantly been in the coastal lowlands of Kenya but there are other parts of the country with altitudes above 600 m above sea level which are suitable or moderately suitable for coconut production. Expansion of coconut production areas can be achieved with better understanduing of agroclimatic requirements and proper site selection.	

2.4.1. Site Selection for orchard establishment	
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Coconut producers, nursery operators and other value chain players such as extension service providers, policy makers at county and national level and procesors
Approaches used in dissemination	 ToT Demonstrations Farmer Field and Business School approach Innovation Platforms Field days and Agricultural shows
Critical/essential factors for successful promotion	Demonstrations, farmer exchange visits.
Partners/stakeholders for scaling up and their roles	 National government for promotion, policy and allocation of funds County governments for funding, promoting the crop and supporting growers with mechanized land preparation. NARS (R&D and training) NGOs (training and funding) CBOs in the cocnut value chain Lead Farmers to stimulate adoption Extension service providers for training farmers
C: Current situation and fu	ature scaling up
Counties where already promoted if any	Kilifi, Kwale, Lamu, Taita Taveta, Mombasa and Tana River
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu, Taita Taveta, Tana River
Challenges in dissemination	 Inadequate agronomic knowledge among producers Land use changes that render some suitable areas unavailable fro coconut growing Unavailability of sufficient amount of water for irrigation where required
Suggestions for addressing the challenges	 Sensitization on importance planting coconut in suitable sites Digging of bore holes for irrigation where needed Proper land preparation for coconut production
Lessons learned in upscaling	Growing Coconut in the recommended agro-ecological area can enhance both productivity and quality.
Social, environmental, policy and market conditions necessary for development and upscaling	This practice will enable growing of coconut in suitable areas and sites for optimal productivity and profitability.
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	KES 15,228 per acre 45.8.0%
Estimated returns	The net present value (NPV) of Coconut was estimated at KES 114,820 per acre for three products (nuts, Makuti, toddy) and KES 275,266 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, and 108% with toddy production.

2.4.1. Site Selection for a	orchard establishment
Gender issues and concerns	Women have less access to land than men
in development	• Women and youth have limited access to education, training and extension
dissemination, adoption	services than men
and scaling up	• Coconut trees are considered men's enterprises thereby limiting women control
	and benefit from them
	• Men may make decisions on site selection because they usally are dominate decisions at the household and community.
Gender related	Employment opportunities for men, youth and women in performing the operations
opportunities	Employment opportunities for men, youth and women in performing the operations.
VMG issues and concerns	• VMGs have limited access to training and extension services
in development	 Due to their social status VMGs are often excluded from decision making in
dissemination. adoption	development and dissemination activities
and scaling up	• VMGs have limited access to seed and information on new varieties and
	production techniques
	• There is low adoption by VMGs due lack of awareness
VMG related opportunities	Employment opportunities for youths in performing the operation
E: Case studies/profiles of s	success stories
Success stories from	Coconut orchard establishment has been adopted in Kilifi, Kwale, Lamu, Taita
previous similar projects	Taveta, Tana River
Application guidelines for	Coconut farming handbook, 2015
users	Production Manuals
	Brochures
F: Status of TIMP	Ready for upscaling
readiness (1-ready for	
upscaling;, 2-requires	
validation; 3-requires	
further research)	
G: Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email: director.icri@kalro.org, Phone: 0712557178
Lead organizations and scientists	KALRO, F.K. Muniu, M.K. Menza, S.K. Mwashumbe, Finyange Pole
Partner organizations	AFA, Micro-Enterprises Support Programme Trust (MESPT)

2.4.2. Land Preparation	
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the technology, innovation or management practice	
Problem to be addressed	Inappropriate land preparation practices
What is it? (TIMP	Appropriate land preparation and land clearing. The initial land preparation is done

2.4.2. Land Preparation	
description)	during the dry season by either ploughing, harrowing, use of herbicides or methods stipulated in conservation agriculture. The planting holes dimensions are a minimum of 90 cm wide and 90 cm depth. Field spacing is maintained at a minimum of 7.5 x 7.5 m for pure stand and atleast 10 x 10 m or larger depending on intercrop. During hole preparation, the top and sub soils are separated. Manure (at least 2 debes) is mixed with with the top soil and then filled back into the hole. Erosion prevention measures must be put in place at this land preparation stage.
Justification	Improper land preparation leads to poorly established crop as the crop has a poorly established root system hence the need have proper planting holes and clear area during establishment.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Coconut producers, nursery operators and other value chain players such as extension service providers, policy makers at county and national level and processors.
Approaches used in	Demonstrations
dissemination	Farmer Field and Business School Approach
	Innovation Platforms
	Field days and Agricultural shows
Critical/essential factors for successful promotion	Demonstrations, farmer exchange visits
Partners/stakeholders for	National government for promotion, policy and allocation of funds
scaling up and their roles	• County governments (funding & promoting the crop)
	NARS (R&D and training)
	NGOs (training and funding)
	CBOs in training
	 Lead Farmers to sumulate adoption Extension service providers for training formers
C: Current situation and fu	• Extension service providers for training farmers
Counties where already	Adopted by some farmers in Kilifi Kwale Lamu Taita Tayeta and Tana River
promoted if any	Adopted by some farmers in Kinn, Kwale, Land, Faita Faveta, and Fana Kiver
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu, Taita Taveta and Tana River
Challenges in	Limited access to machinery and equipment for proper land preparation
dissemination	Inadequate agronomic knowledge among producers
Suggestions for addressing	Sensitization on importance proper land preparation
the challenges	Digging of bore holes
Lessons learned in	• Growing coconut in the recommended agroecological can enhance both
upscaling	productivity and quality
Social, environmental,	This technology will enable growing of coconut and give maximum profitability.

2.4.2. Land Preparation	
policy and market	
conditions necessary for	
development and upscaling	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs	KES 15,228 per acre 45.8.0%
Estimated returns	The net present value (NPV) of Coconut was estimated at KES 114,820 per acre for three products (nuts, Makuti, toddy) and KES 275,266 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, and 108% with toddy production.
Gender issues and concerns	Land preparation is traditionally a man's activity
in development dissemination, adoption	• Women and youth have limited access to education, training and extension services than men
and scaling up	• Coconut trees are considered men's enterprises thereby limiting women control and benefit from them
	Men dominate decisions on coconut at the household and community
Gender related opportunities	• Employment opportunities for men and youth iin performing the operation
VMG issues and concerns	 VMGs have limited access to training and extension services
in development,	• Due to their social status VMGs are often excluded from decision making in
dissemination, adoption	development and dissemination activities
and scanng up	• VMGs have limited access to seed and information on new varieties and
	production techniques There is low adaption by VMCs due look of awareness
VMG related opportunities	• There is low adoption by VMOS due lack of awareness Employment opportunities for youths in performing the operation
F: Case studies/profiles of s	Employment opportunities for youths in performing the operation.
E. Case studies/promes of s	Coconut ershard establishment has been adopted in Kilifi Kuyala Lamu Toite
previous similar projects	Taveta, and Tana River
Application guidelines for	Coconut farming handbook, 2015
users	Production Manuals
	Brochures
F: Status of TIMP readine	ess (1-ready for upscaling;, 2- Ready for upscaling
requires validation; 3-require	s further research)
G: Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email: director.icri@kalro.org, Phone: 0712557178
Lead organizations and scientists	KALRO, F.K. Muniu, M.K. Menza, S.K. Mwashumbe, F. Pole
Partner organizations	Agriculture and Food Authority (AFA), Micro-Enterprises Support Programme Trust (MESPT)

2.4.3. Spacing and orchard establishment		
Category (i.e. technology,	Management Practice	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem to be addressed	Incorrect spacing and improper planting methods leads to poor yields and low nut quality thereby leading to low profitability of the cocnut value chain.	

2.4.3. Spacing and orchard establishment	
What is it? (TIMP	An optimum spacing of 7.5m x 7.5m (for pure stand) and a minimum of 10 x 10 m
description)	with intercrops is recommended.
	10 meters
	10m
	Coconut ochard establishment in square arrangement at KALRO-Mtwapa (left) and
	Triangular arrangement (right)
	Planting
	• Top soil and sub-soil should be to be kept separately during hole preparation
	• Mix the top soil with one debe FYM and a handful (150 g) of compound fertilizer
	e.g. 17:17:17. Mix thoroughly and fill the mixture back into the planting hole
	• Remove seedling from potting bag carefully without disturbing the roots.
	• Make a small hole on the backfilled soil of similar size to the seedling soil root
	mass
	• Cover the seedling with soil ensuring the nursery soil level on the seedling is maintained
	• A basin can be made around the newly planted seedling to help in water retention
	• Sub-soil is then used to make a basin around the seedling for holding water
	• Water the seedling after planting. It is always advisable to establish the crop at
	the beginning of the rainy season
Justification	Coconut being a perennial crop with a bearing life of over 80 years requires proper
	spacing to avoid competition for nutrients. Initial proper establishment of seedlings is
	very essential for good growth system.
B: Assessment of dissemina	tion and scaling up/out approaches
Users of TIMP	Coconut Producers, nursery operators and other value chain players such as extension
	service providers, policy makers at county and national level and procesors.
Approaches used in	• demonstrations
dissemination	Farmer Field and Business School Approach
	Innovation Platforms
	Field days and Agricultural shows
Critical/essential factors	Demonstrations, farmer exchange visits.
for successful promotion	
Partners/stakeholders for	• National government for promotion, policy and allocation of funds
scaling up and their roles	• County governments (funding & promoting the crop)
	• NARS (R&D and training)
	NGUs (training and funding)
	• CBOs in the cocnut value chain
	Lead Farmers to stimulate adoption
C. Cummont situation and f	Extension service providers for training farmers
Counties where short day	Adorted by some formans in Kilif. Knole, Lenne, Teite Terrete, and Ten. D'
Counties where already	Adopted by some farmers in Kilifi, Kwale, Lamu, Taita Taveta, and Tana River
promoted if any	

2.4.3. Spacing and orchard establishment		
Counties where TIMP will	Kilifi, Kwale, Lamu, Taita Taveta and Tana River	
be up scaled		
Challenges in	Inadequate agronomic knowledge among producers	
dissemination	• Existing structures and other trees on some farms can hinder proper spacing of	
	coconut	
Suggestions for addressing	Sensitization on importance planting healthy and vigor seedlings.	
the challenges		
Lessons learned in	Growing Coconut in the recommended agro-ecological can enhance both	
upscaling	productivity and quality.	
Secial anxing mental	This practice will eachly growing of Concept and give meninger profitchility	
social, environmental,	This practice will enable growing of Coconut and give maximum profitability.	
conditions necessary for		
development and upscaling		
D: Economic gender vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 10.444 per acre (32.8%)	
Estimated naturns	KES The net present value (NDV) of Coconut was estimated at KES 114820 per core	
Estimated returns	for three products (puts Malauti toddy) and KES 275266 for puts and malauti	
	Benefit cost ratio (BCR) was 6.2: the internal rate of return (IRR) was about 54% for	
	nuts and makuti alone and 108% with toddy production	
Gender issues and concerns	• Women and youth have limited access to education training and extension	
in development	services than men	
dissemination. adoption	 Coconut trees are considered men's enterprises thereby limiting women control 	
and scaling up	and benefit from them	
	 Men dominate decisions on coconut at the household and community 	
Gender related	Employment opportunities for men, youth and women in performing the operation.	
opportunities		
VMG issues and concerns	VMGs have limited access to training and extension services	
in development,	• Due to their social status VMGs are often excluded from decision making in	
dissemination, adoption	development and dissemination activities	
and scaling up	• VMGs have limited access to seed and information on new varieties and	
	production techniques	
	There is low adoption by VMGs due lack of awareness	
VMG related opportunities	Employment opportunities for youths in performing the operation	
E: Case studies/profiles of	success stories	
Success stories from	Proper spacing has been adopted by farmers in Kilifi, Kwale, Lamu, Taita Taveta,	
previous similar projects	and Tana River	
Application guidelines for	Coconut farming handbook, 2015	
users	Production Manuals	
	• Brochures	
F: Status of TIMP reading	ess (1-ready for upscaling;, 2- Ready for upscaling	
requires validation; 3-require	es further research)	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email:	
	director.icri@kalro.org, Phone: 0712557178	
Lead organizations and	KALRO, F.K. Muniu, M.K. Menza, S.K. Mwashumbe, F. Pole	
scientists		

2.4.3. Spacing and orcha	4.3. Spacing and orchard establishment	
Partner organizations	Agriculture and Food Authority (AFA), MESPT	

2.4.4. Intercropping	
Category (i.e. technology, innovation or management practice)	Management Practice Image: State of the stat
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Long maturity duration for coconut, land degradation Increasing productivity and resilience in land while at the same time conserving the soils and increasing biodiversity
What is it? (TIMP description)	Intercropping of cocnut with annuals when young and also with trees, such as coffee, grieve lea among others as long they are well spaced.
Justification	Intercropping coconut with short duration crops enables farmers to get food and income before the coconut matures and increases overall profitability per unit area, it can be attractive to the youth while the benefits include legumes improving the soil fertility (nitrogen fixation) and cover crops conserves the soil and increase biodiversity.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Coconut Producers, nursery operators and other value chain players such as extension service providers, policy makers at county and national level and processors.
Approaches used in dissemination	 Demonstrations Farmer Field and Business School Approach Innovation Platforms Field days and Agricultural shows
Critical/essential factors for successful promotion	Demonstrations, farmer exchange visits
Partners/stakeholders for scaling up and their roles	 National government for promotion, policy and allocation of funds County governments (funding & promoting the crop) NARS (R&D and training) NGOs (training and funding) CBOs in the cocnut value chain Lead Farmers to stimulate adoption Extension service providers for training farmers
C: Current situation and fu	uture scaling up
Counties where already promoted if any	Adopted by some farmers in Kilifi, Kwale, Lamu, Taita Taveta, and Tana River
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu, Taita Taveta and Tana River
Challenges in	Inadequate agronomic knowledge among producers

2.4.4. Intercropping		
dissemination	Lack strong farmers grower organizations and CBO's	
Suggestions for addressing the challenges	Sensitization and training farmers on appropriate interop systems for coconut	
Lessons learned in upscaling	Intercropping coconut with shorter duration crops has improved overall profitability in coconut based farming systems as well as aided in soil conservation.	
Social, environmental, policy and market conditions necessary for development and upscaling	This practice will enhance profitability of coconut based farming systems	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	KES	
Estimated returns	KES	
Gender issues and concerns in development dissemination, adoption and scaling up	 Women have less access to information, technology and knowledge Women and youth have limited access to the equipment used to make the water pan than men Women have less access to land that can be used for water pan than men Women and youth have limited access to education, training and extension services than men Men dominant most decisions at the household and community levels 	
Gender related	 Intercropping offers good opportunities to both men and women to grow diverse. 	
opportunities	crops for economic gains and at the same time offers enhanced biodiversity benefits	
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 productive resources such as land, credit, and quality seed 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	Intercropping places emphasis on the importance of using available land space to grow diverse of food crops, increase biodiversity, pest management thus the practice is economically viable for the VMGs.	
E: Case studies/profiles of s	success stories	
Success stories from previous similar projects Application guidelines for users	 Intercroping in coconut orchards has been adopted in Kilifi, Kwale, Lamu, Taita Taveta, and Tana River. Coconut farming handbook, 2015 Production Manuals 	
	• Brochures	
F: Status of TIMP reading validation; 3-requires further	ess (1-ready for upscaling;, 2-requires Ready for upscaling research)	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email: director.icri@kalro.org, Phone: 0712557178	
Lead organizations and scientists	KALRO, F.K. Muniu, M.K. Menza, S.K. Mwashumbe, F. Pole	
Partner organizations	Agriculture and Food Authority (AFA), MESPT	

2.4.5. Coconut Crown Cleaning		
Category (i.e. technology,	Management Practice	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem to be addressed	Old, weak, damaged fronds, aborted nuts, debris and excess fibre can act as reservoir	
	for insect pests, disease pathogens, rats and snakes. Weak fronds also pose a risk to	
	nut harvesters and wine tappers since they cannot support the operators' weight.	
What is it? (TIMP	Routine cleaning of coconut crowns through trimming removal of old, weak,	
description)	damaged fronds, removal of debris, aborted nuts and excess fibre.	
	Clean coconut crown	
Justification	Maintenance of clean and healthy crowns improves coconut productivity, facilitates	
	ease of havesting, Toddy tapping and reduces pests and disease pressure and trimmed	
	frond can have other economic uses.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Coconut Producers, nursery operators and other value chain players such as extension	
	service providers, policy makers at county and national level and procesors	
Approaches used in	• Demonstrations	
dissemination	Farmer Field and Business School Approach	
	Innovation Platforms	
~	Field days and Agricultural shows	
Critical/essential factors	Demonstrations, farmer exchange visits.	
for successful promotion		
Partners/stakeholders for	• National government for promotion, policy and allocation of funds	
scanng up and their roles	• County governments (funding & promoting the crop)	
	• NARS (R&D and training)	
	NGOs (training and funding) CDOs in the account value shoir	
	CBOs in the cocnut value chain Lead Formers to stimulate adaption	
	Lead Farmers to sumulate adoption Extension service providers for training formers	
C: Current situation and fu	• Extension service providers for training farmers	
Counties where already		
promoted if any		
Counties where TIMP will	Kilifi Kwale Lamu Taita Tayeta Tana River and other emerging cocnut growing	
be up scaled	areas	
Challenges in	Inadequate agronomic knowledge among producers	
dissemination	 Lack strong farmers grower organizations & CRO's 	
Suggestions for addressing	Capacity building of growers	
the challenges	Cupacity Summing of Browers	

2.4.5. Coconut Crown Cleaning			
Lessons learned in	Coconut crown cleaning can enhance both productivity, quality and control of insect		
upscaling	pests.		
Social, environmental,	This practice will improve productivity and profitability of coconut value chain.		
policy and market			
development and upscaling			
D: Economic gondor vuln	arable and marginalized groups (VMCs) considerations		
Basic costs	KES 2500 per acre (6.5 %)		
Estimated actumes	KES 2500 per dele (0.5 %)		
Estimated returns	KES The net present value (NPV) of Coconut was estimated at KES 114820 per acre		
	(BCP) was 6.2: the internal rate of return (IPP) was about 54% for puts and makuti		
	alone and 108% with toddy production		
Gandar issues and concerns	Women and youth may have less appear to productive resources such as andit		
in development	• Women and youth may have less access to productive resources such as credit, labour and quality seedlings and farm implement than men		
dissemination, adoption	• Women may not have time and mobility to attend extension activities far from		
and scaling up	home or held at times when they are performing other roles e.g. domestic		
	 Women have less access to agricultural information, technology and knowledge 		
	than menen have limited access to land for Coconut production than men		
Gender related	Opportunities for men and youths in performing the operation.		
opportunities			
VMG issues and concerns	• VMGshave less access to productive resources such as credit, labour, quality		
in development,	seedlings and farm implement than men		
dissemination, adoption	• VMGs have less access to agricultural information, technology and knowledge		
and scaling up	than menen have limited access to land for Coconut production than men		
	• 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 and youths in performing the operation		
E: Case studies/profiles of s	success stories		
Success stories from	• Coconut crown cleaning has been adopted in major coconut producing countries		
previous similar projects	such as India and Sri Lanka.		
Application guidelines for	Production Manuals		
users	Brochures		
F: Status of TIMP readine	ess (1-ready for upscaling;, 2-requires Requires validation		
validation; 3-requires further	research)		
G: Contacts			
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email:		
	director.icri@kalro.org, Phone: 0712557178		
Lead organizations and	KALRO, F.K. Muniu, M.K. Menza, S.K. Mwashumbe, F. Pole		
scientists			
Partner organizations	Agriculture and Food Authority (AFA), MESPT		
0			

2.4.6. Fertilizer Application		
Category (i.e. technology, innovation or management practice)	Management Practice	

2.4.6. Fertilizer Application					
A: Description of the techn	nology, innovation or management practice				
Problem to be addressed	Inappro	Inappropriate application of fertilizer and Nutrient deficiency			
What is it? (TIMP	Approp	Appropriate application of fertliser or manure. Application of fertliser is done just			
description)	before t	the rains. The quantiti	ies applied is per the soil	l analysis re	ecommendations.
	Where t	the recommendations 1	lack, the table below give	s a general	guideline. If soil
A well maintained orchard	pH is b	elow 4.5, lime (calciu	m carbonate) & single su	per-phospha	te is mixed with
with good nutrition	soil at e	each planting hole. Wh	here Manure is used, two	debes of m	anure during the
	main rai	iny season are sufficient	nt for a 10 year old tree. (a) (NDV 17.17.17)	a n 4 1100	
	Kecom	Long Poing (April)	Short Daing (October)	Total	1
	1 Cal	Long Kanis (April)	Short Kallis (October)	10141	
	1	30	30	100	
	2	80	80	160	
	3	120	120	240	-
	4	150	150	300	
	5	200	200	400	
	6	300	300	600	
	7	500	500	1000	
	8	600	600	1200	
	9	600	600	1200	
Justification	Proper a	and adequate application	on of crop nutrients in Coo	conut leads t	to high yieds and
	quality,	and preserves the soil	nutrient balance.		
B: Assessment of dissemina	tion and	scaling up/out appro	aches		
Users of TIMP	Coconu	t Producers, nursery	operators and other va	lue chain	players such as
	extensio	extension service providers, policy makers at county and national level and			
	proceso	rs			
Approaches used in	• Den	nonstrations			
dissemination	• Farr	Farmer Field and Business School Approach			
	• Inno	ovation Platforms			
	• Fiel	d days and Agricultura	ll shows		
Critical/essential factors	Demons	strations, farmer excha	nge visits.		
for successful promotion					
Partners/stakeholders for	• Nati	onal government for p	promotion, policy and allo	cation of fu	nds and fertilizer
scaling up and their roles	subs	sidy		1.0	
	• Cou	nty governments for fu	inding & promoting the ci	rop and ferti	lizer subsidy
	• NAI	RS (R&D and training) $(1 + 1)$)		
	• NGG	Os (training and funding)	1g)		
	• CBC	d Earmana ta atimulata	rs		
	• Lead	a Farmers to sumulate	adoption		
C. Current situation and fu	• Exit	ling un	is for training farmers		
Counties where already	Adopted	l hy some farmers in k		Taveta and	Tana River
promoted if any	Adopted	d by some farmers in F	Chini, Kwaic, Laniu, Tana		
Counties where TIMP will	Kilifi. K	Wale, Lamu, Taita Ta	veta, Tana River		
be up scaled	, 1		·····, -·······························		
Challenges in	• Hig	h cost of fertilizers			
dissemination	• Inco	onsistent information to	o coconut farmers on fertil	izer use	

2.4.6. Fertilizer Application		
	Limited access to adequate manure	
	Inadequate agronomic knowledge among producers	
Suggestions for addressing	Sensitization on importance of fertilizer	
the challenges	Training coconut producers on use of fertilizer	
	Holding demonstrations on ferlizer use in coconut	
Lessons learned in upscaling	Proper application of fertilizer enhanced productivity and quality of coconut	
Social, environmental, policy and market conditions necessary for development and upscaling	Proper us eof ferlilizer in cocnut will enhance profitability of the value chain.	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 3600 per acre (20% of variable costs)	
Estimated returns	The net present value (NPV) of Coconut was estimated at KES 114820 per acre for Nuts, Makuti, toddy) and KES 275266 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, and 108% with toddy production.	
Gender issues and concerns in development dissemination, adoption and scaling up	 Women and youth may also have limited access to finances to buy the required inputs such as fertilizers than men. Women may not have time and mobility to attend extension activities far from home or held at times when they are performing other roles e.g. domestic Women have less access to agricultural information, technology and knowledge 	
Candor related	than men	
opportunities	 Employment opportunity exist for youths in performing the operation Employment opportunity exist for youths in transporting fertilizers from the agrovets to the end users 	
VMG issues and concerns	Some VMGs are physically disadvantaged for a practice	
in development,	• VMGs have limited access to land for Coconut cultivation than men	
dissemination, adoption	• VMGs may also have limited access to finances to buy the required inputs such	
and scaling up	 as fertilzers than men VMGs have less access to agricultural information, technology and knowledge than men 	
VMG related opportunities	 Affirmative action in various areas as for instance in the provision of finances for farming Employment opportunity exist for youths in performing the operation 	
E: Case studies/profiles of success stories		
Success stories from previous similar projects	Fertilizer application in Coconut has been adopted by some farmers in Kilifi, Kwale, and Lamu Counties	
Application guidelines for users	 Coconut farming handbook, 2015 Production Manuals Brochures 	
F: Status of TIMP reading validation; 3-requires further	ess (1-ready for upscaling;, 2-requires Ready for upscaling research)	
G: Contacts	i	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email: director.icri@kalro.org, Phone: 0712557178	

2.4.6. Fertilizer Application		
Lead organizations and	KALRO, F.K. Muniu, M.K. Menza, S.K. Mwashumbe, F. Pole	
scientists		
Partner organizations	Agriculture and Food Authority (AFA), MESPT	

2.5 SOIL FERTILITY MANAGEMENT

2.5.1. Integrated Manure Management		
Category (i.e. technology, innovation or management	Wanure incorporation into the soil Technology	
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Declining soil fertility, low yields, increasing soil moisture stress, soil loss through surface run off and declining soil health. Poor manure management and handling contributing to increased Green House Gases (GHG) emissions.	
What is it? (TIMP description)	Integrated Manure Management (IMM) is the optimal, site-specific handling of livestock manure starting at collection, treatment, storage and its application into soils.	
Justification	The decline in soil fertility in smallholder system is a major factor inhibiting agricultural development. Manure plays an essential role in the nutrient cycling (macro and micro). In general, adding manure to soils enhances soil fertility, soil health, improves soil physical properties and promotes biodiversity leading to increased crop productivity. Given the low use and limited access to mineral fertilizers, manure has the potential of providing the limiting nutrients for increased crop productivity at a relatively low cost.	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, agricultural extension officers	
Approaches used in dissemination	 Open and field days Exchange visits Demonstration farms FFBS Innovation platforms 	
Critical/essential factors for successful promotion	 Training on handling, management and use of manure Dissemination approach used to reach target farmers Model demonstration plots using coconut 	
Partners/stakeholders for scaling up and their roles	 County governments Extension services Farmer mobilization and policy formulation Technical backstopping of NGOs – micro financing services 	
C: Current situation and f	uture scaling up	

2.5.1. Integrated Manure Management		
Counties where already promoted if any	Kilifi, Lamu, Kajiado, Uasin Gishu, Muranga, Taita Taveta, Makueni	
Counties where TIMP will be promoted	Kwale. Kilifi, Tana River, Tharaka Nithi, Taita Taveta and Lamu	
Challenges in dissemination	 Lack of model demonstration farms Lack of continuity in training of extension personnel and farmers in integrated manure management Lack of proper mobilization mechanism for reaching many farmers 	
Suggestions for addressing the challenges	 Establishment of many demonstration plots by county governments Capacity building communities' on manure management and its benefits Continuous capacity building of demonstration farmers and extension workers Use of approaches that mobilize farmer to attend demonstration forums 	
Lessons learned if any	 Proper use of manures improves soil fertility and soil moisture retention Use of manures enhances crop productivity Skills in manure preparation, storage and application 	
Social, environmental, policy and market conditions necessary	 Applying manure to soils saves on purchase of inorganic fertilizer, increases crop yield, conserves soil moisture and stabilizes soil aeration and structure Propagation of invasive species when the seed is ingested by the animal and passed to crop field Manure can harbour pathogens which cause disease outbreaks to livestock Contamination of water sources by leaching of nutrients Organic manures when poorly handled increase GHG emissions. However, IMM provides practices that are able to minimize GHG emissions 	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	 Proper handling of manure needs intensive labour for collecting the manure, building a compost heap, maintaining it and finally transporting and applying it field which take a lot of effort and time Using locally available manure/composts saves on purchase of inorganic fertilizer Labour cost for compost pit KES 500.00 Cost of one ton of FYM KES 1000 	
Estimated returns	Returns dependent on crop and crop varieties in the value chain where IMM is practiced	
Gender issues and concerns in development, dissemination, adoption and scaling up	It is labour intensive in terms of handling and application (often by broadcasting) hence may disadvantage wome.	
Gender related opportunities	Manure is locally available for farm households with keep livestock, hence opportunities available for both men and women.	
VMG issues and concerns in development, dissemination, adoption and scaling up	 It is labour intensive in terms of handling and application hence may disadvantage VMGs The VMGs are also resource poor, hence may not have access adequate manures, e.g. need many livestock 	
v wild related opportunities	on what they already own.	
E: Case studies/profiles of	success stories	

2.5.1. Integrated Manure Management		
Success stories	Farmers who adopt manure management practice have reported improved soil health	
	and increased crop yield, and sustainable source of income.	
Application guidelines for	The guideline focuses on the following areas:	
users	Animal feeds	
	Livestock housing and manure collection	
	Manure storage to preserve nutrient and avoid loses	
	• Manure treatment for ease of transport and application in the field	
	• Timing of application for maximum utilization by the crop	
	Anaerobic digestion for biogas production	
	• Regular analysis of manure to ascertain the quality	
	Manure/composts take long to cure, hence need good planning prior to use	
F: Status of TIMP rea	diness, (Ready for upscaling; Ready for up-scaling	
Requires validation; Require	s further research)	
G: Contacts		
Contacts	Director, Environment & Natural Resources, KALRO Secretariat	
Lead organization and	KALRO, S. Kimani, E.Mutuma, D. Kamau, M. Okoti, J. Wamuongo, A.O. Esilaba,	
scientists	F.M. Wandera. C. Nekesa	
Partner organizations	County government, ILRI, FAO	

Research gaps

- Promote IMM complementary technology in counties with low adoption.
- Conduct nutrient budget study on selected farms utilizing manures (including composts) in target counties.

2.5.2. Integrated Soil Fer	rtility Management	
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	Declining soil fertility, low organic matter, restoring soil structure and conserving	
	the limited available moisture in crop production.	
What is it? (TIMP	A set of soil fertility management practices that include the use of fertilizers, locally	
description)	available organic inputs and improved seed combined to adapt practices to local	
	conditions. It places emphasis on the importance of using often scarce resources like	
	fertilizer and organic inputs efficiently through techniques such as fertilizer banding	
	(field application of fertilizer directly in area of root-zone to increase the potential	
	for uptake) and micro dosing (applying small quantities of fertilizer at planting time	
	and a few weeks after emergence).	

2.5.2. Integrated Soil Fertility Management			
Justification	Soils within the farming systems are heterogeneous due to spatial variability in the soil fertility gradients. 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. A large proportion of soils in Kenya are derived from some of the oldest land surfaces which, due to weathering and cropping, have low nutrients. However younger volcanic soils are inherently richer in nutrients, but exhibit soil fertility challenges of soil acidity and nutrient fixation. Past crop management practices have major influence on soil fertility which in turn influences productivity. These inherent soil factors in crop productivity call for an integrated soil fertility management (ISFM) approach that combines appropriate interventions on soil management that include judicious application of organic and inorganic inputs, use of certified seed to achieve optimal agronomic use efficiency of the applied nutrients for improved crop productivity.		
B: Assessment of dissemina	ation and scaling up/out approaches		
Users of TIMP	Farmers, extension staff		
Approaches to be used in dissemination	 Training in workshops On-farm visits FFBS On-farm demonstrations Innovation platforms 		
Critical/essential factors for successful promotion	 Availability of affordable fertilizers, quality manure and clean planting materials Consider variability between farms, in terms of farming goals and objectives, size, labour availability, ownership of livestock, importance of off-farm income Consider production resources (i.e. land, money, labour, crop residues) that different farming families are able to invest in. 		
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 fu	uture scaling up		
Counties where already promoted if any	Siaya, Bungoma, Uasin Gishu, Kakamega, Taita Taveta		
Counties where TIMP will be promoted	Lamu, Kilifi, Kwale, Tharaka Nithi, Tana River, Taita Taveta		
Challenges in dissemination	 Change of mindset in some regions/cultures that organic manures cannot be applied on crops Misconceptions that chemical fertilizer damage the soils 		
Suggestions for addressing the challenges	 Awareness trainings on role of organic manures in coconut cultivation Training and awareness creation on the usefulness of fertilizer applications to address the misconceptions about fertilizers 		
Lessons learned if any	For ISFM to succeed, good germplasm/seed/seedlings and combined timely use of fertilizers and manure is a required.		
Social, environmental,	Practice is socially acceptable Environmentally friendly		
conditions necessary	 Environmentally mentally Increased productivity will provide supply to the markets 		
	 Supporting frameworks/policies are available 		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations		

2.5.2. Integrated Soil Fe	rtility Management	
Basic costs	Certified seed EAT Variety KES 100.00, Dwarf variety KES 400	
	• Hybrid variety KES 500 per seedling	
	• FYM @ 1 ton per acre KES 800.00	
	• Fertilizer 2 bags per acre of N:P:K fertilizer KES 3500.00 per 50kg bag	
	Land preparation costs KES 4780	
Estimated returns	Farmers who have adopted ISFM technologies have more than doubled their agricultural productivity and increased their farm-level incomes by 20-50%	
Gender issues and concerns in development, dissemination adoption and scaling up	The practice integrates participation of male and female gender roles during field activities. Female gender is disadvantaged where application of heavy loads of manure/ fertilizers are to be incorporated in the field. Adoption and scaling up of ISFM technologies could be affected by the ownership of the farm that are mainly male owned while the women do not own the technology.	
Gender related opportunities	Apart from the inorganic fertilizers and good seed, the practice adopts other locally available materials that save on cost which is good for all gender	
VMG issues and concerns	VMGs are physically disadvantaged for a practice that seeks to incorporate manures	
in development,	in the farm. They are also resource poor and may not have the resources to purchase	
dissemination adoption and scaling up	seed and fertilizers as required for successful implementation of the practice.	
VMG related opportunities	The technology if well-practiced can increase farm incomes of VMGs by up to 50%.	
E: Case studies/profiles of s	success stories	
Success stories	ISFM successes have been reported in Kakamega, Nairobi, Kilifi Bungoma, Siaya and Uasin Gishu counties	
Application guidelines for users	• Always use well-adapted, disease- and pest-resistant germplasm/seed to make efficient use of available nutrients	
	• Ensure that good agronomic practices are upheld	
	• For sustainability, combined use of inorganic or organic materials should be promoted	
F: Status of TIMP readiness, (Ready for upscaling;Ready for up-scalingRequires validation; Requires further research)Ready for up-scaling		
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
Lead organization and scientists	KALRO; E. Gikonyo, D. Kamau, A. Esilaba, F. Wandera, G. Gachini. C.N. Ondiko	
Partner organizations	County governments, KALRO, KEFRI and universities	
Research Gaps		

- Validation of the ISFM technology in counties where technology has not been tested
- Testing (fertilizer types, rates, frequencies) in the coconut value chain

2.5.3. Rapid Soil Testing	
Category (i.e. technology,	Innovation
innovation or management	
practice)	

	Handheld scanner and mobile app monitoring soil nutrients	
A: Description of the techno	logy, innovation or management practice	
Problem addressed	Limited access to soil testing services (centralized soil testing laboratories and cost).	
What is it? (TIMP description)	This is a dry method for soil testing using simplicity of light—the interaction of electromagnetic radiation with matter to characterize biochemical composition of a soil and/or plant tissue. It requires partners involved (ICRAF, iSDA and Soil Cares) to work closely with KALRO and County agricultural officers to sensitize farmers to embrace the testing method.	
Justification	Rappid soil testing promotes more efficient fertilizer use, prevents environmental pollution from excess fertilizer application and is affordable	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, Extension officers	
Approaches to be used in dissemination	 Farmer visits Training in workshops Publicity campaigns done at County level. 	
Critical/essential factors for successful promotion.	 Availability of the necessary equipment for rapid on the spot soil testing. Established rapport between farmers and the technical personnel involved in soil testing. Adequate qualified staff to cover the large number of samples from the target 24 counties before the planting season begins. A well-designed storage system for keeping information obtained at farm level including (GPS readings, physical description of the locations, raw measured scanned data and fertilizer recommendation according to crop type suitability). Availability a van to mount the equipment. Farmers must understand, trust, and be willing to act upon the information provided 	
Partners/stakeholders for scaling up and their roles	 County government extension services; providing the link to farmers given that agriculture is devolved Soil Cares; Provides soil scanners technology and capacity building in collaboration with KALRO and ICRAF ICRAF and iSDA tests and validates the recommendation obtained in collaboration with Soil Cares and KALRO Fertilizer companies; To provide fertilizer blends according to soil health status Agro dealers to stock required fertilizers that is readily available to farmers 	
C: Current situation and fut	ture scaling up	
Counties where already promoted		
Counties where TIMP will be upscaled	Kilifi	

Challenges in dissemination	• It requires continuous updating methods to improve recommendations.
	• Lack of awareness on the importance of regular testing of soil quality
Suggestions for addressing	• Awareness creation, intensive farmer field training (capacity building)
the challenges	• Make the whole process cost efficient. Use of scanners (spectroscopy) and less
	wet chemistry analysis.
	Automated pipelines for updating existing recommendation methods.
Lessons learned in upscaling	Timely affordable soil information will guide on fertilizer use. Farmers report
if any	rustration when they apply fertilizers and see no results for lack of understanding soil putrient requirements for individual groups
Social, environmental,	• Socially acceptable-brings income, increases food production, nutrition security
conditions necessary	and family conesion.
conditions necessary	• Environmentally inendity-farmers only apply the required amounts of fertilizers.
	 Increased productivity will provide supply to the markets
	 Supporting frameworks/policies are available
D. Economic gender vulne	• Supporting frameworks/policies are available.
D. Economic, gender, vunier	Hand hald soil seenner KES 200,000,00
Basic costs	Dependent on the entermine edenting the service, but estimated at least 20% of
Estimated returns	Dependent on the enterprise adopting the service, but estimated at least 30% of our estimated at least 30% of
Condon issues and someone	Current returns and no doubt will be making agronomy great again.
in development	By bringing services closer to the users saves time and resources to the farmers
dissemination adoption and	(men, women and youm).
scaling up	
Gender related opportunities	Offers employment especially for the youth where soil sampling champions will be
Gender related opportunities	trained to help the local community in sampling.
	Retooling of personnel at national and County levels.
VMG issues and concerns in	Willingness to adopt and scaling up technology by VMGs given that farmers have
development, dissemination	not adopted current soil testing services due to distances and costs
adoption and scaling up	
VMG related opportunities	This is a TIMP that will bring soil testing services nearer to this group of farmers
	and therefore is a saving and is also expected to improve productivity.
E: Case studies/profiles of su	access stories
Success stories	Has been tested used successfully by other organizations like ICRAF, Soil Cares & KESREF.
	It has been adopted at Kenya cane testing centre for checking maturity level and
	quality of sugarcane.
Application guidelines for	• A handheld scanner to testing soils and crops in the field
users	• Community soil sampling champions are identified and trained on good soil
	sampling procedures
	• Soil and crop is analyzed and the results including fertilizer recommendation
	generated on site
F: Status of TIMP reading validation; Requires further re	ess, (Ready for upscaling; Requires Requires validation esearch)
G: Contacts	
Contacts	Director General, Environment and Natural Resources, KALRO Secretariat
Lead organization and scientists	KALRO, F. M. Wandera, G. N. Gachini, A. Chek, D. Kamau, A.O. Esilaba, C.N. Ondiko
Partner organizations	County governments in the 24 counties,
-	

Soil Cares,
ICRAF and iSDA

Gaps:

- Testing paired soil and crop samples to determine available and total nutrients present in the soil
- Determine nutrient deficiency and make fertilizer recommendations based on crop specific ntrient requirement
- Developing a fertilizer recommendation system with options for new blends.
- Working with fertilizer companies to produce fertilizer blends packaged in smaller quantities
- Using scanners at farm level to undertake fertilizer quality analysis, e.g. quantitative and qualitative analysis, major and trace elemental analysis, and chemical and physical analysis
- Updating existing soil maps with newly acquired soil data to provide current soil fertility status in the country

2.6.1. Grass strips	
Category (i.e. technology,	Technology
innovation or management	
practice)	
	Grass strips in coconut production
A: Description of the techn	ology, innovation or management practice
Problem addressed	The risk of soil erosion and increased run off
What is it? (TIMP	Grass strips are dense strips of grass panted up to a meter wide, along a contour. With
description)	time, silt builds up above the strip and benches are formed. Grass strips can be
	erosion They are a popular and easy way to terrace land especially in areas with
	relatively good rainfall. The technology is suitable in regions with fairly gentle slopes
	(0 - 6%); grass is needed for fodder; and moderate rainfall areas.
Justification	Agricultural production is threatened in many parts of the Kenya by soil moisture
	stress and serious soil erosion. Conservation of soil and moisture through
	construction of grass strips leads to better and reliable crop yields.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Farmers
Approaches to be used in	Approaches to be used in the dissemination include:
dissemination	On-farm demonstrations during farmer field schools
	Training in workshops
	• Distributed of extension materials through farmer groups and the County
Critical/accontial factors	extension service providers
Critical/essential factors	• Availability of labour

2.6 SOIL AND WATER MANAGEMENT

2.6.1. Grass strips	
for successful promotion	• Availability of land, apart from cropland.
	• Farmers and extension service with skills to design and construct stone lines.
	• Land tenure systems that allows individual ownership
Partners/stakeholders for	• County government extension service providers – delivery of information to
scaling up and their roles	farmers, technology access, capacity building
	• Community farmer groups – Provide on farm demonstration plots to hold farmer
	field schools; provide collective labor
	• External service providers – capacity building and access to technology
C: Current situation and fu	iture scaling up
Counties where already	Makueni, Machakos, Tharaka Nithi, Kakamega
promoted if any	
Current extent of reach	Practiced widely in many counties, especially where crop-livestock interactions is
	key.
Counties where TIMP will	Kilifi
be promoted	
Challenge(s) in	• Labour intensive for maintaining and controlling grass from becoming a weed
development and	Reduced land area for crop production
dissemination	
Suggestions for addressing	• Farmers need to be supported with appropriate tools and suitable grass varieties
the challenges	 Capacity building on the maintenance of grass strips
E .	 Training on site specific designs and layout
Lessons learned, if any	• Establishment of grass strips induces a process of natural terracing on slopes as
,	soil collects behind the grass barrier, even in the first year
	• Grass strips can be very appropriate for farmers who cut and carry fodder for
	their animals
	• Grasses are also used as mulch for crops by farmers
Social, environmental,	• Enforce policies on soil and water conservation at the County level
policy and market	• Create awareness on the importance of soil and water conservation
conditions necessary	• Avail low-cost technologies for soil and water conservation
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	The main input cost is the labour for establishing grass strips. The cost will depend
	on the type of grass to be planted, land size and the landscape terrain/slope. Labour
	cost KES 400.00 per man-day.
Estimated returns	The returns depend on the value chain being addressed and also type of grass
Gender issues and concerns	• Limited ownership of or access to land may limit women from technology
in development,	implementation
dissemination, adoption	• Limited power in making decisions on land use may limit women in technology
and scaling up	adoption
	• The technology is labour intensive and may limit implementation by women
	• Differing accessibility to information between men and women because of gender
	norms that place access to new information and technologies in the hands of male
	heads of will affect adoption and scaling up.
	• Limited access to appropriate tools and credit may limit application of technology
	among specific gender e.g. women
Gender related	• Increased agricultural production will increase access to food and income among
opportunities	all gender
	• Youthful male and women will provide labour during the implementation of the

2.6.1. Grass strips	
	technology
VMG issues and concerns in development and dissemination	 Limited access to information will limit access to information and adoption Limited decision-making power on land use may limit VMG in accessing and adopting the technology May not be in attendance during awareness and sensitization campaigns due to physical body challenges or insecurity challenges. The technology is labour intense and may be difficult for the VMG to implement in the field The labour cost of adopting this technology might be out of reach for the VMGs
	 thus affecting adoption and scaling up The technology demands proper training and access to information to enable proper implementation. This might be lacking among the VMGs
VMG related opportunities	Application of contour ridge is expected to improve agriculture production thus, more food and income
E: Case studies/profiles of s	success stories
Success stories, if any	
Application guidelines for users	Spacing between grass strips depends on the slope of the land. It can be 20-30 m on gentle slopes and 10-15m on steep land. Grass strips can be planted along ditches to stabilize them, or on the rises of bench terraces to prevent erosion. The grass needs to be trimmed regularly, to prevent shading and spreading to crop areas. Various grass species are used, e.g., Vetiver, Napier, Guinea and Guatemala depending on what is locally available. Vetiver grass is drought resistant and good for reducing erosion.
F: Status of TIMP readi validation; Requires further	ness (Ready for upscaling, Requires 1 Ready for upscaling research)
G: Contacts	
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI. Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>
Lead organization and scientists	KALRO, E. Mutuma; J. Wamuongo; M, Wairimu; P. Kitiem, J. Mwaura; D. Kamau, F. M. Wandera, C.N. Ondiko and A.O. Esilaba.
Partner organizations	County Government extension service.

2.6.2. Zai Pits	
Category (i.e. technology,	Technology
innovation or management	
practice)	
	A STORE STATES AND A STORE AND A
	Zai pits
A: Description of the technology, innovation or management practice	
Problem addressed	Unreliable water to sustain a crop as a result of high seasonal rainfall variability
	leading to total crop failures. Decreased yields leading to food insecurity.
What is it? (TIMP	Zai Pits are small planting pits typically measuring 60-90 cm in width, 20-30 cm

2.6.2. Zai Pits	
description)	deep and spaced 10m apart for coconut production. Zai Pits harvests and stores water for prolonged crop use. Farmers plant seeds into the pits after filling one to three handfuls of organic material such as manure, compost, or dry plant biomass. The technology is highly suitable for areas with unpredictable rains especially the coastal lowlands.
Justification	The impacts of climate change such as low and erratic rainfall continue to threaten agricultural production, food security and livelihoods especially in arid and semi-arid lands (ASALs). <i>Zai Pits</i> technology has the potential to harvests and store rain water for prolonged crop use. This technology also contributes to improving the management of degraded lands, reducing soil erosion, vegetation loss and biodiversity as well as crop yield.
B: Assessment of dissemina	ntion and scaling up/out approaches
Users of TIMP	Farmers
Approaches to be 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, Agro-vets and the County extension offices.
Most effective approach	Model farm demonstration
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 <i>Zai</i> pits. Availability of affordable organic matter i.e. manure, compost
Partners/stakeholders for scaling up and their roles	 County government extension services delivery of information inputs to farmers. Community farmer groups – Provide on-farm demonstration plots to hold farmer field schools NGOs – capacity building, policy support in soil and water conservation issues
C: Current situation and fu	iture scaling up
Counties where already promoted if any	Kilifi, Kwale, Lamu, Makueni, Machakos, Tharaka Nithi
Current extent of reach	Limited adoption because of the costs involved
Counties where TIMP will be promoted	All other Counties with suitable agro-ecological settings for Kale production.
Challenge(s) in development and dissemination	The greatest challenge is that the technology is labour intensive and many farmers may find it difficult to implement at large scale.
Suggestions for addressing the challenges	 Farmers need to be supported with appropriate equipment for preparation of <i>Zai</i> pits for efficiency and increased output per man hour Training youthful farmers to be champions of <i>Zai</i> pits construction at the Ward level/village level
Lessons learned, if any	The technology has huge potential to increase farmers' resilience especially in coastal lowlands. Similarly, when the farmers are adequately trained on the technology, many of them would be willing to invest in <i>Zai</i> pits to maximize yields.
Social, environmental, policy and market conditions necessary	 Enforcement of policies on soil and water conservation at the County level Creation of awareness on the importance of soil and water conservation Provision of low-cost technologies for soil and water conservation Policies that support individual land tenure systems Provision of support in the establishment of the <i>Zai</i> pits
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations

2.6.2. Zai Pits		
Basic costs	The main input cost is the labour for Zai pit preparation. It is estimated at KES 50.00	
	per Zai pit	
Estimated returns	To be determined	
Gender issues and concerns	• Ownership of or access to land, farming inputs and credit is an important gender	
in development,	issue in the adoption of Zai pits	
dissemination, adoption	• Making decisions on land use, what to grow, expenditures and savings is an	
and scaling up	important gender consideration in Zai Pits. This may disadvantage women	
	• Differing accessibility of the technology between men and women because of	
	gender norms that place access to new information and technologies in the hands of male heads of households is big gender concern in adoption	
	 Ownership of or access to land, farming inputs, information technologies (radios) 	
	cell phones) and credit will affect adoption and scaling up	
Gender related	• Increased agricultural produce will increase access to food and income among	
opportunities	women, male and youth	
	• Youthful male and women will provide labour during the implementation of the technology	
VMG issues and concerns	• Limited of access to information due to factors like physical disability affects	
in development,	technology access	
dissemination, adoption	• In attendance during awareness and sensitization campaigns due to physical body	
and scaling up	challenges or insecurity challenges.	
	• The technology is labour intense and may be difficult for the VMG to implement in the field	
VMG issues and concerns	• The labour cost of adopting this technology might be out of reach for the VMGs	
in adoption and scaling up	thus affecting adoption and scaling up	
	• The technology demands proper training and access to information to enable	
	proper implementation. This might be lacking among the VMGs	
	• Competing priorities and household decisions might hinder adoption and scaling	
	• The technology involves carrying of heavy manure to the field during	
	establishment which may be difficult for the physically weak VMGs.	
VMG related opportunities	Application of ZAI pits is expected to improve agriculture production thus, more	
	food and income	
E: Case studies/profiles of success stories		
Success stories, if any	Two women groups in Kiliki, Matungulu sub-County of Machakos County through a	
	representative Janet Ndunge reported having started using the Zai pit farming	
	technology in 2013 after attending a farming workshop by the Institute for Culture	
	and Ecology (ICE). "Ever since we started using Zai pits, we have seen an increase in	
	our narvests as compared to the conventional methods of farming, she said. Farmers	
	n Kaulonzwelli, Makuelli County increased dug pits from 170-500 pits for crop production due to initially observed benefits. Communities in arid and semi-arid	
	lands (ASAI s) have also rehabilitated degraded lands and increased production by	
	many folds.	

2.6.2. Zai Pits	
Application guidelines for	Zai pits are 20-30 cm deep, 60 cm wide. In dry areas the size of planting pits can be
users	enlarged. Compost or manure is placed in the pits before planting to improve soil
	fertility. It is not necessary to follow the contour when constructing pits. Compost or
	manure is placed in the pits before planting to improve soil fertility. It is not
	necessary to follow the contour when constructing pits. The Zai pits are during the
	dry season when labour constraints are minimal. Each pit is 90-90 cm wide, 10-30
	cm deep, with the soil from the pit thrown downhill to form a crescent shaped dam.
	The spacing of the pits within a row, as well as the space between the rows of pits
	varies between 60 and 90 cm. At the beginning of the rains, fill the holes with 50-
	60kg of dung or compost. The organic matter is mixed, in the bottom of the hole,
	with approximately 50 kg of soil.
F. Status of TIMD reading	And (Doody for up cooling Dooving Doody for up cooling

F: Status of TIMP readiness (Ready for up scaling, Requires Ready for up scaling validation; Requires further research)

G: Contacts	
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.
	Tel: +254-020-2464435 Ext. 300, E-mail: cd.narl@kalro.org
Lead organization and	KALRO, E. Mutuma; J. Wamuongo; M, Wairimu; P. Ketiem, J. Mwaura; D.
scientists	Kamau., Wandera F.M., Ondiko C.N., and A.O. Esilaba.
Partner organizations	County Government's extension offices.

RESEARCH GAPS

• Validation of the economic viability of the technology in counties where it has never been used.

2.6.3. Retention ditches		
	Retention ditches in coconut fields	
Category (i.e. technology,	Management Practice	
innovation or management practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	The risk of soil erosion and increased run off	
What is it? (TIMP	Retention ditches are trenches designed to catch and retain incoming runoff and hold	
description)	it until it infiltrates into the ground. They can be an alternative to waterways in high rainfall areas, but they are most often used in semi-arid areas to harvest water. The technology is suitable in semi-arid areas, permeable, deep and stable soils, and on flat or gentle sloping land.	
Justification	The impacts of climate change such as low and erratic rainfall continue to threaten agricultural production, food security and livelihoods especially in the ASALs. Agricultural production is threatened in many parts of the Kenya by soil erosion and	

2.6.3. Retention ditches		
	limited soil moisture. Conservation of soil and moisture through construction of	
	retention ditches has led to better and more reliable crop yields.	
B: Assessment of dissemina	ition and scaling up/out approaches	
Users of TIMP	Farmers	
Approaches to be used in	On-farm demonstrations during farmer field schools	
dissemination	Training in workshops	
	• Extension information materials which will be distributed to farmers through	
	farmer groups and the County extension service providers	
	• FFBS	
	Agriculture Innovation Platforms	
Critical/essential factors	• Availability of labour as the technology is labour intensive	
for successful promotion	• Farmers and extension service with skills to design and construct stone lines	
	Land tenure systems that allows individual ownership	
Partners/stakeholders for	• County government extension service providers – delivery of information to	
scaling up and their roles	farmers, technology access, capacity building	
	• Community farmer groups – Provide on farm demonstration plots to hold farmer	
	field schools; provide collective labor	
	• External service providers – capacity building and access to technology	
C: Current situation and fu	iture scaling up	
Counties where already	Kilifi, Kwale, Lamu, Taita-Taveta	
promoted if any		
Counties where TIMP will	Kilifi	
be promoted		
Challenge(s) in	• Increased risk of soil erosion if retention ditches are improperly laid out	
development and	• Labour intensive and many farmers may find it difficult to implement at large	
dissemination	scale	
	• Land tenure systems – communal land ownership, or in places where individuals don't have land title deeds	
Suggestions for addressing	• Earmers need to be supported with appropriate tools for diaging out retention	
the challenges	ditches for efficiency and increased output per man hour	
	 Training youthful farmers to be champions of digging out retention ditches 	
	 Training on site specific designs and layout 	
	 Fast-track land registration 	
Lessons learned, if any	When the farmers are adequately trained and sensitized on the technology, many of	
	them would be willing to invest.	
Social, environmental,	• Enforce policies on soil and water conservation at the County level	
policy and market	• Create awareness on the importance of soil and water conservation	
conditions necessary	• 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 digging retention ditches. The cost will depend	
	on the land size and the landscape terrain/slope. KES 50 per metre.	
Estimated returns	To be determined	
Gender issues and concerns	• Limited ownership of or access to land may limit women from technology	
in development,	implementation	
dissemination, adoption	• Limited power in making decisions on land use may limit women in technology	
and scaling up	adoption	

2.6.3. Retention ditches		
	 The technology is labour intensive and may limit implementation by women Differing accessibility to information between men and women because of gender norms that place access to new information and technologies in the hands of male heads of will affect adoption and scaling up. Limited access to appropriate tools and credit may limit application of technology among specific gender e.g. women 	
Gender related opportunities	 Increased agricultural production will increase access to food and income among all gender Youthful male and women will provide labour during the implementation of the technology 	
VMG issues and concerns in development and dissemination	 Limited access to information will limit access to information and adoption Limited decision making power on land use may limit VMG in accessing and adopting the technology May not be in attendance during awareness and sensitization campaigns due to physical body challenges or insecurity challenges. The technology is labour intense and may be difficult for the VMG to implement in the field. The labour cost of adopting this technology might be out of reach for the VMGs thus affecting adoption and scaling up The technology demands proper training and access to information to enable proper implementation. This might be lacking among the VMGs 	
VMG related opportunities	Application of contour ridge is expected to improve agriculture production thus, more food and income	
E: Case studies/profiles of	success stories	
Success stories, if any	Over 50,000 smallholder farmers in Eastern and Central Kenya record more than double of yields and reduced soil erosion after embracing a soil conservation scheme that involves digging of retention trenches in hillside to trap runaway water and soil.	
Application guidelines for users	The ditches are dug to about 30-60 cm depth and 0.5-1 m width across the direction of the slope. In very stable soils it is possible to make the sides nearly vertical, but in most cases the top width of the ditch needs to be wider than the bottom width. The soil is thrown to the lower side of the slope to prevent it falling back in and form an embankment. On flat land, ditches are spaced at about 20m and have closed ends so that all rainwater is trapped. On sloping land ditches are spaced at 10 - 15 m intervals and may have open ends to discharge excess water.	
F: Status of TIMP readiness Ready for upscaling, Requires Requires validation validation; Requires further research)		
G: Contacts	•	
Contacts	Centre Director KALRO-Kabete, off Waiyaki way, P.O. Box 14733-00800, NAIROBI. Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
Lead organization and scientists	KALRO, E. Mutuma; J. Wamuongo; M, Wairimu; P. Kitiem, J. Mwaura; D. Kamau and A.O. Esilaba F.M.Wandera	
ratulet organizations		

2.6.4. Rain water harvesting systems (water pond)		
Category (i.e. technology,	Management practice	
innovation or management		
practice)		

2.6.4. Rain water harvesting systems (water pond)		
	Water harvesting pond	
A: Description of the techn	ology, innovation or management practice	
Problem addressed:	Water scarcity for crop and livestock use especially in the face of diminishing rainfall because of climate change.	
What is it? (TIMP description)	Rain water harvesting is a technique of collection and storage of rainwater into natural reservoirs or tanks, or the infiltration of surface water into subsurface aquifers (before it is lost as surface runoff). A vast number of techniques allow flexibility and adaptability to site-specific situations to best fight water scarcity and make agricultural production more resilient. One method of rainwater harvesting is rooftop harvesting and harvesting through earth dams.	
Justification	Water, especially with increased incidences of rainfall variability due to climate change, is the most limiting factor to land productivity. It is also a major driver of soil erosion and land degradation. Therefore, there is need to enhance water harvesting and storage. By collecting, storing and utilizing water for purposes, farmers are able to prevent soil erosion, stabilize water supply, and reduce reliance on other water sources. Smallholder farmers can also recoup initial investment costs in water harvesting by planting high-value crops, and extending their growing season through the entire year.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, pastoralists and agro-pastoralist	
Approaches to be used in dissemination	 Demonstrations on technology use Farmer Field and Business Schools Technical training and re-tooling of extension personnel Innovation platforms Awareness creation through various platforms like local FM stations 	
Critical/essential factors	• Avail resources (human technical and financial) to support acquisition and	
for successful promotion	 Avail resources (numar, technical and maneral) to support acquisition and establishment of water harvesting systems Policy to support use of communal land to establish and manage earth dams Policies supporting Public-Private Partnerships in water harvesting Sensitization of local communities to embrace the practice 	
Partners/stakeholders for scaling up and their roles	 Private sector – access to technology, access to credit, technology installation County government – capacity building, policy support, credit facilities, NGOs – access to technologies, capacity building, technology installation 	
C: Current situation and future scaling up		
Counties where already promoted	Most counties are investing on water harvesting technology at community level. More is required to increase uptake by farmers in coastal ASALs	
Counties where TIMP will be up scaled	Meru and other counties with suitable agro-ecological conditions for water melon production	
2.6.4. Rain water harvesting systems (water pond)		
---	---	--
Challenges in	Resource use conflicts where land is communally owned	
dissemination	• Limited skills in technology installation and management	
	Limited community mobilization policy for water related activities	
	• Lack of proper water usage and control measures	
	• In the case of earth dams where there is a lot of siltation, regular de-siltation is	
	required	
	• Threats to sustainability of established systems because of lack of community	
	participation in systems monitoring and maintenance	
Suggestions for addressing	Resource mobilization through partnerships with private sector	
the challenges	• Engaging a participatory process during the planning and implementation of the project	
	• User specific training programs water harvesting technologies, maintenance and	
Lessons learned in	Detential to control community against water scarcity	
upscaling if any	 Folential to caution community against water scalency Improved productivity where water harvesting has been implemented 	
Social environmental	 Imploved productivity where water harvesting has been implemented. Device systems that are conder sensitive target different cender needs 	
policy and market	 Devise systems that are genuer sensitive – target unreferit genuer needs Correct out any ironment and social impact assessment of the technology in specific 	
conditions necessary	• Cally out environment and social impact assessment of the technology in specific Counties and cultures	
	• Support structures that help access to credit for technology access and	
	maintenance	
	 Enact Policy frameworks to support water harvesting 	
	 Enact policies on land tenure systems to support water harvesting 	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	Labour costs for soil excavation are usually high when using human labour. KES	
	2000 per cubic metre	
Estimated returns	• Time saved fetching water from afar is channeled into other economic	
	• Money used to treat diseases related to poor water hygiene is used for other	
	• Molicy used to field diseases related to poor water hygicile is used for other activities	
	 Healthy population will have energy to provide labour in agricultural activities 	
Gender issues and concerns	• The distance from household need to be considered as women are the custodian	
in development and	of households in terms of domestic water demands	
dissemination	• The design of the water pans should take care of the Occupation, Health and	
	Safety of the communities	
	• The technologies will reduce time needed to fetch for water which will impact	
~	positively the women	
Gender related	Water harvesting facilities save the time spent to collect water from far off, usually	
opportunities	by women. The saved time is channeled into other economic activities.	
VMG issues and concerns	• Limited access to credit or financial services may limit access to technology	
in development,	• The land tenure systems may inhibit adoption of technology	
dissemination, adoption		
and scaling up		
VMG related opportunities	• Develop SME opportunities around water harvesting. Also do small food gardens	
	and tree nurseries around water pans	
	• VMG maximize can engage in n availability of water to engage in small iGAs around water harvesting	
	• Livestock too easily access water and their market value likely to appreciate	
	 The technology will reduce the time used to search for water 	
	- The teenhology will reduce the time used to bearen for water	

2.6.4. Rain water harves	ting systems (water pond)
E: Case studies/profiles of s	success stories
Success stories	Agro-pastoralists who adopted water harvesting technology have had sustained source of income and improved livelihoods. A typical African Water Bank rainwater harvesting system collects 400,000 to 450,000 litres of rainwater within two to three hours of steady rain. It has an artificial roof of 900 to 1,600 square metres and storage tanks. The largest tank constructed in Narok County has a capacity of 600,000 litres. This amount of water can serve a community of 400 people for approximately 24 months without extra rain. The capacity can be added at a rate of 220,000 litres per year. The system is low cost and can be 100 percent maintained locally. It also uses local skills, labour, materials and technology. Apart from boosting access to water in arid and semi regions, rainwater harvesting contributes to water conservation thus reducing overexploitation of water resources.
Application guidelines for	Handbook on Rainwater Harvesting and Storage Options
users	• Manual for Rooftop Rainwater Harvesting Systems in the Republic of Yemen
F: Status of TIMP readines	ss (Ready for upscaling; Requires Ready for upscaling
validation; Requires further	research)
G: Contacts	
Contacts	Director, Environment & Natural Resources, KALRO Secretariat
Lead organization and scientists	KALRO, P. Radiro, J. Mwaura, P. Ketiem
Partner organizations	County governments
DOL DO	

GAPS

• Development of models of rain water harvesting for intensive agricultural production and household use.

2.6.5. Mulching		
Category (i.e. technology,	Management Practice	
innovation or management		
practice)		
	Mulch of coconut husks Mulch of coconut leaves	
A: Description of the technology, innovation or management practice		
Problem addressed	Accelerated loss of soil moisture-water stress in the soil. Suppression of weeds, loss	
	of organic matter, managing salinity in coastal lowlands.	
What is it? (TIMP	The practice of covering the soil/ground with natural materials such as coconut	
description)	husks, straw, dead leaves and compost to make more favourable conditions for plant	
	growth, development and efficient crop production. Benefits: retains moisture in the	
	soil; suppression of weeds; keep the soil cool, help improve soil fertility (as the	
	mulches decompose) and nutrient availability.	
Justification	Mulching facilitates retention of soil moisture and helps in control of temperature	
	fluctuations, improves physical, chemical and biological properties of soil, as it adds	
	nutrients to the soil and ultimately enhances the growth and yield of crops. It	

2.6.5. Mulching		
	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 dissemina	ntion and scaling up/out approaches	
Users of TIMP	Farmers	
Approaches to be used in	• Farmer field and business schools	
dissemination	• On-farm demonstrations during field days schools	
	• Training in workshops	
	Innovation platforms	
Critical/essential factors	• Availability of plant or crop residues	
for successful promotion	• Size of the land	
	• Competing uses of crop residues	
	• Type of the crop	
Partners/stakeholders for	County government extension services	
scaling up and their roles	• Provide link with farmers	
	• Community farmer groups	
	• Play coordination role for ease in problem identification and dissemination	
C: Current situation and fu	iture scaling up	
Counties where already	Baringo, Tharaka Nithi, Tana River, West Pokot, Kilifi, Machakos,	
promoted		
Current extent of reach	Available and practiced in different commodity value chains	
Counties where TIMP will	Kilifi	
be promoted		
Challenges in	• Lack of enough plant and crop residues due to competing uses	
dissemination	• Possibilities of insect build up categorized as pest or disease vectors	
Suggestions for addressing	Crop diversification to increase availability of residues.	
the challenges	• Establish and follow a good integrated pest control management program for the	
	particular crop.	
	• Adapting alternative mulching materials like high absorbance polymers e.g.	
	coconut husks and palms	
Lessons learned	There is need to adapt to alternative mulching technologies in addition to use of	
	organic materials like crop, plant residues, and agricultural processing wastes.	
Social, environmental,	Practice is socially acceptable	
policy and market	• Environmentally friendly	
conditions necessary	• Increased productivity will provide supply to the markets	
	Supporting frameworks/policies are available	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	This is low cost but labour intensive during the initial application. Labour costs	
	vary. KES 400.00 per man-day.	
Estimated returns	Generally >100% of the initial investments.	
Gender issues and concerns	The practice uses remnants from previous crops/plants that may offer competition in	
in development,	terms of fuelwood and livestock thus bringing a conflict those performing the	
dissemination, adoption	specific tasks, e.g. women in case of fuelwood and men for livestock feed. This will	
and scaling up	negatively affect the adoption and scaling up.	
Gender related	Women who mainly perform the weeding tasks will get a relief and spend their	
opportunities	efforts elsewhere. Similarly, the improved productivity will benefit both gender in	
	terms of higher earnings.	
VMG issues and concerns	Though easy to use, it is be a bit labour intensive for VMGs, hence its adoption and	

2.6.5. Mulching	
in development,	scaling up.
dissemination, adoption	
and scaling up	
VMG related opportunities	Mulch is locally available on-farm, and thus has very low costs implying that all including VMGs can take advantage of the practice.
E: Case studies/profiles of s	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	 1st step: Shovel away old mulch, debris, and rocks. Shovel away all the old mulch, debris, and rocks so that you can see the tree trunk. A "mulch volcano" occurs when mulch is piled up year after year on the base of a tree. Mulch piled up at the base of a tree is detrimental and starves the roots of needed oxygen. 2nd step: Cut up-growing roots with pruners. Up-growing roots can wrap around the base of the tree and kill it over time. If you notice any roots growing upward around the tree as you clear away old mulch, cut them away. Up-growing roots are a sign that the tree is starved for oxygen. 3rd step: Remove grass and other weeds with a spade or gardening claw. Scrape the area around the base of the tree to get rid of any weeds or grass 4th step: Adding a proper mulch bed. Spread mulch in a 4–5 feet (1.2–1.5 m) diameter around the tree. Lay down a thin layer of mulch around the tree. The mulch should not touch the tree itself. Leave (2.5–5.1 cm) of space between the base of the tree and the mulch Mulch management Pull or kill weeds that grow out of the mulch. Mulch is meant to act as a barrier for weeds and grass. You should pull any weeds or grass that grow out of the mulch bed throughout the year to prevent future growth. You can also use an herbicide, which is a chemical weed killer, around your tree to prevent grass and weeds from growing in your mulch Rake the mulch occasionally to prevent it from getting packed down. Compacted mulch prevents oxygen from passing through and can starve your tree's roots Replenish the mulch once a year. Make it a point to replenish the mulch around the tree orce a year. This will prevent weeds, provide essential nutrients, and help with the tree's drainage
F: Status of TIMP rea	diness, (Ready for upscaling: Ready for up-scaling
Requires validation; Require	s further research
G: Contacts	
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>
Lead organization and scientists	KALRO, E. Mutuma, P. Ketiem, J. Mwaura, A.O. Esilaba, J. Wamuongo . F.M.Wandera. C.N.Ondiko
Partner organizations	County governments
	Public-Private-Partnerships
Desearch const	· · · · · · · · · · · · · · · · · · ·

Research gaps:

• Research on mulching using factory/industrial wastes in the coconut value chains is required.

2.6.6. Green Legume cover crop		
Category (i.e. technology,	Management Practice	
innovation or management		
practice)		
	Legume cover cropping with coconut	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Soil moisture losses, loss of soil organic matter, declining soil fertility and	
	managing soil salinity in coastal lowlands	
What is it? (TIMP	Cover cropping is the practice of growing leguminous plants to offer the soil	
description)	protection against degradation. These plants have fast growing rates, fast	
	accumulation of biomass, are able to fix nitrogen biologically (BNF), they have C:	
	N ratios, hence are readily decomposed into soil organic matter. They include Musung pruviews Delighos purpursus (lablab). Crotolaria echroleusa/jungag	
	Caliandra spp. Gliricidia senium	
	Benefits : retain moisture in the soil: suppress weeds: keep the soil cool help	
	improve soil fertility (as the mulches decompose) and biological nitrogen fixation	
Iustification	Green manure/cover crops thrive in sub-humid ecosystems hence, coconut growing	
Justification	areas in the coastal lowlands are suitable. Green manure facilitates retention of soil	
	moisture and helps in control of temperature fluctuations, improves 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 dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers	
Approaches to be used in	• Farmer field and business schools	
dissemination	On-farm demonstrations during field days schools	
	Training in workshops	
	Innovation platforms	
for successful promotion	• Availability of seeds	
for successful promotion	• Size of the land	
	Competing uses of cover crop residues Type of the grop	
Partners/stakeholders for	County government extension corvices: Provide link with formers	
scaling up and their roles	 County government extension services, Provide link with farmers Community former groups: play coordination role for assa in problem 	
sealing up and then roles	identification and dissemination	
C: Current situation and fu	iture scaling up	
Counties where already	Baringo, Tharaka Nithi, Tana River, West Pokot, Kilifi, Machakos, Machakos,	
promoted	Embu.	
Current extent of reach	Available and practiced in different commodity value chains	
Counties where TIMP will	Kilifi	
	1	

2.6.6. Green Legume cover crop		
be promoted		
Challenges in	High cost of seeds	
dissemination		
Suggestions for addressing	Seed multiplication to increase availability of seeds	
the challenges		
Lessons learned	There is need to increase cover crop coverage in addition to use of organic	
~	materials.	
Social, environmental,	Practice is socially acceptable	
policy and market	• Environmentally friendly	
conditions necessary	• Increased productivity will provide supply to the markets	
	Supporting frameworks/policies are available	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	This is low cost but labour intensive during the initial application.	
	Certified seeds KES 2000 per acre	
Estimated returns	Generally >100% of the initial investments.	
Gender issues and concerns	The practice uses remnants from previous crops/plants that may offer competition	
in development,	in terms of fuelwood and livestock thus bringing a conflict those performing the	
dissemination, adoption	specific tasks, e.g. women in case of fuelwood and men for livestock feed. This will	
and scaling up	negatively affect the adoption and scaling up.	
Gender related	Women who mainly perform the weeding tasks will get a relief and spend their	
opportunities	efforts elsewhere. Similarly, the improved productivity will benefit both gender in terms of higher cornings	
VMC issues and concomes	Though appy to use it is he a hit labour intensive for VMCs, hence its adoption and	
in development	Though easy to use, it is be a bit labour intensive for vivios, hence its adoption and scaling up	
dissemination adoption	scaling up	
and scaling up		
VMG related opportunities	Mulch is locally available on-farm, and thus has very low costs implying that all	
vine related opportunities	including VMGs can take advantage of the practice.	
E: Case studies/profiles of s	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		
F: Status of TIMP rea	diness, (Ready for upscaling: Ready for upscaling	
Requires validation; Require	s further research	
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: cd.narl@kalro.org	
Lead organization and	KALRO, E. Mutuma, P. Ketiem, J. Mwaura, A.O. Esilaba, J. Wamuongo, F.M.	
scientists	Wandera and C.N. Ondiko	
Partner organizations	County governments	
5	• •	

Research gaps:

• Research on use of cover crops in improving soil fertility under coconut production.

2.6.7. Coconut Intercropping	
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the techn	ology, innovation or management practice
Problem addressed:	Reduced land sizes for agricultural food production, declining soil fertility, soil loss through erosion, high weed prevalence.
What is it? (TIMP description)	Intercropping is a multiple cropping practice involving growing two or more crops in together. The most common goal of intercropping is to produce a greater yield on a given piece of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop. The practice offers the potential to increase yields, enhance soil fertility and minimize the effects of climate change. Strip intercropping: multiple rows, or a strip, of the second crop is planted between 2 rows of the coconut plants. Spacing. The inter row spacing of the inter-crop species is specific within two rows of the coconut plant. Common intercrop species are coconut- cassava, coconut- maize, coconut-legume
Justification	Climate change is negatively impacting agricultural productions. 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 practice of enhancing climate change adaptation. It offers the potential to increase yield, enhance soil fertility/biodiversity and minimize the moisture losses. The practice builds healthy soils, control pests and harness a variety of benefits to increase yields. Intercropping of compatible plants encourages biodiversity by providing a habitat for a variety of insects and soil organisms that would not be present in a single-crop environment. The practice have several advantages, An intercrop uses resources of light, water, and nutrients more efficiently than single crops planted in separate areas, resulting in improved yields and income. Crop mixes frequently have low insect pest densities. This occurs when the crop mix confuse the insects by attracting beneficial predators. Intercropping allows for more effective management of cover crops.
B: Assessment of dissemina	ntion and scaling up/out approaches
Users of TIMP	Farmers, extension staff, researchers
Approaches to be used in dissemination	 Field Demonstrations Agricultural shows Extension services FFBS Innovation platforms

2.6.7. Coconut Intercropping	
Critical/essential factors	• Awareness creation on the benefits and contribution of the practice to all
for successful promotion	stakeholders.
	• Easy access of crop varieties that are compatible with coconut
	• Technical packages describing appropriate schedules of planting intercrop.
	• Package on fertilizer rates and regimes under the practice.
Partners/stakeholders for	• County governments – to provide extension services, farmer mobilization and
scaling up and their roles	policy formulation
	NGOs – to provide support on capacity building and micro-financing services
C: Current situation and fu	iture scaling up
Counties where already	Most counties in the medium to high rainfall areas & arid and semi-arid areas
promoted	
Counties where TIMP will	Kilifi
be up scaled	
Challenges in	• Limited access and wide distribution of clean planting materials (intercrop
dissemination	varieties)
	• Inadequate access of technical materials on the establishment, operations and
	management of intercrop management practice by farmers
	• The increased effects of climate change hindering adoption.
	• Farmer high poverty levels coupled with illiteracy especially in deep rural areas
	of Kenya.
Suggestions for addressing	• Enhance access of clean planting materials across the counties. Work closely
the challenges	with certified seed merchants, research institutions
	• Train and sensitize farmers on the basic principles of intercropping, their
	benefits and types suitable to their contexts. Use farmer field schools and
	demonstrations
	• Develop a comprehensive manual on the practice to guide the farmers during the
Lassons learned in up	adoption The prestice is your important in past management
scaling if any	 The practice is very important in pest management Earmore can use a trap grop to attract pasts, keeping them away from the main
sealing, if any	• Farmers can use a map crop to attract pests, keeping them away from the main crop. Therefore, farmers can easily adopt this method to significantly cut down
	on pesticides input costs
	• The number of ecological benefits provided by this practice can also accelerate
	up scaling. Intercropping promotes interactions between crops and pollinators.
	thus supporting biodiversity and wildlife species.
Social, environmental,	• Socially accepted by both male and female gender.
policy and market	• The practice is environmentally friendly as it enhances biodiversity, controls
conditions necessary	erosion and minimizes use of pesticides
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Certified maize seed KES 2000 per acre
Estimated returns	Always greater than initial investment
Gender issues and concerns	• The practice integrates participation of both male and female gender roles during
in development,	field implementation
dissemination	• It is important to know the demands of the technology product end users for ease
	of acceptability
	• Gender disparities in access to information may impact on adoption decisions.
	Access to information is a pre-requisite for informed decisions on adoption
Gender related	Intercropping offers good opportunities to both men and women to grow diverse
opportunities	crops for economic gains and at the same time offers enhanced biodiversity benefits

2.6.7. Coconut Intercropping		
VMG issues and concerns in development, dissemination, adoption and scaling up	The technology can be practiced using locally available and low cost materials and hence enhances adoption by the vulnerable and marginalized farmers/users. However, for optimized benefits, the availability of the required inputs like clean planting materials and appropriate fertilizers can be a challenge to these vulnerable group of people.	
VMG related opportunities	Intercropping places emphasis on the importance of using available land to grow diverse food, increase biodiversity, pest management thus the practice is economically viable, available and cost effective to the advantage of VMG.	
E: Case studies/profiles of s	E: Case studies/profiles of success stories	
Success stories	Farmers have reported improved soil conditions, reduced runoff and nutrient loss, soil moisture retention in the soil and generally an increased crop production following application of this widely used and readily available management practice.	
Application guidelines for users	 Intercropping scheme is aimed at improving the overall economics of the farm. It is for this reason any new intercropping idea should first be tested on a relatively small area for evaluations Observe careful timing of field operations (sometimes necessitating special interventions) to keep competition between the intercropped species in balance A crop mix that works well in one year may fail the next if weather favors one crop over another A mixture of crops with different growth forms or timing of development may make cultivation and use of mulches more difficult and less effective Planting crops in alternate rows or strips greatly simplifies management and captures some of the benefits of intercropping for pest control Intercropping poses a special problem for crop rotation. This is because if plants from two families are mixed in the same bed or field, achieving a substantial time lag before replanting either of those families may be difficult Intercropping requires extra care and effort in planning and maintaining a viable crop rotation 	
F: Status of TIMP readiness (Ready for upscaling: Requires Ready for upscaling		
validation; Requires further n	research	
G: Contacts		
Contacts	Director, Environment & Natural Resources, KALRO Secretariat	
Lead organization and scientists	KALRO, P. Ketiem, E. Mutuma, M. Okoti, , D. Kamau, A.O. Esilaba, F.M.Wandera, C.N.Ondiko	
Partner organizations	County governments,	
	KALRO	
Research gaps		

- Little information is available on the interactions of coconut and other crop intercrops especially in the coastal lowlands of Kenya
- Limited knowledge on resource-use efficiency particularly in coconut intercropping systems in coastal lowlands of Kenya

2.6.8. Conservation Agriculture	
Category (i.e. technology,	Management Practice
innovation or management	
practice)	

2.6.8. Conservation Agriculture		
A: Description of the techn	ology, innovation or management practice	
Problem to be 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	Conservation agriculture is a set of management practice that minimizes the	
description)	disturbance of soil structure, conserves soil moisture and enhances soil biodiversity.	
-	Conservation agriculture principles are:	
	Minimal soil disturbance	
	• Permanent ground cover - maintenance of a mulch of carbon-rich organic matter covering and feeding the soil (3) Crop rotation or sequences and associations of crops including trees, which could include nitrogen-fixing legumes	
Justification	• Land productivity is decreasing leading to decreased yield. Continuous land operation continues to emit more GHGs (Carbon) responsible for the climatic changes. Conservation agriculture has potential to enhance management of soil fertility and organic matter, and improvement of the efficiency of nutrient inputs, helping to produce more with proportionally less fertilizer; Rotations and crop associations that include legumes are capable of hosting nitrogen-fixing bacteria in their roots; this contributes to optimum plant growth without increased GHG emissions induced by fertilizer production; Avoidance of tillage minimizes occurrence of net losses of carbon dioxide by microbial respiration and oxidation of the soil organic matter and builds soil structure and bio pores through soil biota and roots; The protective soil cover of leaves, stems and stalks from the previous crop shields the soil surface from heat, wind and rain, keeps the soil cooler and reduces moisture losses by evaporation and, Helps to reduce soil compaction and plough pans and regenerates degraded lands.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, Extension Agents, Researchers	
Approaches to be used in	Agricultural shows	
dissemination	 Mass media 	
	• FFBS	
	• On-farm and on-station demonstrations	
	• Field Davs	
	• Innovation platforms	
Critical/essential factors	• Training on principles and benefits of conservation agriculture	
for successful promotion	Model demonstration using crops	
Partners/stakeholders for	• County Extension officers - Dissemination of information, capacity building	
scaling up, their roles and	• NGOs (African Conservation Network, One Acre Fund)- Capacity Building,	
stage of involvement	Dissemination of information	
	CIAT, IITA, FAO – capacity building	
	• County Governments - Funding conservation agriculture activities, support capacity building, enabling environment and supportive policies	
C: Current situation and future scaling up		
Counties where already promoted if any	Bungoma, Meru, Embu, Tharaka Nithi, Laikipia, Kakamega	
Counties where TIMP will	Kilifi	
be up-scaled		
Challenges in	• Non-availability of crop residue in suitable quantities	
dissemination	• Competition for crop residues with other uses like wood fuel and livestock	
	• Land tenure (farmers reluctant to invest in conservation agriculture where they	

2.6.8. Conservation Agriculture		
	do not have clear land rights)	
	• Limited knowledge on the incremental benefits of conservation agriculture	
	Limited access to conservation agriculture implements	
Suggestions for addressing the challenges	• Enhance Public Private Partnerships (PPP) to support increased production and market access	
	• Improve KALRO and County government capacity to train and re-tool technical team so as to enhance uptake of the technology	
	• Allocation of more funds for continued research and dissemination of this technology would aid increased uptake of conservation agriculture with agroforestry	
Lessons learned in upscaling if any	• Uptake of conservation agriculture technology increases with the realized incremental benefits over time	
	• Continuous capacity building increases conservation agriculture technology uptake	
Social, environmental, policy and market	• Develop Integrated Herbicide Management Plan – pre-emergence and post- emergence herbicides	
conditions necessary for development and	• Reliable technology adoption and suitable price and market access for produce under conservation agriculture	
dissemination	• Continuous capacity building of the community on the benefits of conservation agriculture technology	
	 County policies that support households investing in conservation agriculture with inputs like implements 	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	Costs related to ripping services and herbicides amount to KES 5000/acre. This is	
	apart from the normal inputs of seed and fertilizer when establishing. But the costs of reduce over the years, while the returns increase.	
Estimated returns	• Reduction of costs associated with tillage-induced soil erosion and degradation i.e. 40% of land degradation	
	• Returns on conserving soil exceeding 150 ton/hectare annually and associated increased productivity	
Gender issues and concerns in development,	• Conservation agriculture with trees is a management practice that that can be easily adopted by women	
dissemination, adoption	Reduces labor demands across all gender, hence good for all gender	
and scaling up	• Land ownership is mainly by men therefore reducing wider adoption	
	Women are usually left out of decision making thereby reducing uptake	
Gender related	• Cconservation agriculture with agroforestry provides opportunities for Small	
opportunities	Medium Enterprises (SMEs) e.g. tree nurseries. The technology therefore renders itself to easy adoption by women	
VMG issues and concerns	• Limited decision making on land use may limit the adoption by VMGs	
in development,	• Limited access to conservation agriculture inputs like planting implements may	
dissemination, adoption and scaling up	limit the VMGs adopting	
VMG related opportunities	Opportunity to run SMEs such as tree nurseries for increased resilience.	
E: Case studies/profiles of	success stories	
Success stories from	Farmers and agro-pastoralists who adopt the technology have had sustainable source	
previous similar projects	of income and increased resilience	
Application guidelines for	• Okoba, B. (2018), Climate-Smart Agriculture: Training Manual for Agricultural	
users	Extension Agents in Kenya.	

2.6.8. Conservation Agriculture			
	• Esilaba, E.O (2019), KCEP-C	CRAL CSA Extension Manual	
	• SUSTAINET EA 2010. Ted	chnical Manual for farmers and Field Extension	
	Service Providers: Conse	ervation Agriculture. Sustainable Agriculture	
	Information Initiative, Nairob	bi	
F: Status of TIMP readiness (Ready for upscaling; Requires Ready for upscaling			
validation; Requires further	ner research)		
G: Contacts			
Contacts	Director, Environment & Natural	Resources, KALRO Secretariat	
Lead organization and	KALRO, E. Mutuma, V. W .Wa	asike, E. Njiru, F.M. Wandera, C.N. Ondiko, A.O.	
scientists	Esilaba		
Partner organizations	County government, Private Publ	lic Partnerships, FAO. IITA	
GAPS			

- Identification of the most s
- Identification of the most suitable diversified crop rotations and suitable crops for biomass for the different counties.
- Development of suitable conservation agriculture implements/field equipment prototypes.
- Capacity building on the benefits and operationalization of Conservation Agriculture systems both among extension and technical staff, and at decision-making levels:

2.6.9. Coconuts and Agree	oforestry	
Category (i.e. technology, innovation or management practice)	Management Practice	
A: Description of the technology innovation or management practice		
Problem addressed:	Soil moisture loss, reduced soil fertility, soil loss through surface run off, high weed prevalence.	
description)	around or among crops or pasturelands. There are three classes of agro-forestry practice namely:	
	 Agrisilviculture: Is growing of trees and agriculture crops together in same lands at the same time Silvipastoral system: Is growing of trees and grasses or forage species together in same lands at the same time Agrisilvipastoral system: Is growing of trees, agriculture crops and grasses together in same lands at the same time Agroforestry aims to develop a symbiotic relationship to achieving agronomic gain on a given piece of land by making use of resources or ecological processes present 	
Justification	Climate change is negatively impacting agricultural productions. Farmers are	

2.6.9. Coconuts and Agroforestry		
	experiencing low yields, crop failures, declined soil fertility and generally low farm returns from their investments. Agroforestry is one of the potential management practice of enhancing climate change adaptation. It offers the potential to increase yield, enhance soil fertility/biodiversity increase nutrient cycling and availability, reduce of run off and soil erosion losses, improve soil organic matter, retain nutrients in soils and maintain favourable soil physical properties including using nitrogen fixing agroforestry species that substantially increase nitrogen inputs in the soil.	
B: Assessment of dissemina	ition and scaling up/out approaches	
Approaches to be used in dissemination	Demonstrations, Agricultural shows and Extension services.	
Critical/essential factors for successful promotion	 Awareness creation on the benefits and contribution of the practice to all stakeholders Easy access of legume varieties that are compatible with potatoes 	
	• Technical packages describing appropriate schedules of planting intercrop.	
Partners/stakeholders for scaling up and their roles	 Package on fertilizer rates and regimes under the practice County governments – to provide extension services, farmer mobilization and policy formulation NGOs to provide support on capacity building and micro-financing services 	
C: Current situation and fu	ature scaling up	
Counties where already promoted		
Counties where TIMP will be upscaled	Kilifi	
Challenges in dissemination	 Limited access and wide distribution of clean planting materials (intercrop varieties) Inadequate access of technical materials on the establishment, operations and management of intercrop management practice by farmers The increased effects of climate change hindering adoption. Farmer high poverty levels coupled with illiteracy especially in deep rural areas of Kenya 	
Suggestions for addressing the challenges	 Enhance access of clean planting materials across the counties. Work closely with certified seed merchants, research institutions Train and sensitize farmers on the basic principles of intercropping, their benefits and types suitable to their contexts. Use farmer field schools and demonstrations Develop a comprehensive manual on the practice to guide the farmers during the adoption 	
Lessons learned in up- scaling, if any	 The practice is very important in pest management. Farmers can use a trap crop to attract pests, keeping them away from the main crop. Therefore, farmers can easily adopt this method to significantly cut down on pesticides input costs The number of ecological benefits provided by this practice can also accelerate up scaling. Agroforestry promotes interactions between crops and pollinators, thus supporting biodiversity and wildlife species 	
Social, environmental, policy and market conditions necessary	 Socially accepted by both male and female gender. The practice is environmentally friendly as it enhances biodiversity, controls erosion and minimizes use of pesticides 	
D. Economic, gender, vuin	crabic and marginalized groups (vivids) considerations	

2.6.9. Coconuts and Agroforestry		
Basic costs	This is a low cost management practice though technically demanding especially	
	where the objective is to control pest through agroforestry	
Estimated returns	Always higher than initial investment costs	
Gender issues and concerns	• The practice integrates participation of both male and female gender roles during	
in development,	field implementation	
dissemination	• It is important to know the demands of the technology product end users for ease	
	of acceptability	
	• Gender disparities in access to information may impact on adoption decisions.	
~	Access to information is a pre-requisite for informed decisions on adoption.	
Gender related	Agroforestry offers good opportunities to both men and women to grow diverse crops	
opportunities	for economic gains and at the same time offers enhanced biodiversity benefits	
VMG issues and concerns	The technology can be practiced using locally available and low cost materials and	
in development,	hence enhances adoption by the vulnerable and marginalized farmers/users.	
dissemination, adoption	However, for optimized benefits, the availability of the required inputs like clean	
and scamg up	group of people	
VMG related opportunities	Agroforestry amphasises importance of using available land to grow a diverse of	
V WO related opportunities	food increase biodiversity pest management thus the practice is economically	
	viable. The practice is available and cost effective to the advantage of VMG.	
E: Case studies/profiles of s	success stories	
Success stories		
Application guidelines for	• Agroforestry systems aim at improving the overall economics of the farm. It is	
users	for this reason any agroforestry idea should first be tested on a relatively small	
	area for evaluations	
	• Observe careful timing of field operations (sometimes necessitating special	
	interventions) to keep competition between the crops and tree species in balance	
	• A mixture of crops with different growth forms or timing of development may	
	make cultivation and use of mulches more difficult and less effective	
	• Planting crops in alternate rows or strips greatly simplifies management and	
	captures some of the benefits of agroforestry in pest control	
F: Status of TIMP readiness (Ready for upscaling: Requires Ready for up-scaling		
validation; Requires further i	research	
G: Contacts		
Contacts	Director, Environment & Natural Resources, KALRO Secretariat	
Lead organization and	KALRO, P. Ketiem, E. Mutuma, M. Okoti, , D. Kamau, A.O. Esilaba, F. M.	
scientists	Wandera, C.N. Ondiko	
Partner organizations	County governments, ICRAF, KEFRI, KFS	
GAPS		
• Little information	tion on the interactions of various crops and agroforestry tree species	
especially in th	e humid and sub humid.	

• Limited knowledge on resource-use efficiency particularly in regions prone to soil erosion

2.6.10. Drip irrigation systems for small scale farmers	
Category (i.e. technology,	Technology
innovation or management	
practice)	

2610 Drin irrigation sys	tems for small scale farmers
	The first of state functs Image: State function Image: State function
A: Description of the techn	ology, innovation or management practice
Problem addressed	Crop water stress caused by seasonal rainfall variability in rain fed production.
What is it? (TIMP description)	Supplementation of water in crop production systems that 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). 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.
Justification	The impact of climate change (seasonal rainfall variability and drought) to crop production is a real threat to food security. Adoption of drip irrigation systems into coconut production provides the opportunity for farmers to enhance crop resilience, increase yields and incomes.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Model Farmers, extension staff, universities
Approaches used in dissemination	 Field days Farmer field and business schools Brochures, posters, fliers Training workshops Farmer to farmer On farm and on station demonstration
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	Makueni, Bomet, Kajiado, Machakos, Lamu,
Counties where TIMP will be promoted	Kilifi
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

2.6.10. Drip irrigation systems for small scale farmers		
	• Limited knowledge on the drip irrigation technology and its management	
Recommendations for	• Model farmer demonstration would create awareness and willingness to invest on	
addressing the challenges	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 drin irrigation system 	
Lessons learned	 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,	Capacity building for increased awareness	
policy and market	Policy support for increased investments in Drip irrigation systems	
conditions necessary	• The water quality should be known to adjust the drip systems to avoid clogging	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	Inputs materials include water source, drip lines, drippers, pump unit, filtering and fertilizing systems. ¹ / ₄ acre costs between KES 50, 000 to KES 100,000.	
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 are available for other competing	
	needs (domestic, livestock or industrial).	
Gender issues and concerns	• Drip systems are easily installed and therefore suitable for both male and female	
in development,	gender	
dissemination, adoption	• Drip system reduces workload for all gender and provides significant positive impact on family food and putritional inteka	
and scaling up	• Woman are extensively involved in most horticultural farming enterprises (i.e.	
	vegetable farming) under the drin-irrigation systems. This may increase their	
	labor hours	
	• Acceptable and easy to scale up by both male and female, including youth	
Gender related	Opportunities available for women and men to generate sustainable income	
opportunities		
VMG issues and concerns	The technology fits well with the VMGs and easily installed and manageable, thus	
in development,	improving nutrition for the VMG.	
dissemination, adoption		
and scaling up		
VMG related opportunities	Drip technology reduces the workload to VMGs and provides an opportunity to make business because they are mostly done on high value crops	
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	• Isaya V. Sijali, 2001. Drip Irrigation: Options for smallholder farmers in eastern	
users	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	

2.6.10. Drip irrigation systems for small scale farmers		
	DRR Implementers. Rome: Food and Agriculture Organization of the United	
	Nations (FAO). http://www.fao.org/3/a-i3765e.pdf	
F: Status of TIMP read	iness (1. Ready for Up scaling; 2. 1 = Ready for up-scaling	
Requires validation; 3. Requ	ires further research)	
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
Lead organization and	KALRO; P. Radiro	
scientists		
Partner organizations	AMIRAN Kenya, HortiPro, Agro-Irrigation, Aqua-Valley Services Ltd, Davis &	
	Shirtliff, Micro finance institutions (MFIs) e.g. MESPT, KEPHIS, MoALDF, NOCD	

GAPS

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

2.7 CROP HEALTH INTEGRATED MANAGEMENT OF PESTS

2.7.1. Integrated Management of Rhinoceros beetle in Coconut

Category (i.e. technology, innovation or management practice)





Adult Rhinoceros Beetle

A: Description of the technology, innovation or management practice		
Low productivity of coconuts due to destruction of coconut plantations at early stage		
of establishment by Rhinoceros beetle.		
Management of Rhinoceros beetle damage through Field hygiene, splitting and		
burning old coconut trunks and keeping field clear of refuse and trash		
Trapping the beetle using a pheromone as an attractant.		
The adult flies at night to palms and bores into the spear leaf, cutting and chewing the young unopened leaves. The leaves continue to develop and when they unfold show the characteristic V-shaped damage		
If the whole growing point is eaten, palm usually dies, particularly young palms less than four years old. It is a serious pest in plantations where field sanitation is neglected.		
ation and scaling up/out approaches		
Producers, extension agents,		
• On-farm and on-station research trials, demonstrations and farmer field schools		
Training workshops, seminars, meetings		
Field days		

2.7.1. Integrated Management of Rhinoceros beetle in Coconut		
Critical/essential factors	 Agricultural shows MoALFC/Extension officers Farmer research networks Farmer to farmer sessions Mass media – Agricultural programs Promotional materials Digital platforms Mobile phone agricultural apps and platforms Agricultural innovation platforms Research to test, validate and release improved coconut varieties with superior vialds and available. 	
for successful promotion	 A platform for interaction for all cowpea value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks 	
Partners/stakeholders for scaling up and their roles	 KALRO to continually undertake research in pest management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of pesticides Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators 	
C: Current situation and f	uture scaling up	
Counties where already promoted if any	Kwale, Kilifi, Tana-River, Lamu, Taita-Taveta	
Counties where TIMP will be up scaled	Kwale, Kilifi, Tana-River, Lamu, Taita-Taveta, Makueni, Tharaka Nithi, Busia and Homa Bay	
Challenges in dissemination	 Limited number of farmer groups Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders 	
Suggestions for addressing the challenges	 Establish coconut innovation platforms 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	 Adoption of good agricultural practices by the producers is key in management of the pest and diseases 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 development and up scaling	 Regulatory bodies (PCPB, KEBS [Kenya Bureau of Standards] to ensure pest control products sold to farmers are genuine and of high quality The producers are willing to adopt the integrated pest and 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, vuln	erable and marginalized groups (VMGs) considerations	

2.7.1. Integrated Management of Rhinoceros beetle in Coconut		
Basic costs	KES 5000 /acre for labour and pheromone trap costs	
Estimated returns	Gross margin KES 107,325 per acre per season in 8 th year	
Gender issues and concerns in development ,dissemination, adoption and scaling up	 Access and control of land for women is limited Some integrated pest management practices e.g. application of pesticides are not conducive for the elderly 	
Gender related opportunities	 Youth can provide labour for practices such as insecticide application (Spray teams), sanitary and hygiene maintenance of the coconut orchards Potential to create employment along the value chain e.g. agro chemical dealers, spray application services 	
VMG issues and concerns in development, dissemination, adoption	 Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Lack of knowledge in the registration of VMGs and proper functionalities of the 	
and scaling up	groupLow access to credit facilities for the VMGs	
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.	
E: Case studies/profiles of success stories		
Success stories from previous similar projects	 Farmers in Kwale, Kilifi, Tana-River, Lamu and Taita-Taveta have adopted the cultural management practices. Farmers in Kwale, Kilifi and Taita Taveta have adopted the pheromone trapping technology 	
Application guidelines for users	Plantwise Knowledge Bank	
F: Status of TIMP readiness (2-ready for upscaling Ready for up scaling		
G. Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI. Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
Lead organization and scientists	KALRO, Kori N., Otipa M., Wasike, V., Mwaura S., Too A., Gathambiri C.	
Partner organizations	ICRAF, CABI, KOPPERT Biological Systems, Real IPM	

2.7.2. Integrated management of Termites (Coptotermes formosanus) in Coconut	
Category (i.e. technology, innovation or management practice)	Management practice Management practice Fermite damage on trunk
A: Description of the technology, innovation or management practice	
Problem to be addressed	Destruction of the plantation at early stage of establishment

2.7.2. Integrated management of Termites (Coptotermes formosanus) in Coconut	
What is it? (TIMP description) Justification	 Help termite enemies/ predators (birds, insect predators) to feed on the insects Traditional methods for controlling termites - use of repellent plants such as neem seeds and leaves as mulch; '<i>Mvuga</i>' and '<i>Mwatsa</i>' interplanted in the field Chemicals: Drench soil around the trees, or Swab the affected trunk. Murphy ant killer, Thunder, Sulban and Concord have been used successfully Watering trees well discourages some types of termites When applying mulch avoid direct contact between mulch and tree base Feed on various parts of the crop both in the nursery or field Young plants may die during germination Old trees fall off or die, roots having been eaten off. More damage is during the
D. Aggagment of diggomin	dry season
B: Assessment of dissemina	Dro ducers, expertens
Approaches used in dissemination Critical/essential factors for successful promotion	 On-farm and on-station research trails and demonstrations Training workshops, seminars, meetings Field days Agricultural shows MoALFC/Extension officers Farmer research networks Farmer to farmer Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms Mobile phones FFBS Agricultural innovation platforms Research to test, validate and release improved coconut varieties tolerant to tarmitas infectation
for successful promotion	 termites infestation A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks
Partners/stakeholders for scaling up and their roles	 KALRO to continually undertake research in termites management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of pest control products for pest and disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators
C: Current situation and f	uture scaling up
Counties where already promoted if any	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.
be up scaled	
Challenges in dissemination	 Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of coconut innovation platforms to facilitate interaction of farmers with

2.7.2. Integrated management of Termites (Coptotermes formosanus) in Coconut		
	relevant stakeholders	
Suggestions for addressing	Establish coconut innovation platforms	
the challenges	• 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	• Adoption of good agricultural practices by the producers is key in management of	
scaling if any	the diseases	
	• Chances of successful scaling are higher when diverse value chain stakeholders	
	Collaborate in an innovation platform	
	• Partnersmp is important in technology dissemination and adoption and this can be facilitated through innovation platforms	
Social, environmental,	• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are	
policy and market	genuine and of high quality	
conditions necessary for	Producers willing to adopt the disease management practices	
development and up	• Producers are organized in groups to ensure that management practices are	
scaling	effectively up-scaled	
	Farm input costs are within the reach of farmers.	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 2,500 /acre for labour and termiticide cost	
Estimated returns	Gross margin KES 107, 325 per acre per season in 8 th year	
Gender issues and concerns	Access and control of land for women is limited	
in development	Some integrated pest management practices e.g. application of fungicides are not	
,dissemination, adoption	conducive for the elderly	
and scaling up		
Gender related	• Youth can provide labour for practices such as insecticide application	
opportunities	• Potential to create employment along the value chain e.g. agro chemical dealers,	
VMG issues and concorns	spray application services	
in development	• Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG	
dissemination, adoption	 Low access to credit facilities 	
and scaling up	Low access to creat facilities	
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.	
E: Case studies/profiles of success stories		
Success stories from	Farmers in Muranga, Kirinyanga, Embu and Meru have adopted the management	
previous similar projects	practice.	
Application guidelines for	Plantwise Knowledge Bank	
users		
F: Status of TIMP reading	ess (1-ready for upscaling; 2-requires Ready for up scaling	
validation; 0-requires further research)		
G. Contacts		
Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi	
	Email: <u>cd.narl@kalro.org</u> , Phone: 0727624471	
Lead organization and	KALRO	
scientists	Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.	
Partner organizations	ICRAF, CABI, KOPPERT Biological Systems, Real IPM	

2.7.3. Integrated Manag	ement of Correid bug (<i>Pseudotheraptus wayi</i>) in coconut
Category (i.e. technology,	Management practice
innovation or management practice)	
	Damage by Coreid bug
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	High infestation of young coconut fruits by Coreid bug, low productivity of coconuts
	due to abiotic stress, poor quality nuts. Badly scarred and gumming nuts and small
	nuts with less copra and poor husk quality.
What is it? (TIMP	Biological and chemical control of Correid bug
description)	• Biological: Red weaver ants "Majimoto" are natural predators. Encourage
	predators by intercropping coconut with citrus
	• Chemical control: spray on the inflorescence after the receptive phase of the formula flowers with an appropriate shamical a a Imidaehlarid
Instification	This is an insect that sucks can from young puts and even cashew puts. They can
Justification	cause damage of 80-90% of the total crop. The nymphs and adults suck young
	nuts that are 1-5 months old leading to:
	 Premature nut fall, badly scarred and gumming nuts small nuts with less copra
	and poor husk quality enhanced.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Producers, exporters
Approaches used in	On-farm and on-station research trails and demonstrations
dissemination	Training workshops, seminars, meetings
	• Field days
	Agricultural shows
	MoALFC/Extension officers
	• Farmer research networks
	• Farmer to farmer
	Mass media – Agricultural programs
	Promotional materials (posters/brochures/leaflets, manuals)
	Digital platforms
	Mobile phones
	• FFBS
	Agricultural innovation platforms
Critical/essential factors	Research to test validate and release improved coconut varieties
for successful promotion	• A platform for interaction of coconut value chain stakeholders
	Adoption of appropriate agronomic practices
	Well organized farmer groups and networks
rarmers/stakenoiders for	• KALKO to continually undertake research in disease management
scaning up and then roles	• KEPHIS to ensure seeding quality is maintained
	FORD to promote registration of pesticides for disease management Earmore/farmor groups to adopt the technologies
	• Farmers/farmer groups to adopt the technologies

2.7.3. Integrated Management of Correid bug (<i>Pseudotheraptus wayi</i>) in coconut	
	• County governments, central governments for development of enabling policies
	and create awareness
	Financial institutions to provide credit facilitators
C: Current situation and fu	iture scaling up
Counties where already	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.
Counties where TIMP will	Kilifi
be up scaled	Kiili
Challenges in	• Limited knowledge by farmers on integrated pest management
dissemination	Limited number of farmer groups
	• Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders
Suggestions for addressing	Establish coconut innovation platforms
the challenges	• 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	• Adoption of good agricultural practices by the producers is key in management of
scaling if any	the diseases
	• Chances of successful scaling are higher when diverse value chain stakeholders
	 Partnership is important in technology dissemination and adoption and this can be
	facilitated through innovation platforms
Social, environmental,	• Regulatory bodies e.g. PCPB, KEBS to ensure pest control products sold to
policy and market	farmers are genuine and of high quality
conditions necessary for	Producers willing to adopt the disease management practices
development and up	• Producers are organized in groups to ensure that management practices are
scaling	effectively up-scaled
	Farm input costs are within the reach of farmers
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	KES 2,500 /acre for labour and insecticide cost
Estimated returns	Gross margin 107,325 per ha per season in 8 th year
Gender issues and concerns	Access and control of land for women is limited
in development	• Some integrated pest management practices e.g. application of fungicides are not
, dissemination, adoption	conducive for the elderly
Gander related	• Vouth can grouide labour for anotices such as incesticide analization
opportunities	 Four can provide rabour for practices such as insecticide application Botantial to graate apployment along the value chain a grager chamical dealers.
opportunities	• Potential to create employment along the value chain e.g. agro chemical dealers, spray application services
VMG issues and concerns	• Some of the pest integrated management practices such as pruning, spraying is
in development,	difficult to undertake for VMG
dissemination, adoption	Low access to credit facilities
and scaling up	
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.
E: Case studies/profiles of success stories	
Success stories from	Farmers in Muranga, Kirinyanga, Embu and Meru have adopted the management
previous similar projects	practice.

2.7.3. Integrated Management of Correid bug (<i>Pseudotheraptus wayi</i>) in coconut	
Application guidelines for	Plantwise Knowledge Bank
users	
F: Status of TIMP readiness (1-ready for upscaling;, 2-requires Ready for up scaling	
validation; 3-requires further	research)
G. Contacts	
Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi
	Email: cd.narl@kalro.org, Phone: 0727624471
Lead organization and	KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.
scientists	
Partner organizations	ICRAF, CABI, KOPPERT Biological Systems, Real IPM

2.7.4. Integrated management Mealybugs in Coconut	
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Yield loss
What is it? (TIMP	Conservation of Mealybugs natural enemies. Mealybugs are usually controlled by a
description)	wide range of natural enemies. However, use of pesticides may kill these natural
	enemies leading to mealybug outbreaks.
Justification	Infested plants may wilt due to sap depletion; leaves turn yellow, gradually dry and
	with low market value, or unaccentable for the fresh fruit market
B • Assessment of disseming	with low market value, of unacceptable for the fresh fruit market.
D. Assessment of dissemina	Producers exporters
Approaches used in	Producers, exporters
dissemination	On-farm and on-station research trails and demonstrations Training workshops, cominger, mostings
dissemination	 Field days
	 Field days Agricultural shows
	 MoALEC/Extension officers
	 Farmer research networks
	 Farmer to farmer
	 Mass media – Agricultural programs
	• Promotional materials (posters/brochures/leaflets, manuals)
	• Digital platforms
	Mobile phones
	• FFBS
	Agricultural innovation platforms
Critical/essential factors	Research to test validate and release improved cowpea varieties

2.7.4. Integrated management Mealybugs in Coconut		
for successful promotion	• A platform for interaction of coconut value chain stakeholders	
	Adoption of appropriate agronomic practices	
	Well organized farmer groups and networks	
Partners/stakeholders for	• KALRO to continually undertake research in disease management	
scaling up and their roles	• KEPHIS to ensure seedling quality is maintained	
	• PCPB to promote registration of pesticides for pest and disease management	
	• Farmers/farmer groups to adopt the technologies	
	• County governments, central governments for development of enabling policies	
	and create awareness	
C. Current situation and f	• Financial institutions to provide credit facilitators	
C: Current situation and it		
promoted if any	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.	
Counties where TIMP will	Kilifi	
be up scaled		
Challenges in	• Limited knowledge by farmers on integrated pest management	
dissemination	• Limited number of farmer groups	
	• Lack of cowpea innovation platforms to facilitate interaction of farmers with	
	relevant stakeholders	
Suggestions for addressing	Establish coconut innovation platforms	
the challenges	• Dissemination of integrated pest management practices and safe use of pesticides	
	• Promote appropriate marketing channels e.g. contract farming, collective	
.	production and marketing	
scaling if any	• Adoption of good agricultural practices by the producers is key in management of the diseases	
	• 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,	• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are	
policy and market	genuine and of high quality	
conditions necessary for	Producers willing to adopt the disease management practices	
development and up	• Producers are organized in groups to ensure that management practices are	
scanng	effectively up-scaled	
	• Farm input costs are within the reach of farmers.	
D: Economic, gender, vuin	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 3000 /acre for labour and insectides cost	
Estimated returns	Gross margin KES 107,325 per acre per season in 8 th year	
Gender issues and concerns	• Access and control of land for women is limited	
dissemination adoption	• Some integrated pest management practices e.g. application of fungicides are not	
and scaling up		
Gender related	• Youth can provide labour for practices such as insecticide application	
opportunities	 Potential to create employment along the value chain e.g. agro chemical dealers. 	
"Protonico	spray application services	
VMG issues and concerns	• Some of the pest integrated management practices such as pruning spraying is	
in development,	difficult to undertake for VMG	
dissemination, adoption		

2.7.4. Integrated management Mealybugs in Coconut		
and scaling up	Low access to credit facilities	
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.	
E: Case studies/profiles of success stories		
Success stories from	Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted	
previous similar projects	the management practice.	
Application guidelines for	Plantwise Knowledge Bank	
users		
F: Status of TIMP readiness (1-ready for upscaling;, 1-requires Ready for up scaling		
validation; 0-requires further research)		
G. Contacts		
Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi	
	Email: <u>cd.narl@kalro.org</u> Phone: 0727624471	
Lead organization and	KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.	
scientists		
Partner organizations	ICRAF, CABI, KOPPERT Biological Systems, Real IPM	

2.7.5. Integrated management of coconut scale (Aspidiotus destructor) in Coconut	
Category (i.e. technology,	Management practice
innovation or management practice)	Infestation of scales on coconut
A: Description of the technology, innovation or management practice	
Problem to be addressed	Yield loss
What is it? (TIMP	Management of coconut scale through:
description)	 Conservation of natural enemies. They usually keep scales under control. Ladybird beetles and parasitic wasps are particularly effective in controlling the coconut scale Avoiding or restricting movement of infested plants in areas where the coconut scale is not a problem to avoid spread of the scale
	 Destroying infested plants and plant parts. This may help to eradicated scales from new areas. However, this scale is difficult to eradicate due to its wide host range Providing good growing conditions for the palms. Healthy palms in well-drained
	soils are seldom seriously infested.
Justification	Intested plants may wilt due to sap depletion; leaves turn yellow, gradually dry and ultimately fall off. Feeding on nuts results in discoloured, bumpy, and scarred nuts, with low market value, or unacceptable for the fresh fruit market.

2.7.5. Integrated management of coconut scale (Aspidiotus destructor) in Coconut		
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Producers, exporters	
Approaches used in	On-farm and on-station research trails and demonstrations	
dissemination	Training workshops, seminars, meetings	
	• Field days	
	Agricultural shows	
	MoALFC/Extension officers	
	• Farmer research networks	
	• Farmer to farmer	
	Mass media – Agricultural programs	
	Promotional materials (posters/brochures/leaflets, manuals)	
	Digital platforms	
	Mobile phones	
	• FFBS	
	Agricultural innovation platforms	
Critical/essential factors	Research to test validate and release improved coconut varieties	
for successful promotion	• A platform for interaction of coconut value chain stakeholders	
	Adoption of appropriate agronomic practices	
	Well organized farmer groups and networks	
Partners/stakeholders for	KALRO to continually undertake research in disease management	
scaling up and their roles	• KEPHIS to ensure seedling quality is maintained	
	PCPB to promote registration of pesticides for disease management	
	• Farmers/farmer groups to adopt the technologies	
	• County governments, central governments for development of enabling policies	
	and create awareness	
	Financial institutions to provide credit facilitators	
C: Current situation and f	uture scaling up	
Counties where already	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.	
promoted if any		
Counties where TIMP will	Turkana	
be up scaled		
Challenges in	• Limited knowledge by farmers on integrated pest management	
dissemination	Limited number of farmer groups	
	• Lack of coconut innovation platforms to facilitate interaction of farmers with	
	relevant stakeholders	
Suggestions for addressing	Establish coconut innovation platforms	
the challenges	• 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	• Adoption of good agricultural practices by the producers is key in management of	
scaling if any	the diseases	
	• 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,	• Regulatory bodies e.g. PCPB, KEBS to ensure fungicides sold to farmers are	
policy and market	genuine and of high quality	

2.7.5. Integrated management of coconut scale (Aspidiotus destructor) in Coconut		
conditions necessary for	Producers willing to adopt the disease management practices	
development and up	• Producers are organized in groups to ensure that management practices are	
scaling	effectively up-scaled	
	• Farm input costs are within the reach of farmers.	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 2,500 /acre for labour and insecticide cost	
Estimated returns	Gross margin KES 107,325 per acre per season in 8 th year	
Gender issues and concerns	Access and control of land for women is limited	
in development	• Some integrated pest management practices e.g. application of crop protection	
,dissemination, adoption	products are not ideal for the elderly	
and scaling up		
Gender related	• Youth can provide labour for practices such as insecticide application	
opportunities	• Potential to create employment along the value chain e.g. agro chemical dealers,	
	spray application services	
v MG issues and concerns	• Some of the pest integrated management practices such as pruning, spraying is	
dissemination adoption	annoul to be undertaken by VMG	
and scaling up	• Low access to credit facilities	
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.	
E: Case studies/profiles of success stories		
Success stories from	Farmers in Muranga, Kirinyanga, Embu and Meru have adopted the management	
previous similar projects	practice.	
Application guidelines for	Plantwise Knowledge Bank	
users		
F: Status of TIMP readine	ess (1-ready for upscaling;, 2-requires Ready for up scaling	
validation; 3-requires further	research)	
G. Contacts		
Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi	
	Email: <u>cd.narl@kalro.org</u> , Phone: 0727624471	
Lead organization and	KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.	
scientists		
Partner organizations	ICRAF, CABI, KOPPERT Biological Systems, Real IPM	



2.7.6. Integrated Pest Management of African palm weevils (<i>Rhynchophorus phoenicis</i>) in Coconut		
Problem to be addressed	Destruction of the orchard	
What is it? (TIMP description)	Control for African palm weevil is preventative, using cultural and sanitary methods	
Justification	Damages young palms, yet may also, in exceptional cases, cause damage to mature crops.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Producers, exporters	
Approaches used in	On-farm and on-station research trails and demonstrations	
dissemination	Training workshops, seminars, meetings	
	• Field days	
	Agricultural shows	
	MoALFC/Extension officers	
	• Farmer research networks	
	• Farmer to farmer	
	Mass media – Agricultural programs	
	Promotional materials (posters/brochures/leaflets, manuals)	
	Digital platforms	
	Mobile phones	
	• FFBS	
	Agricultural innovation platforms	
Critical/essential factors	Research to test validate and release improved Coconut varieties	
for successful promotion	• A platform for interaction of coconut value chain stakeholders	
	Adoption of appropriate agronomic practices	
Derthers /stakeholders for	Well organized farmer groups and networks KALPO to continuelly undertake measurely in integrated next and disease	
scaling up and their roles	• KALKO to continuariy undertake research in integrated pest and disease	
seaming up and then roles	• KEPHIS to ensure seedling quality is maintained	
	 PCPB to promote registration of crop health products for disease management 	
	 Farmers/farmer groups to adopt the technologies 	
	 County governments, central governments for development of enabling policies 	
	and create awareness	
	Financial institutions to provide credit facilitators	
C: Current situation and f	iture scaling up	
Counties where already	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta	
promoted if any		
Counties where TIMP will	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta	
be up scaled		
Challenges in	• Limited knowledge by farmers on integrated pest management	
dissemination	Limited number of farmer groups	
	• Lack of coconut innovation platforms to facilitate interaction of farmers with	
	relevant stakeholders	
Suggestions for addressing	Establish coconut innovation platforms	
me chanenges	• Dissemination of integrated pest management practices and safe use of pesticides for guaranteed food safety	
	• Promote appropriate marketing channels e.g. contract farming, collective	
	production and marketing	

Lessons learned in up scaling if any• Adoption of good agricultural practices by the producers is key in management of the diseasesscaling if any• Adoption of good agricultural practices by the producers is key in management of the diseasesscaling if any• Adoption of good agricultural practices by the producers is key in management of the diseasesSocial, environmental, policy and market conditions necessary for development and up scaling• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management practices D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costsKES 2,500 /acre for labour and insecticide costEstimated returnsGross margin KES 107.325 per are per season in 8th yearGender related opportunities• Access and control of land for women is limited • Some integrated pest management practices e.g. application of fungicides are not conducive for the elderly• MG issues and concerns in development , dissemination, adoption and scaling up• Youth can provide labour for practices such as insecticide application • Potential to create employment along the value chain e.g. agro chemical dealers, spray application servicesVMG issues and concerns in development, dissemination, adoption and scaling up• Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories • Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMGVMG issues and concerns in development, dissemination, adoption and s	2.7.6. Integrated Pest Ma	anagement of African palm weevils (<i>Rhynchophorus phoenicis</i>) in Coconut	
scaling if any the diseases scaling if any the diseases 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 development and up scaling P Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality Producers willing to adopt the disease management practices P Producers are organized in groups to ensure that management practices are effectively up-scaled D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 2,500 /acre for labour and insecticide cost Estimated returns Gender issues and concerns in development disease and concerns in development dissemination, adoption and scaling up • Youth can provide labour for practices such as insecticide application of fungicides are not conducive for the elderly Gender related opportunities • Youth can provide labour for practices such as insecticide application of spraying is difficult to undertake for VMG dissemination, adoption and scaling up • Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG vestores from previous similar projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. <t< td=""><td>Lessons learned in up</td><td>• Adoption of good agricultural practices by the producers is key in management of</td></t<>	Lessons learned in up	• Adoption of good agricultural practices by the producers is key in management of	
 Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform Partmership 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 Producers willing to adopt the disease management practices Producers are organized in groups to ensure that management practices are effectively up-scaled Peroducers are organized in groups to ensure that management practices are effectively up-scaled Peroducers are organized in groups to ensure that management practices are effectively up-scaled Farm input costs are within the reach of farmers. DE conomic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107.325 per acre per season in 8th year Gender related Some integrated pest management practices e.g. application of fungicides are not conducive for the elderly Some of the pest integrated management practices such as insecticide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services VMG issues and concerns in dwelopment, dissemination, adoption and scaling up Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories Success stories from practices Plantwise Knowledge Bank Erstatus of TIMP readiness (1-ready for upscaling; 2-requires reson in 27a524471 Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.nart@kalro.org, Phone: 0727624471 	scaling if any	the diseases	
collaborate in an innovation platform• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platformsSocial, environmental, policy and market conditions necessary for development and up scaling• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality • Producers willing to adopt the disease management practices • Some integrated groups (VMGs) considerationsBasic costsKES 2,500 /acre for labour and insecticide costStimated returnsGross margin KES 107.325 per acre per season in 8 th yearGender risues and concerns in development dissemination, adoption and scaling up• Youth can provide labour for practices such as insecticide application • Potential to create employment along the value chain e.g. agro chemical dealers, spray application servicesVMG issues and concerns in development, dissemination, adoption and scaling up• Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG • Low access to credit facilitiesVMG related opportunitiesCan create		• Chances of successful scaling are higher when diverse value chain stakeholders	
• 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 • Regulatory bodies e.g. PCPBP, KEBS 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 • Economic, gender, vuln=rable and marginalized groups (VMGs) considerations • Res 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107.325 per acre per season in 8 th year Gender issues and concerns in development , dissemination, adoption and scaling up • Access and control of land for women is limited • Some integrated pest management practices such as insecticide application of fungicides are not conducive for the elderly • Youth can provide labour for practices such as insecticide application • Potential to create employment along the value chain e.g. agro chemical dealers, spray application services • Some of the pest integrated management practices such as pruning, spraying is difficul to undertake for VMG VMG issues and concrems in development, dissemination, adoption and scaling up • Some of the pest integrated management practices such as pruning, spraying is difficul to undertake for VMG VMG issues and concrems in development, users in Kwale, Killfi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted previous similar projects • So		collaborate in an innovation platform	
Social, environmental, policy and market conditions necessary for development and up scaling Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality Producers willing to adopt the disease management practices Producers willing to adopt the disease 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 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concreming in development, dissemination, adoption and scaling up Youth can provide labour for practices such as insecticide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access to credit facilities Some of the pest integrated management practices such as pruning, spraying is adifficult to undertake for VMG Low access tories Some of the pest integrated management practices such as inserticide application. Ecas studies/profiles of Success		• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms	
policy and market conditions necessary for development and up scaling	Social, environmental,	• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are	
conditions necessary for development and up scaling 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. 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 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concerns in development ,dissemination, adoption and scaling up Access and control of land for women is limited Some integrated pest management practices such as insecticide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services VMG issues and concerns in development, dissemination, adoption and scaling up Vout can provide labour for VMG Low access to credit facilities Low access to credit facilities VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of users Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-T	policy and market	genuine and of high quality	
development and up scaling 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, vuln=rable and marginalized groups (VMGs) considerations Basic costs KES 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concerns in development , dissemination, adoption and scaling up Access and control of land for women is limited Some integrated pest management practices such as insecticide application of fungicides are not conducive for the elderly Some of the pest integrated management practices such as insecticide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services VMG issues and concerns in development, dissemination, adoption and scaling up Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access to credit facilities VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories Success stories from previous similar projects Parmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.	conditions necessary for	 Producers willing to adopt the disease management practices 	
scaling effectively up-scaled • Farm input costs are within the reach of farmers. • Farm input costs are within the reach of farmers. D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concerns in development , dissemination, adoption and scaling up • Access and control of land for women is limited Gender related opportunities • Youth can provide labour for practices such as insecticide application opportunities • Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG VMG issues and concerns in development, dissemination, adoption and scaling up • Low access to credit facilities VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories Success stories Success stories from previous similar projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Application guidelines for users Plantwise Knowledge Bank users The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalno.org, Phone: 0727624471 Lead organization and scientists	development and up	• Producers are organized in groups to ensure that management practices are	
• Farm input costs are within the reach of farmers. D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concerns in development ,dissemination, adoption and scaling up Access and control of land for women is limited Some integrated pest management practices e.g. application of fungicides are not conducive for the elderly Some integrated pest management practices such as insecticide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access to credit facilities Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access tories Success stories Success stories Success stories Success stories from previous similar projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Plantwise Knowledge Bank Settus of TIMP readiness (1-ready for upscaling;, 2-requires leady for up scaling validation; 3-requires further research) G. Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.nart@kalro.org, Phone: 0727624471 Lead organization and scientists Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM<!--</td--><td>scaling</td><td>effectively up-scaled</td>	scaling	effectively up-scaled	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concerns in development , dissemination, adoption and scaling up Access and control of land for women is limited Some integrated pest management practices e.g. application of fungicides are not conducive for the elderly Potential to create employment along the value chain e.g. agro chemical dealers, spray application services VMG issues and concerns in development, dissemination, adoption and scaling up Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access to credit facilities Success stories from projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Plantwise Knowledge Bank Plantwise Knowledge Bank Plantwise Knowledge Bank Status of TIMP readiness (1-ready for upscaling;, 2-requires research) Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scalins and scaling and scal		• Farm input costs are within the reach of farmers.	
Basic costs KES 2,500 /acre for labour and insecticide cost Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concerns in development , dissemination, adoption and scaling up • Access and control of 1and for women is limited Gender related opportunities • Youth can provide labour for practices such as insecticide application of fungicides are not conducive for the elderly VMG issues and concerns in development, dissemination, adoption and scaling up • Youth can provide labour for practices such as insecticide application VMG issues and concerns in development, dissemination, adoption and scaling up • Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Application guidelines for users Plantwise Knowledge Bank vesers F: Status of TIMP readiness (1-ready for upscaling;, 2-requires ready for up scaling validation; 3-requires further research) Ready for up scaling Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scaling waits, V.W., Mwaura S., Too A., Gathambiri C. scientists Parther organization	D: Economic, gender, vulno	erable and marginalized groups (VMGs) considerations	
Estimated returns Gross margin KES 107,325 per acre per season in 8 th year Gender issues and concerns in development ,dissemination, adoption and scaling up Access and control of land for women is limited Some integrated pest management practices e.g. application of fungicides are not conducive for the elderly Some integrated pest management practices e.g. application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access to credit facilities VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Application guidelines for users Plantwise Knowledge Bank F: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research) Ready for up scaling G. Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scientists KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C. Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM	Basic costs	KES 2,500 /acre for labour and insecticide cost	
Gender issues and concerns in development ,dissemination, adoption and scaling up Access and control of land for women is limited Some integrated pest management practices e.g. application of fungicides are not conducive for the elderly Gender related opportunities Youth can provide labour for practices such as insecticide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services VMG issues and concerns in development, dissemination, adoption and scaling up Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access to credit facilities VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories Success stories Success stories from previous similar projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Application guidelines for users Plantwise Knowledge Bank F: Status of TIMP readiness (1-ready for upscaling;, 2-requires) validation; 3-requires further research) Ready for up scaling Gentacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scientists	Estimated returns	Gross margin KES 107,325 per acre per season in 8 th year	
in development ,dissemination, adoption and scaling up Gender related opportunities VMG issues and concerns in development, dissemination, adoption and scaling up VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories Success stories form previous similar projects Application guidelines for users F: Status of TIMP readiness (1-ready for upscaling;, 2-requires) F: Status of TIMP readiness (1-ready for upscaling;, 2-requires) Ready for up scaling validation; 3-requires further research) G. Contacts Contacts Contacts Farmers in KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scientists Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM	Gender issues and concerns	 Access and control of land for women is limited 	
dissemination, adoption and scaling upconducive for the elderlyGender related opportunities• Youth can provide labour for practices such as insecticide application • Potential to create employment along the value chain e.g. agro chemical dealers, spray application servicesVMG issues and concerns in development, dissemination, adoption and scaling up• Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG • Low access to credit facilitiesVMG related opportunitiesCan create employment for VMG across the all segments of the value chain.E: Case studies/profiles of success storiesSuccess stories from previous similar projectsFarmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.Application guidelines for usersPlantwise Knowledge BankF: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research)Ready for up scaling validation; 3-requires further researchContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C. scientistsPartner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	in development	• Some integrated pest management practices e.g. application of fungicides are not	
and scaling up • Youth can provide labour for practices such as insecticide application opportunities • Youth can provide labour for practices such as insecticide application opportunities • Potential to create employment along the value chain e.g. agro chemical dealers, spray application services VMG issues and concerns in development, dissemination, adoption and scaling up • Low access to credit facilities VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories • Some of the past integrated management practice, the management practice. Success stories from previous similar projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Application guidelines for users Plantwise Knowledge Bank users Plantwise Knowledge Bank G. Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scientists KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C. scientists Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM	,dissemination, adoption	conducive for the elderly	
Gender related opportunities• Youth can provide labour for practices such as insecticide application • Potential to create employment along the value chain e.g. agro chemical dealers, spray application servicesVMG issues and concerns in development, dissemination, adoption and scaling up• Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG • Low access to credit facilitiesVMG related opportunitiesCan create employment for VMG across the all segments of the value chain.E: Case studies/profiles of success storiesSuccess stories from previous similar projectsSuccess stories from usersFarmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.Application guidelines for usersPlantwise Knowledge BankG. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	and scaling up		
opportunities• Potential to create employment along the value chain e.g. agro chemical dealers, spray application servicesVMG issues and concerns in development, dissemination, adoption and scaling up• Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMGVMG related opportunitiesCan create employment for VMG across the all segments of the value chain.E: Case studies/profiles of success storiesSuccess stories from previous similar projectsSuccess stories from usersPlantwise Knowledge BankF: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research)Ready for up scalingG. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsICRAF, CABI, KOPPERT Biological Systems, Real IPM	Gender related	 Youth can provide labour for practices such as insecticide application 	
VMG issues and concerns in development, dissemination, adoption and scaling up • Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG • Low access to credit facilities • Low access to credit facilities • VMG related opportunities Can create employment for VMG across the all segments of the value chain. E: Case studies/profiles of success stories • Some of the management practice. Success stories from previous similar projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Application guidelines for users Plantwise Knowledge Bank F: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research) Ready for up scaling G. Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scientists KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C. Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM	opportunities	• Potential to create employment along the value chain e.g. agro chemical dealers, sprav application services	
in development, dissemination, adoption and scaling up - Low access to credit facilities - Low access the all segments of the value chain	VMG issues and concerns	• Some of the pest integrated management practices such as pruning, spraving is	
dissemination, adoption and scaling up• Low access to credit facilitiesVMG related opportunitiesCan create employment for VMG across the all segments of the value chain.E: Case studies/profiles of success storiesSuccess stories from previous similar projectsSuccess stories from previous similar projectsFarmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.Application guidelines for usersPlantwise Knowledge BankF: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research)Ready for up scalingG. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	in development,	difficult to undertake for VMG	
and scaling upCan create employment for VMG across the all segments of the value chain.E: Case studies/profiles of success storiesSuccess stories from previous similar projectsFarmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.Application guidelines for usersPlantwise Knowledge BankPlantwise Knowledge BankF: Status of TIMP readiness (1-ready for upscaling; 2-requires validation; 3-requires further research)Ready for up scalingG. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	dissemination, adoption	• Low access to credit facilities	
VMG related opportunitiesCan create employment for VMG across the all segments of the value chain.E: Case studies/profiles of success storiesFarmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.Success stories from previous similar projectsFarmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.Application guidelines for usersPlantwise Knowledge BankF: Status of TIMP readiness validation; 3-requires further research)Ready for up scaling (1-ready for upscaling;, 2-requires)G. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	and scaling up		
E: Case studies/profiles of success stories Success stories from previous similar projects Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Application guidelines for users Plantwise Knowledge Bank F: Status of TIMP readimess (1-ready for upscaling;, 2-requires validation; 3-requires further research) Ready for up scaling G. Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scientists KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C. Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM	VMG related opportunities	Can create employment for VMG across the all segments of the value chain.	
Success stories from previous similar projectsFarmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice.Application guidelines for usersPlantwise Knowledge BankF: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research)Ready for up scalingG. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	E: Case studies/profiles of success stories		
previous similar projectsthe management practice.Application guidelines for usersPlantwise Knowledge BankF: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research)Ready for up scalingG. ContactsContactsContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	Success stories from	Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted	
Application guidelines for usersPlantwise Knowledge BankF: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research)Ready for up scalingG. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	previous similar projects	the management practice.	
usersReady for up scaling validation; 3-requires further research)Ready for up scaling Ready for up scalingG. ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	Application guidelines for	Plantwise Knowledge Bank	
F: Status of TIMP readiness (1-ready for upscaling;, 2-requires validation; 3-requires further research) Ready for up scaling G. Contacts The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Contacts Email: cd.narl@kalro.org, Phone: 0727624471 Lead organization and scientists KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C. Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM	users		
G. ContactsContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C. Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	F: Status of TIMP reading validation; 3-requires further	research) Ready for up scaling	
ContactsThe Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	G. Contacts		
Email: cd.narl@kalro.org, Phone: 0727624471Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi	
Lead organization and scientistsKALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.Partner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM		Email: <u>cd.narl@kalro.org</u> , Phone: 0727624471	
scientistsPartner organizationsICRAF, CABI, KOPPERT Biological Systems, Real IPM	Lead organization and	KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.	
Partner organizations ICRAF, CABI, KOPPERT Biological Systems, Real IPM	scientists		
	Partner organizations	ICRAF, CABI, KOPPERT Biological Systems, Real IPM	

2.7.7. Integrated Management of Bole rot disease (Marasmielus infescocophilus) in Coconut	
Category (i.e. technology,	Management practice
innovation or management	
practice)	

2.7.7. Integrated Manag	ement of Bole rot disease (<i>Marasmielus infescocophilus</i>) in Coconut
	Bole rot disease
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Disease caused by the Basidiomycete (Marasmiellus cocophilus). It mostly affects
	the young palms of the tall variety that are less than 8 years old.
	The disease has caused some substantial deaths to coconut palms in the coastal
What is it? (TIMD	Destroying of offseted trees by huming
what is it? (I IMP description)	Destroying of affected trees by burning.
description	
	• selection of seedlings in nurseries and subsequent transplanting should be done as early as possible
	• During transportation, handle the seedlings carefully, prune and disinfect
	damaged roots.
	• Avoid obtaining seedlings from affected areas.
	Carry out periodic soil sterilization of nurseries
	• Avoid cultivation in between palms, where disease is present.
Justification	Destruction of the orchard.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Producers, exporters
Approaches used in	On-farm and on-station research trails and demonstrations
dissemination	Training workshops, seminars, meetings
	• Field days
	Agricultural shows
	MoALFC/Extension officers
	Farmer research networks
	 Farmer to farmer Mass modia A priority type programs
	 Mass media – Agricultural programs Promotional materials (nosters/brochures/leaflets, manuals)
	 Digital nlatforms
	 Mobile phones
	• FFBS
	Agricultural innovation platforms
Critical/essential factors	Research to test validate and release improved coconut varieties
for successful promotion	• A platform for interaction of coconut value chain stakeholders
	Adoption of appropriate agronomic practices
	Well organized farmer groups and networks
Partners/stakeholders for	KALRO to continually undertake research in disease management
scaling up and their roles	• KEPHIS to ensure seedling quality is maintained
	PCPB to promote registration of fungicides for disease management
	Farmers/farmer groups to adopt the technologies

2.7.7. Integrated Manag	ement of Bole rot disease (<i>Marasmielus infescocophilus</i>) in Coconut
	• County governments, central governments for development of enabling policies
	and create awareness
C. Current situation and f	Financial institutions to provide credit facilitators
C: Current situation and f	Iture scaing up
counties where already	Kwale, Kiliff, Mombasa, Tana-River, Lamu, Taita-Taveta.
Counties where TIMP will	Turkana
be up scaled	
Challenges in	 Limited knowledge by farmers on integrated pest management
dissemination	 Limited knowledge by farmers on integrated pest management Limited number of farmer groups
	• Lack of coconut innovation platforms to facilitate interaction of farmers with
	relevant stakeholders
Suggestions for addressing	Establish coconut innovation platforms
the challenges	• Dissemination of integrated pest management practices and safe use of pesticides
	• Promote appropriate marketing channels e.g. contract farming, collective
Lessons lessmed in sur	production and marketing
caling if any	• Adoption of good agricultural practices by the producers is key in management of the diseases
seaming 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,	• Regulatory bodies e.g. PCPB, KEBS to ensure pest control products sold to
policy and market	farmers are genuine and of high quality
conditions necessary for	• Producers willing to adopt the disease management practices
scaling	• Producers are organized in groups to ensure that management practices are officially up scaled
	 Farm input costs are within the reach of farmers
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	KES 2.500 /acre for labour and fungicides cost
Estimated returns	Gross margin KES 107325 per acre per season in 8 th year
Gender issues and concerns	Access and control of land for women is limited
in development	 Some integrated pest management practices e.g. application of fungicides are not
,dissemination, adoption	conducive for the elderly
and scaling up	
Gender related	• Youth can provide labour for practices such as insecticide application
opportunities	• Potential to create employment along the value chain e.g. agro chemical dealers,
	spray application services
v MG issues and concerns	• Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMC
dissemination adoption	Low access to credit facilities
and scaling up	
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.
E: Case studies/profiles of	success stories
Success stories from	Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta. have adopted
previous similar projects	the management practice.

2.7.7. Integrated Management of Bole rot disease (Marasmielus infescocophilus) in Coconut		
Application guidelines for	Plantwise Knowledge Bank	
users		
F: Status of TIMP readiness (1-ready for upscaling;, 1-requires Ready for up scaling		
validation; 0-requires further	research)	
G. Contacts		
Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi	
	Email: <u>cd.narl@kalro.org</u> , Phone: 0727624471	
Lead organization and	KALRO, Kori N., Otipa M.J., Wasike, V.W., Mwaura S., Too A., Gathambiri C.	
scientists		
Partner organizations	ICRAF, CABI, KOPPERT Biological Systems, Real IPM	

2.7.8. Integrated pest ma	anagement Lethal Yellowing Disease (Phytoplasma) in Coconut
Category (i.e. technology,	Management practice
innovation or management practice)	Image: Contract of the second seco
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Destruction of the orchard. High prevalence's of the vector (leafhopper) within a
	region and the existence of alternative host plants that act as breeding grounds for the vector contribute to the rapid spread of the disease.
What is it? (TIMP	An integrated pest management of Lethal Yellowing Disease
description)	No known control measures
	 Use genetically resistant ecotypes ("Malayan Yellow Dwarf") and hybrids ("Malayan Yellow Dwarf" x "Panama Tall"). This is the only practical long-term solution to lethal yellowing Avoid movement of planting materials from affected areas, and cut down and
	destroy affected trees
Justification	Destruction of the orchard. Lethal yellowing in palms is a disease that is caused by a pytoplasma and vectored by <i>Auchenorryncha Homoptera</i> (Plant hoppers).
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Producers, exporters
Approaches used in	On-farm and on-station research trails and demonstrations
dissemination	Training workshops, seminars, meetings
	Field days

 Agricultural shows MoALFC/Extension officers Farmer to farmer Mask media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms Mobile phones FFBS Agricultural innovation platforms Critical/essential factors Research to test validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for KALPNIS to ensure seeding quality is maintained PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Cc Current situation and future scaling up Counties where TIMP will be up scaled Lack of cowpea innovation platforms Lack of cowpea innovation platforms Establish cowpea innovation platforms Establish cowpea innovation platforms Establish cowpea innovation platforms Adoption of good agricultural practices by the producers is key in management of the diseases Pormotes of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Resultator of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Resputatory bordies e.g. PCPB7, KEBS to ensure fungicides sol to farmers are genuine and of high quality Producers willing to adopt the teckology dissemination and adoption and this can be facilitated through in	2.7.8. Integrated pest ma	anagement Lethal Yellowing Disease (Phytoplasma) in Coconut
 MoALFC/Extension officers Farmer research networks Farmer to farmer Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms Mobile phones FFBS Agricultural innovation platforms Critical/essential factors Research to test validate and release improved coconut varieties Appricultural innovation platforms Critical/essential factors Appricultural innovation platforms Critical/essential factors Appricultural innovation platforms KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management FETBA Countig swhere already promets, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where TIMP will Limited number of farmer groups Lack of cowpea innovation platforms Limited number of farmer groups Lack of cowpea innovation platforms Dissenniation of integrated pest management of the challenges Promote appropriate marketing Lassons learned in up scaling in any and marketing Adoption of good agricultural practices by the producers is key in management of the disease of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Dissenniation of integrated pest management practices and safe use of pesticides collaborate in an innovation platforms Dissenniation of integrated pest management practices is key in management of the disease are corganized in groupy dissemination and adoption and this can be f		Agricultural shows
• Farmer research networks • Farmer to farmer • Mass media – Agricultural programs • Promotional materials (posters/brochures/leaflets, manuals) • Digital platforms • Mobile phones • FFBS • Agricultural innovation platforms for successful promotion • Research to test validate and release improved coconut varieties • Apatron for interaction of coconut value chain stakeholders • Applictor for interaction of coconut value chain stakeholders • Applictor for interaction of coconut value chain stakeholders • Applictor of appropriate agronomic practices • Well organized farmer groups and networks Partners/stakeholders for • KALRO to continually undertake research in disease management • Farmers/farmer groups to adopt the technologies • Counties where already Promoted if any Counties where TIMP will be up scaled Challenges in • Limited knowledge by farmers on integrated pest management • Limited knowledge by farmers on integrated pest management • Limited knowledge by farmers on integrated pest management • Lack of cowpea innovation platforms • Lack of succes and acreas innovation platfor		MoALFC/Extension officers
 Farmer to farmer Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms Mobile phones FFBS Agricultural innovation platforms Critical/essential factors A platform for interaction of coconut value chain stakeholders A platform for interaction of coconut value chain stakeholders A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for scaling up and their roles KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies Counticy governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where aftready promoted if any Counties where TIMP will be up scaled Challenges in distribution scope innovation platforms to facilitate interaction of farmers with relevant stakeholders Usagestions for addressing Establish cowpea innovation platforms Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides or ollaborate in an innovation platforms Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Dissemination of integrated pest management practices and safe use of pesticides collaborate in an innovation platforms Partnership is important in technology disemination and adoption and this can be facilita		• Farmer research networks
 Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms Mobile phones FFBS Agricultural innovation platforms Critical/essential factors Research to test validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where already promoted if any Counties where TIMP will be up scaled Challenges in Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms Dissemination Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides or production and marketing Producers of successful scaling are higher when diverse value chain stakeholders Dissemination of integrated pest management practices sub stakeholders Dissemination of integrated pest management practices and safe use of pesticides or laborate in an innovation platform Partnerskitade duroup funovation platform Partnerskited portor and interchology dissemination and adoption and this can be facilitated through innovation platform		• Farmer to farmer
 Promotional materials (posters/brochures/leaflets, manuals) Digital platforms Mobile phones FFBS Agricultural innovation platforms Critical/essential factors Research to test validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where already promoted if any Counties where already Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta. Counties where TIMP will be up scaled Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Datopti of good gricultural practices by the producers is key in management of the disease 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 platform Partnership is important i		Mass media – Agricultural programs
 Digital platforms Mobile phones FFBS Agricultural innovation platforms Critical/essential factors A platform for interaction of coconut value chain stakeholders Applatform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for scaling up and their roles KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Gounties where already Counties where already Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta. Counties where already Limited knowledge by farmers on integrated pest management Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms Dissemination Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases Chances of successful scaling are higher when diverse value chain stakeholders collators Chances of successful scaling are higher when diverse value chain stakeholders collators Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Partnership is important in technology disse		Promotional materials (posters/brochures/leaflets, manuals)
 Mobile phones FFBS Agricultural innovation platforms Critical/essential factors for successful promotion Research to test validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for scaling up and their roles KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Farmers/statemer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where already promoted if any Counties where TIMP will be up scaled Limited knowledge by farmers on integrated pest management Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms Dissemination Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of		Digital platforms
• FFBS • Agricultural innovation platforms Critical/essential factors for successful promotion • Research to test validate and release improved coconut varieties • Aplatform for interaction of coconut value chain stakeholders • Adoption of appropriate agronomic practices • Well organized farmer groups and networks • Well organized farmer groups and networks Partners/stakeholders for scaling up and their roles • KALRO to continually undertake research in disease management • FCPB to promote registration of fungicides for disease management • Fermers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness • Financial institutions to provide credit facilitators C: Current situation and future scaling up Counties where already Kwale, Kilfi, Mombasa, Tana-River, Lamu, Taita-Taveta. Promoted if any • Limited knowledge by farmers on integrated pest management • Limited number of farmer groups • Lack of cowpea innovation platforms • Listlish cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides Suggestions for addressing the challenges • Establish cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides Social, environmental, policy and market conditions necessary for development and up scal		Mobile phones
Agricultural innovation platforms Critical/essential factors Research to test validate and release improved coconut varieties for successful promotion Aplatform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for scaling up and their roles KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Francial institutions to provide credit facilitators Current situation and future scaling up Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination Imited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms Imited number of intergrated 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 Social, environmental, policy and market conditions necessary for development and up scaling Social, environmental, policy and market conditions necessary for Producers willing to adopt the disease management practices Produce		• FFBS
Critical/essential factors • Research to test validate and release improved coconut value chain stakeholders for successful promotion • A platform for interaction of coconut value chain stakeholders Partners/stakeholders for scaling up and their roles • KALRO to continually undertake research in disease management • KALRO to continually undertake research in disease management • KALRO to continually undertake research in disease management • Counties where already promoted coconut value chain stakeholders • Counties where already promote registration of fungicides for disease management • Counties where already promoted if any Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta. • Counties where already promoted if any • Limited knowledge by farmers on integrated pest management • Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders • Establish cowpea innovation platforms Suggestions for addressing the challenges • Establish cowpea innovation platforms • Chances of successful scaling are higher when diverse value chain stakeholders Suggestions for addressing the challenges • Adoption of good agricultural practices by the producers is key in management of the diseases • Dissemination of socies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality • Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality • Regul		Agricultural innovation platforms
for successful promotion A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for scaling up and their roles KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where already promoted if any Counties where already promoted if any Counties where TIMP will be up scaled Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms Lack of cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Social, environmental, policy and market conditions necessary for development and up scaling Regulatory b	Critical/essential factors	• Research to test validate and release improved coconut varieties
 Adoption of appropriate agronomic practices Well organized farmer groups and networks Partners/stakeholders for scaling up and their roles KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators C: Current situation and future scaling up Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination Limited knowledge by farmers on integrated pest management Limited knowledge by farmers to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges Establish cowpea innovation platforms Dissemination of good agricultural practices by the producers is key in management of the diseases Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality Producers willing to adopt the disease management practices are effectively up-scaled Fram input costs are within the reach of farmers. D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations 	for successful promotion	• A platform for interaction of coconut value chain stakeholders
Partners/stakeholders for scaling up and their roles • KALRO to continually undertake research in disease management • KALRO to continually undertake research in disease management • KALRO to continually undertake research in disease management • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness • Financial institutions to provide credit facilitators • Financial institutions to provide credit facilitators Counties where already promoted if any • Kale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta. Counties where TIMP will be up scaled • Limited knowledge by farmers on integrated pest management Challenges in dissemination • Limited knowledge by farmers on integrated pest management • Lack of cowpea innovation platforms • Lack of cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing • Adoption of good agricultural practices by the producers is key in management of the diseases • Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform • Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform		Adoption of appropriate agronomic practices
Partners/stakeholders for scaling up and their roles • KALRO to continually undertake research in disease management scaling up and their roles • KEPHIS to ensure seedling quality is maintained • PCPB to promote registration of fungicides for disease management • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness • Financial institutions to provide credit facilitators C: Current situation and future scaling up Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination • Limited knowledge by farmers on integrated pest management • Limited number of farmer groups • Lack of cowpea innovation platforms • Dissemination • Establish cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing • Adoption of good agricultural practices by the producers is key in management of the diseases Suggestions learned in up scaling if any • Adoption of good agricultural practices by the producers is key in management of the diseases • Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms • Adoption of good agricultural practices by the producers is key in manag		Well organized farmer groups and networks
Scaing up and their roles • KEPHIS to ensure seeding quality is maintained • PCPB to promote registration of fungicides for disease management • Farmers/farmer groups to adopt the technologies • County governments, central governments for development of enabling policies and create awareness • Financial institutions to provide credit facilitators C: Current situation and future scaling up Counties where already promoted if any Counties where already promoted of farmer scaling up Counties where already promoted if any Counties where already promoted if any Counties where already promoted if any Cust if any Challenges in • Limited knowledge by farmers on integrated pest management • Limited knowledge by farmers on integrated pest management • Limited number of farmer groups • Lack of cowpea innovation platforms • Establish cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides	Partners/stakeholders for	• KALRO to continually undertake research in disease management
 PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where already promoted if any Counties where TIMP will be up scaled Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Dissemination of good agricultural practices by the producers is key in management of the diseases Chances of successful scaling are higher when diverse value chain stakeholders Chances of successful scaling are higher when diverse value chain stakeholders Chances of successful scaling are higher when diverse value chain stakeholders Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality Producers willing to adopt the disease management practices Producers willing to adopt the disease management practices are effectively up-scaled Farmers. Economic, gender, vulnerable and marginalized groups (VMGs) considerations 	scaling up and their roles	• KEPHIS to ensure seedling quality is maintained
 Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Counties where already promoted if any Counties where TIMP will be up scaled Limited knowledge by farmers on integrated pest management Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Dissemination Establish cowpea innovation platforms Dissemination of good agricultural practices by the producers is key in management of the diseases 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 Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality Producers are organized in groups to ensure that management practices are effectively up-scaled Farmers. Economic, gender, vulnerable and marginalized groups (VMGs) considerations 		• PCPB to promote registration of fungicides for disease management
 County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators Ci Current situation and future scaling up Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases 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 Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality Producers are organized in groups to ensure that management practices are effectively up-scaled Farm input costs are within the reach of farmers. 		• Farmers/farmer groups to adopt the technologies
and create awarness • Financial institutions to provide credit facilitators C: Current situation and future scaling up Counties where already promoted if any Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta. Counties where TIMP will be up scaled Image: Counties where TIMP will be up scaled Challenges in dissemination Image: Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges Image: Establish cowpea innovation platforms 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 Adoption of good agricultural practices by the producers is key in management of the diseases Social, environmental, policy and market conditions necessary for development and up scaling Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality Producers are organized in groups to ensure that management practices are effectively up-scaled Producers are within the reach of farmers. Di Economic, gender, vulnerable and marginalized groups (VMGs) considerations Farm input costs are within the reach of farmers.		• County governments, central governments for development of enabling policies
• Financial institutions to provide credit facilitators C: Current situation and future scaling up Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination • Limited knowledge by farmers on integrated pest management • Limited number of farmer groups • Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges • Establish cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketing • Adoption of good agricultural practices by the producers is key in management of the diseases • 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 development and up scaling • Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality • Producers are organized in groups to ensure that management practices are effectively up-scaled • Producers are within the reach of farmers. Dis Economic, gender, vulnerable and marginalized groups		and create awareness
Current situation and ruture scaing up Counties where already promoted if any Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta. Counties where TIMP will be up scaled Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases 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 platform Regulatory bodies e.g. PCPBP, KEBS 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. 		Financial institutions to provide credit facilitators
Counties where already promoted if anyKwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.Counties where TIMP will be up scaledChallenges in dissemination• Limited knowledge by farmers on integrated pest managementLimited number of farmer groups• Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholdersSuggestions for addressing the challenges• Establish cowpea innovation platforms• Establish cowpea innovation platforms• Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketingLessons learned in up scaling if any• Adoption of good agricultural practices by the producers is key in management of the diseasesSocial, environmental, policy and market conditions necessary for development and up scaling• Regulatory bodies e.g. PCPBP, KEBS 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	C: Current situation and f	uture scaling up
promoted if any Counties where TIMP will be up scaled Challenges in dissemination Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges Establish cowpea innovation platforms 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 Social, environmental, policy and market conditions necessary for development and up scaling Producers willing to adopt the disease management practices Producers are organized in groups to ensure that management practices are effectively up-scaled Producers are within the reach of farmers.	Counties where already	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.
Counties where TIMP will be up scaledChallenges in dissemination• Limited knowledge by farmers on integrated pest management • Limited number of farmer groups • Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholdersSuggestions for addressing the challenges• Establish cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketingLessons learned in up scaling if any• Adoption of good agricultural practices by the producers is key in management of the diseases • 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 platformsSocial, environmental, policy and market conditions necessary for development and up scaling• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality • 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	promoted if any	
be up scaledChallenges in dissemination• Limited knowledge by farmers on integrated pest managementLimited number of farmer groups• Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholdersSuggestions for addressing the challenges• Establish cowpea innovation platforms• Establish cowpea innovation platforms• Dissemination of integrated pest management practices and safe use of pesticides• Promote appropriate marketing channels e.g. contract farming, collective production and marketing• Adoption of good agricultural practices by the producers is key in management of the diseases• 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• Regulatory bodies e.g. PCPBP, KEBS 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.• Economic, gender, vulnerable and marginalized groups (VMGs) considerations	Counties where TIMP will	
 Challenges in dissemination Limited knowledge by farmers on integrated pest management Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 	be up scaled	
 Limited number of farmer groups Limited number of farmer groups Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 	Challenges in	Limited knowledge by farmers on integrated pest management
 Lack of cowpea innovation platforms to facilitate interaction of farmers with relevant stakeholders Suggestions for addressing the challenges Establish cowpea innovation platforms Dissemination of integrated pest management practices and safe use of pesticides Promote appropriate marketing channels e.g. contract farming, collective production and marketing Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 	dissemination	• Limited number of farmer groups
Suggestions for addressing the challenges• Establish cowpea innovation platforms • Dissemination of integrated pest management practices and safe use of pesticides • Promote appropriate marketing channels e.g. contract farming, collective production and marketingLessons learned in up scaling if any• Adoption of good agricultural practices by the producers is key in management of the diseases • 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 platformsSocial, environmental, policy and market conditions necessary for development and up scaling• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are genuine and of high quality • 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		• Lack of cowpea innovation platforms to facilitate interaction of farmers with
 Suggestions for addressing the challenges Establish cowpea innovation platforms 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 Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 	Currentiana fan adduessing	relevant stakeholders
 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 Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 	suggestions for addressing	• Establish cowpea innovation platforms
 Promote appropriate marketing channels e.g. contract farming, conective production and marketing Lessons learned in up scaling if any Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 	the chanenges	• Dissemination of integrated pest management practices and safe use of pesticides
 Lessons learned in up scaling if any Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 		• Promote appropriate marketing channels e.g. contract farming, collective
 Adoption of good agricultural practices by the producers is key in management of the diseases 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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 	Lessons learned in up	• A dention of good agricultural practices by the producers is low in management of
 Social, environmental, policy and market conditions necessary for development and up scaling B: Economic, gender, vulnerable and marginalized groups (VMGs) considerations 	scaling if any	• Adoption of good agricultural practices by the producers is key in management of the diseases
 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 development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 	seaming in any	 Chances of successful scaling are higher when diverse value chain stakeholders.
 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 Regulatory bodies e.g. PCPBP, KEBS 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. 		collaborate in an innovation platform
 Social, environmental, policy and market conditions necessary for development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 		 Partnership is important in technology dissemination and adoption and this can be
 Social, environmental, policy and market conditions necessary for development and up scaling Regulatory bodies e.g. PCPBP, KEBS 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. 		facilitated through innovation platforms
 policy and market conditions necessary for development and up scaling D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations 	Social, environmental,	• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are
 conditions necessary for development and up scaling 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. 	policy and market	genuine and of high quality
 development and up scaling 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	conditions necessary for	• Producers willing to adopt the disease management practices
scaling effectively up-scaled • Farm input costs are within the reach of farmers. D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	development and up	• Producers are organized in groups to ensure that management practices are
Farm input costs are within the reach of farmers. D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	scaling	effectively up-scaled
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		• Farm input costs are within the reach of farmers.
	D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations

2.7.8. Integrated pest ma	anagement Lethal Yellowing Disease (Phytoplasma) in Coconut
Basic costs	KES 2,500 /acre for labour and fungicides cost
Estimated returns	Gross margin KES 272,610 per acre per season in 8 th year
Gender issues and concerns in development ,dissemination, adoption and scaling up	 Access and control of land for women is limited Some integrated pest management practices e.g. application of fungicides are not conducive for the elderly
Gender related opportunities	 Youth can provide labour for practices such as fungicide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services
VMG issues and concerns in development, dissemination, adoption and scaling up	 Some of the pest integrated management practices such as pruning, spraying is difficult to undertake for VMG Low access to credit facilities
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.
E: Case studies/profiles of	success stories
Success stories from previous similar projects	Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta have adopted the management practice.
Application guidelines for users	K.S Kimaru, K. P Muchemi & J. W Mwangi Manuel Tejada Moral (Reviewing editor) (2020) Effects of anthracnose disease on cowpea production in Kenya, Cogent Food & Agriculture, 6:1, DOI: <u>10.1080/23311932.2020.1799531</u>
F: Status of TIMP reading validation; 1-requires further	ess (1-ready for upscaling;, 1-requires Ready for up scaling research)
G. Contacts	
Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi Email: <u>cd.narl@kalro.org</u> , Phone: 0727624471
Lead organization and scientists	KALRO, Otipa M.J., Amata R., Mutisya D. and Too Abel
Partner organizations	ICRISAT,

2.7.9. Integrated pest ma	anagement of Bud rot disese (Phytophthora palmivora) in Coconut
Category (i.e. technology,	Management practice
innovation or management practice)	Disease symptoms
A: Description of the technology, innovation or management practice	
Problem to be addressed	Destruction of the orchard
What is it? (TIMP	An integrated pest management of Bud rot disease
description)	Cultural control
	• Adopt proper spacing and avoid over-crowding in bud rot prone gardens. Chemical control
	• Spray copper oxy chloride 50% WP @ 1 Kg in 300-400 l of water/acre on the crown of the neighboring palms as a prophylactic measure before the onset of

2.7.9. Integrated pest ma	anagement of Bud rot disese (Phytophthora palmivora) in Coconut		
Justification	 monsoon Follow common cultural, mechanical and biological practices Mechanical control Remove the rotten portions from the spear and the two adjacent leaves, remove and destroy infected debris and infected coconut trees. This helps to reduce spread Do not irrigate nurseries at dusk or at night to avoid prolonged periods of free moisture Plant resistant varieties. Malaysian dwarf varieties, such as "Malayan Yellow Dwarf", "Bali" "Tall", "Malayan Yellow Dwarf" x "Palu Tall" hybrids, and other varieties originating in South-East Asia, show resistance. free moisture Plant resistant varieties. Malaysian dwarf varieties, such as "Malayan Yellow Dwarf", "Bali" "Tall", "Malayan Yellow Dwarf" x "Palu Tall" hybrids, and other varieties originating in South-East Asia, show resistance. free moisture Plant resistant varieties. Malaysian dwarf varieties, such as "Malayan Yellow Dwarf", "Bali" "Tall", "Malayan Yellow Dwarf" x "Palu Tall" hybrids, and other varieties originating in South-East Asia, show resistance. free moisture Plant resistant varieties. Malaysian dwarf varieties, such as "Malayan Yellow Dwarf", "Bali" "Tall", "Malayan Yellow Dwarf" x "Palu Tall" hybrids, and other varieties originating in South-East Asia, show resistance 		
B: Assessment of dissemina	ation and scaling up/out approaches		
Users of TIMP	Producers, exporters		
Approaches used in dissemination	 On-farm and on-station research trails and demonstrations Training workshops, seminars, meetings Field days Agricultural shows MoALFC/Extension officers Farmer research networks Farmer to farmer Mass media – Agricultural programs Promotional materials (posters/brochures/leaflets, manuals) Digital platforms Mobile phones FFBS Agricultural innovation platforms 		
Critical/essential factors for successful promotion	 Research to test validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Adoption of appropriate agronomic practices Well organized farmer groups and networks 		
Partners/stakeholders for scaling up and their roles	 KALRO to continually undertake research in disease management KEPHIS to ensure seedling quality is maintained PCPB to promote registration of fungicides for disease management Farmers/farmer groups to adopt the technologies County governments, central governments for development of enabling policies and create awareness Financial institutions to provide credit facilitators 		
C: Current situation and f	ature scaling up		
Counties where already promoted if any	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.		
Counties where TIMP will be up scaled	Kilifi		
Challenges in	Limited knowledge by farmers on integrated pest management		
2.7.9. Integrated pest management of Bud rot disese (<i>Phytophthora palmivora</i>) in Coconut			
--	---	--	--
dissemination	Limited number of farmer groups		
	• Lack of coconut innovation platforms to facilitate interaction of farmers with		
	relevant stakeholders		
Suggestions for addressing	Establish cowpea innovation platforms		
the challenges	• 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	• Adoption of good agricultural practices by the producers is key in management of		
scaling if any	the diseases		
	• 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,	• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides sold to farmers are		
policy and market	genuine and of high quality		
conditions necessary for	• Producers willing to adopt the disease management practices		
development and up	• Producers are organized in groups to ensure that management practices are		
scaling	effectively up-scaled		
	• Farm input costs are within the reach of farmers.		
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations			
Basic costs	KES 3,500 /acre for labour and insecticide cost		
Estimated returns	Gross margin KES 107,325 per acre per season in 8th year		
Gender issues and concerns	Access and control of land for women is limited		
in development	• Some integrated pest management practices e.g. application of fungicides are not		
, dissemination, adoption	conductive for the elderly		
and scaling up			
opportunities	• Youth can provide labour for practices such as fungicide application		
opportunities	• Potential to create employment along the value chain e.g. agro chemical dealers, spray application services		
VMG issues and concerns	• Some of the pest integrated management practices such as pruning, spraying is		
in development,	difficult to undertake for VMG		
dissemination, adoption	Low access to credit facilities		
and scaling up			
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.		
E: Case studies/profiles of	success stories		
Success stories from	Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted		
previous similar projects	the management practice.		
Application guidelines for	K.S Kimaru, K. P Muchemi & J. W Mwangi Manuel Tejada Moral (Reviewing		
users	editor) (2020) Effects of anthracnose disease on cowpea production in Kenya, Cogent		
E. Status of TIMD modine	Food & Agriculture, 0.1, DOI. 10.1080/25511952.2020.1799551 arg. (1. ready, for unceeling, 2. requires. Beady, for unceeling.		
r: Status of Thyle reading	research)		
G Contacts			
Contacts	The Centre Director, KALRO-Kabete, P.O. Box 14733-00800 Nairobi		
	Emoil: ad parl@kalro arg. Dhone: 0727624471		
Land organization and	KALPO Oting M L Amote D. Mutique D and Teo Abol		
scientists	KALKO, Oupa M.J., Amata K., Muusya D. anu 100 Aber		

2.7.9. Integrated pest ma	nagement of Bud rot disese (Phytophthora palmivora) in Coconut
Partner organizations	ICRISAT

2.7.10. Integrated management of Eriophyid mite in coconut orchards			
Category (i.e. technology,	Management practice		
innovation or management practice)			
	Mile damage on coconut		
A: Description of the techn	ology, innovation or management practice		
Problem to be addressed	High infestation of young coconut fruits by Eriophyid mites, low productivity of coconuts due to abiotic stress and poor quality nuts		
What is it? (TIMP	An integrated management of Eriophyid mite in coconut orchads		
description)	Chemicals and biological control		
	• Trunk injection of monocrotophos		
	• Spraving with sulphur		
	• Spraying with 2% neem oil and garlic mixture		
	• Spraying with neem based insecticides		
	• Application of 30% used engine oil		
	• Spraying with 20% palm oil +0.5% sulphur WP+0.2% soap em		
	Use of tolerant varieties/cultivars		
	Gon thembili & yellow dwarf show tolerance		
	Damage significantly less than green dwarf/ordinary tall		
	• Development of tolerant varieties is being done		
	Predatory control		
	• Several predatory mites have been reported in the world. This has not been attempted in Kenya.		
	• Sri Lanka was the first and only country to develop a predatory control method		
	• Local predatory mite, <i>Neoseiulus baraki</i> Athias-Henriot (Phytoseidae) proved as a promising candidate		
	• The mite is a generalist predator		
	• Research revealed its effectiveness in reducing coconut mite populations and its		
	damage		
	A mass rearing method was developed in the laboratory		
Justification	The coconut mite (Aceria guerreronis Keifer), attacks young fruits of the coconut		
	palm (Cocos nucifera L.), to which it is almost exclusively confined. The life cycle		
	of this mite includes egg, two larval instars and an adult stage. Eggs are shiny white		
	and globular in shape which hatch into larvae (protonymph) in three days. The		
	second instar larva is called hymph which subsequently moults into adults. An adult mite is very minute, measuring 200,250 µm (0.2,25 mm) in length and 25,50 µm		
	(0.035-0.05 mm) in width with two pairs of less found in the anterior region of the		
	body. It is pale in colour with elongate body and worm-like in appearance. Both		
	nymphs and adults cause damage. Each female can lay approximately 30-50 eggs. It		

2.7.10. Integrated management of Eriophyid mite in coconut orchards		
	takes about 9-12 days to complete one life cycle from egg to adult. Each colony	
	contains hundreds of eggs, larvae, nymphs and adults. Mite population is usually	
	nigner during not months.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Producers, exporters	
Approaches used in	On-farm and on-station research trails and demonstrations	
dissemination	Training workshops, seminars, meetings	
	• Field days	
	Agricultural shows	
	• MoALFC/Extension officers	
	Farmer research networks	
	• Farmer to farmer	
	Mass media – Agricultural programs	
	Promotional materials (posters/brochures/leaflets, manuals)	
	Digital platoform	
	Mobile phones	
	• FFBS	
	Agricultural innovation platforms	
Critical/essential factors	• Research to test validate and release improved cowpea varieties	
for successful promotion	• A platform for interaction of coconut value chain stakeholders	
	Adoption of appropriate agronomic practices	
	Well organized farmer groups and networks	
Partners/stakeholders for	• KALRO to continually undertake research in disease management	
scaling up and their roles	• KEPHIS to ensure seedling quality is maintained	
	• PCPB to promote registration of fungicides for disease management	
	• Farmers/farmer groups to adopt the technologies	
	• County governments, central governments for development of enabling policies	
	and create awareness	
C. Comment situation and f	Financial institutions to provide credit facilitators	
C: Current situation and f	Rure scaling up	
Counties where already	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta	
	TZ-11-0	
Counties where TIMP will	Kilifi	
be up scaled		
Challenges in	• Limited knowledge by farmers on integrated pest management	
dissemination	• Limited number of farmer groups	
	• Lack of coconut innovation platforms to facilitate interaction of farmers with	
Suggestions for addressing	relevant stakenolders	
the challenges	• Dissemination of integrated pest management practices and safe use of pesticides	
the chanenges	• Promote appropriate marketing channels e.g. contract farming, collective production and marketing	
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders	
scaling if any	collaborate in an innovation platform	
	• Partnership is important in technology dissemination and adoption and this can be	
	facilitated through innovation platforms	
	• Adoption of good agricultural practices by the producers is key in management of	
	the diseases	

2.7.10. Integrated management of Eriophyid mite in coconut orchards		
	• 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	 Regulatory bodies e.g. PCPBP, KEBS 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, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 5000/acre for labour and insecticide costs in 8th year	
Estimated returns	Gross margin KES 107,325 per acre per season in 8th year	
Gender issues and concerns in development ,dissemination, adoption and scaling up	 Access and control of land for women is limited Some integrated pest management practices e.g. application of fungicides are difficult for the elderly to undertake 	
Gender related opportunities	 Youth can provide labour for practices such as fungicide application Potential to create employment along the value chain e.g. agro chemical dealers, spray application services 	
VMG issues and concerns in development, dissemination, adoption and scaling up	 Some of the pest integrated management practices such as pruning, spraying is not easy to undertake for VMG Low access to credit facilities 	
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.	
E: Case studies/profiles of success stories		
Success stories from previous similar projects Application guidelines for users	 Farmers in Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.have adopted the management practice. Status of cowpea production in Kenya. Lusike A. Wasilwa, Joseph K. Njuguna, Evelyn N. Okoko and Grace W. Watani. 	
F: Status of TIMP readiness (1-ready for upscaling;, 2-requires Ready for up scaling validation; 3-requires further research)		
G. Contacts		
Contacts	The Centre Director, KALRO-Kabete; P.O. Box 14733-00800 Nairobi, Email: cd.narl@kalro.org, Phone: 0727624471	
Lead organization and scientists	KALRO, Otipa, M.J., Amata R., Mutisya D., Finyange P and Too A.,	
Partner organizations	ICRAF, CABI	

2.7.11. Integrated Management of Leaf rot	
Category (i.e. technology,	Management practice
innovation or management	
practice)	

2.7.11. Integrated Management of Leaf rot			
	Brown colour spots Fan like appearance of leaves enlarge resulting in rotting		
A: Description of the techn	ology, innovation or management practice		
Problem to be addressed	Leaf rot in coconut		
	The first symptom is the appearance of water-soaked brown lesions in the spear leaves of root-wilt affected palms. Gradually these spots enlarge and coalesce resulting in extensive rotting. As the leaf unfurls the rotten portions of the lamina dry and get blown off in wind, giving a 'fan' shape to the leaves. Sometimes, the symptom becomes very acute and the spear fails to unfurl.		
What is it? (TIMP	An integrated management of Leaf rot in coconut		
description)			
Justification			
B: Assessment of dissemination and scaling up/out approaches			
Users of TIMP	Producers, exporters		
Approaches used in	On-farm and on-station research trails and demonstrations		
dissemination	Training workshops, seminars, meetings		
	• Field days		
	Agricultural shows		
	MoALFC/Extension officers		
	• Farmer research networks		
	• Farmer to farmer		
	Mass media – Agricultural programs		
	Promotional materials (posters/brochures/leaflets, manuals)		
	Digital platform		
	Mobile phones		
	• FFBS		
	Agricultural innovation platforms		
Critical/essential factors	Research to test validate and release improved Cowpea varieties		
for successful promotion	• A platform for interaction of Coconut value chain stakeholders		
	Adoption of appropriate agronomic practices		
	Well organized farmer groups and networks		
Partners/stakeholders for	KALRO to continually undertake research in disease management		
scaling up and their roles	• KEPHIS to ensure seedling quality is maintained		
	PCPB to promote registration of fungicides for disease management		
	Farmers/farmer groups to adopt the technologies		
	• County governments, central governments for development of enabling policies		
	and create awareness		
	Financial institutions to provide credit facilitators		
C: Current situation and f	C: Current situation and future scaling up		
Counties where already	Kwale, Kilifi, Mombasa, Tana-River, Lamu, Taita-Taveta.		

2.7.11. Integrated Management of Leaf rot			
promoted if any			
Counties where TIMP will	Kilifi		
be up scaled			
Challenges in	Limited knowledge by farmers on integrated pest management		
dissemination	Limited number of farmer groups		
	• Lack of coconut innovation platforms to facilitate interaction of farmers with		
Suggestions for addressing	relevant stakeholders		
the challenges	 Establish Cocontil Innovation platforms Dissomination of integrated past management practices and cofe use of pasticides 		
	 Dissemination of integrated pest management practices and safe use of pesticides Promote establishment of farmer producer and marketing groups 		
Lessons learned in up	Establish cowpea innovation platforms		
scaling if any	 Partnership is important in technology dissemination and adoption and this can be 		
	facilitated through innovation platforms		
	• Adoption of good agricultural practices by the producers is key in management of		
	the diseases		
Social, environmental,	• Regulatory bodies e.g. PCPBP, KEBS to ensure fungicides genuine and high		
policy and market	quality pesticides are available.		
development and up	• Producers willing to adopt the disease management practices		
scaling	• Producers are organized in groups to ensure that management practices are effectively up-scaled		
C	 Farm input costs are within the reach of farmers 		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations		
Basic costs	KES 5,500/acre for labour and fungicides in 8 th year		
Estimated returns	Gross margin KES 107,325 per acre per season in 8 th year		
Gender issues and concerns	Access and control of land for women is limited		
in development	• Some integrated pest management practices e.g. application of fungicides are not		
,dissemination, adoption	conducive for the elderly		
and scaling up			
Gender related	 Youth can provide labour for practices such as fungicide application Detential to greate apple practices the value share to apple the value of the v		
opportunities	• Potential to create employment along the value chain e.g. agro chemical dealers,		
VMG issues and concerns	• Some of the pest integrated management practices such as pruning spraying is		
in development,	not easy to undertake for VMG		
dissemination, adoption	• Low access to credit facilities		
and scaling up			
VMG related opportunities	Can create employment for VMG across the all segments of the value chain.		
E: Case studies/profiles of s	success stories		
Success stories from			
previous similar projects			
Application guidelines for	CAB International (2005). Crop Protection Compendium, 2005 edition. Wallingford,		
F: Status of TIMP readine	ess (1-ready for upscaling;, 2-requires Ready for up scaling		
G Contacts			
Contacts	The Centre Director KALRO-Kabete: P.O. Box 14733-00800 Nairobi Email:		
Contacto	<u>cd.narl@kalro.org,</u> Phone: 0727624471		

2.7.11. Integrated Management of Leaf rot		
Lead organization and	KALRO, Otipa, M. J., Amata R., Mutisya D. Finyange P Finyange and Too A.	
scientists		
Partner organizations	ICRAF, CABI	

2.7.12. Coconut Integrated Weed Management			
Category (Technology, Innovation and Crop	Innovation		
management practices)			
A: Description of the techno	ology, innovation or managemen	t practice	
Problem addressed	Different annual and perenn management of the cocord profitability. Some key we <i>spp.</i>), goose grass (<i>Eleusi</i> <i>Sateria spp.</i> Palmer amaran and Sedges including Yello (<i>Cyperus rotundus</i>) are moregions where they have suc characteristics. Competition levels: 1) intraspecific con competition between cocond weed species and 4) intra species	ial weed species competition y nut cropping systems resulti ed grass species including (<i>ine indica</i>), Craws feets (D ths (<i>Amaranthus palmeri</i>), Re ow nutsedge (<i>Cyperus esculer</i>) ore a challenge in coconut cceeded because of their morp soil nutrients, moisture, space ompetition between coconu at and weed species, 3) intersp ecific competition between same	with coconut and their poor ng to reduced yield and Crab sanguinalis (<i>Digitaria</i> <i>actyloctenium aegyptium</i>), ed pigweed (<i>A. retroflexus</i>) <i>ntus</i>), and Purple nutsedge coconut growing fields or phological and phenological and sunlight.occurs at four t plants, 2) interspecific pecific competition between me weed species.
	Wondering jew (Commelina benghalensis)	Bindweed (Convulvulus arvensis) and stargrass (Cynodon aethiocapus)	

2.7.12. Coconut Integrated Weed Management



2.7.12. Coconut Integrated Weed Management			
What is it? (TIMP	Integrated Weed Management (IWM) is the use of two or more appropriate		
description)	approaches to manage weeds including: preventive, planting in a weed free pre		
	land, use of mulch (biodegradab	le or synthetic), cultural,	rotation, intercropping,
	condition of the field resources a	clientical control based	on case specific weed
	Managing weeds with hand implement "Muro"	Managing weeds with ha implement 'Jembe''	and
	Managing weeds with herbicide	Managing weeds with animal drawn implement	
Justification	Coconut are vulnerable to weed ir	vasion. This is due to limi	ited knowledge on weed
	biology and management strategies which include prevention, physical, biocontrol, intercrops, covercrops and herbicide. Whereas physical manual weeding can be effective for managing some weed species, it is time consuming and labour intensive.		
	However manual weeding can also	be ineffective especially t	large age and apparently
	disseminated through cuttings an	d is replanted when wee	ding is done under wet
	conditions. Hence, regrowth beco	omes a big problem. The	refore, there is need to
	apply more than one approach to a	manage the biodiversity of	weeds. Judicious use of
	herbicides integrated with cover	crops has shown potential	l to increase yields and
	profitability for weed control in co	conut cropping systems.	
B: Assessment of dissemination	on and scaling up/out approaches		
Users of TIMP	Farmers, Extension workers, Agrodea	llers	
Approaches used in	• FFBS		
dissemination	• AIP		
	• Training workshops, seminars,	meetings	
	Demonstrations and field days.	Media (Online)	
Critical/essential factors	• Research to test, validate and release IWM in Coconut varieties.		rieties.
	 A platform for interaction of co Bromote and train an interaction 	beconut value chain stakeho.	laers
	 Promote and train on integrated Address environmental and set 	a weed management (IWM	use of herbicides
	 Address environmental and sale Accompany the promotion with 	th demos and field days y	with farmers groups and
	stakeholders on the effectivene	ess of the various weed ma	anagement ontions using
	FFSB approach		anagement options using

2.7.12. Coconut Integrated Weed Management			
	 Train stakeholders on biology of weeds and weed dynamics in cropping systems Farmers need training on timing with regard to conservation of biodiversity. Preserve pollinators for increased productivity of weed control. Train users on appropriate use of herbicide and safe use 		
Partners/stakeholders for scaling up and their respective roles.	 Agrochemical companies Agrodealers KALRO County extension staffs CBO, & NGOs) 		
C: Current situation and futu	ire scaling up		
Counties where already promoted if any	Kilifi, Kwale, Lamu		
Counties where TIMPs will be up scaled	Kilifi		
Challenges in development and dissemination	 Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Low use of agronomic practices labour intensity High cost of herbicides Inadequate knowledge and information on types of herbicides to use How and when to use them and their persistence in the soil Muthe on appropriateness of using herbicides 		
Suggestion for addressing the challenges	 Mydis on appropriateness of using herofedes Establish coconut innovation platforms, Promotion of the technology/ product in the suitable areas conducting demos and field days and involvement of the stakeholder e.g. agro-chemical companies and agro-dealers Develop and disseminate information to various stakeholders Training on integrated approaches using available methods, including appropriate herbicides for coconut Their persistence in different soil environment that can affect follow up intercrop or cover in the first five years of Coconut establishment Safe use of herbicides 		
Lesson learned in up scaling if any	 Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform That integrated approaches of weed management are more effective than use of one control method and is environmentally friendly Continuous use of herbicide is an environmental, health and social hazard. Consumers concerns of herbicide residues in the soil and odor absorption by nuts needs attention Creation of awareness through demonstrations and farmer field days help in adoption of the technology/ IWM Availability of market is essential 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	 Train stakeholders to understand the working of an integrated weed management program Address the environmental and social concerns related to use of herbicides. A functional agrodealer network to supply the products when required by the farmers 		

2.7.12. Coconut Integrated Weed Management		
	• Have a safety plan when using herbicides	
D: Economic, gender, vulnera	ble and marginalized groups (VMGs) considerations	
Basic costs	KES (Cost will based on the approaches of management selected)	
Estimated returns	KES (Cover crops and herbicide combination gives highest returns).	
Gender issues and concerns	Weeding is mostly done by women and children, dissemination strategies should	
in development and	target women more but also take care of men by sensitizing men and youth so they	
dissemination	become aware of the TIMP.	
Gender issues and concerns	• Make all gender understand the benefits of IWM	
in adoption and scaling up	• Empower both men and women to make a judicious decision on IWM approach	
	• Use of IWM technology can reduce drudgery from manual weeding and save	
	time for other activities for women	
Gender related	Labour is reduced therefore opportunities for women and youth to get in other	
opportunities	economic activities including the production and marketing.	
Vulnerable and	VMG groups could be having limitations in accessing the knowledge, resources and	
marginalized groups	exposed to many threats such as insecurity and land disputes.	
(VMG) issues and		
concerns in development,		
dissemination, adoption		
and scaling up		
VMG related opportunities	Training VMG on IWM practices and opportunities	
E: Case studies/profiles of suc	cess stories	
Success stories	Kenya smallholder farmers.	
Application guidelines for	https://Cocos.s/jol.info	
users		
F: Status of TIMP Readin	ess (1. Ready for up scaling; 2. Requires validation.	
Requires validation; 3. Require	s further research)	
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
Lead organization and	KALRO-Mtwapa,	
scientists	Dr Hottensiah Mwangi, Dr Momanyi N. Violet, & Francis Muniu.	
Partner organizations	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u> ,	
	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email:	
	director.icri@kalro.org, Phone: 0712557178	

2.7.13. Coconut Intercrop	pping System
Categories (i.e. technology	Innovation
innovation or management	
practice)	
A: Description of the technolo	ogy, innovation or management practice
Problem addresses	Weed competition in coconut cropping system reduces yield and profitability.
	Suitable cover crops such as <i>Pueraria phaseolodies</i> and other legume cover crops
	should be used as intercrop to shade provide shade for suppressing weeds and
	conserve moisture for the coconut to increase the yield and profitability of coconut.
	This should be done intelligently to profit trees through weed control and soil
	fertility. Farmers inter-cropping coconut with other crops such as watermelon,

2.7.13. Coconut Intercro	pping System	
	pumpkins, and shallow rooted vegetables to reduce weeding and have bett	er returns
	to their investment in young orchards. Intercropping to control weeds	s requires
	specific spacing, the right choice of crops depending on growth habit of the	intercrop.
	This will require understanding the optimal crop spacing and configuration su	election of
	varieties adapted to coconut intercropping and adopting sequencing approache	s that will
	maximize use of the resources (water, nutrients and light) without causing undue c	ompetition
	and farmer lack this knowledge	ompetition
	and furnier flock this knowledge.	
	The second of the second s	
	A CONTRACT OF A	
	CARLES AND AN AND AN AN AND AND AND AND AND AN	
	Pichardia brasilionsis, truchodosma zoylanioum, and Triday programbans;	
	Richardia brasiliensis, irychodesma zeylanicum, and Tridax procumbens.	
	Dandelion (Taraxacum officinale) grass weeds	
What is it? (TIMP	Growing of two or more crops in a field at the same time, as a tool to r	educe the
description)	weed area and enhance production and to obtain efficient land use. Inte	rcropping
1 /	systems are defined based on the temporal and spatial arrangements of the	crops that
	reduce weeds. Appropriate intercropping systems are strip or row patterns in	n coconut.
	Innovative intercropping may include planting shallow rooted vegetables	s (onions.
	narsley) legimes (<i>Pueraria phaseolodies</i> beans) in between rows of Co	conut and
	will involve arrangement that reduce weeds	condt und
	will involve arrangement that reduce weeds.	
	The second of the second	
	Innovative intercropping arrangement that reduces weeds in coconut	
Justification	Intercrops in middle rows done prudently provide weed control and profi	t coconut
	through soil health improvement. Suitable intercrops can provide income of	luring the
	vears before profitability of coconuts. Innovative intercropping systems	can heln
	formers achieve the desired productivity and profitability while at the s	amo timo
	diversifying the cropping system and adenting to alimete change. Coccept	door woll
	uiversitying the cropping system and adapting to chinate change. Coconut	uoes well
	when intercropped with legumes, bananas, vegetables like cowpeas, an	narantnas,
	Nutmeg and orchids to mitigate the risk of total crop failure due to	arought.
	Intercropping has important advantages in regard to efficient land us	e. It can
	significantly increase total productivity as compared to monocropping	thanks to
	better utilization of water, nutrients and solar energy. Crops in these sy	stems use

2.7.13. Coconut Intercrop	pping System
	available resources more efficiently due to different rooting and canopy properties; but they should not shade or disturb root system. Therefore is one of the most dependable ways to sustain coconut production in light of prevailing climate change.
B: Assessment of dissemination	on and scaling up/out approaches
Users of TIMP	Farmers, Extension Staff
Approaches used in dissemination	 FFBS AIP Training workshops, seminars, meetings Promotional materials (posters/ brochures/ leaflets, manuals)
Critical/essential factors for successful promotion	 Demos and field days Research to test, validate and release intercropping system in coconut varieties A platform for interaction of coconut value chain stakeholders Conduct demos and the field days with farmers groups and stakeholders
Partners/stakeholders for scaling up and their respective roles.	 County extension staffs NGOs Private sectors e.g. seed company and seed dealers Research organizations (KALRO, Egerton University, UoN)
C: Current situation and futu	ire scaling up
Counties where already promoted if any	Kilifi, Kwale, Lamu
Counties where TIMPs will be up scaled	Kilifi
Challenges in development and dissemination	 Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders. Low use of the agronomic practices Inadequate training and limited extension staff
Suggestion for addressing the challenges	 Establish coconut innovation platforms Facilitation of training of county extension staffs Contact demos and field days
Lesson learned in up scaling if any	 Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform Intercropping systems are knowledge intensive and should not shade, crowd or

2.7.13. Coconut Intercropping System		
Social, environmental, policy and market conditions necessary for development and up-	 compete seriously for soil and water. Such a change calls for intensive training and demonstration for farmers to familiarize with the innovation to benefit. Creation of awareness through demonstrations and farmer field days help in adoption of the innovation coconut intercropping Availability of market is essential Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms A farmer learning platform is essential for training on how to deploy the innovative intercropping systems. 	
scaling		
D: Economic, gender, vulnera	ble and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns in development, dissemination adoption and scaling up	 Complexity of the intercropping system can result in decreased labour, which could impact on the women who are key players during planting and weeding Need to train, especially women, on how to implement the intercropping systems 	
Gender related opportunities	• Diversity and yield stability are a major win for the entire household.	
VMG issues and concerns in development, dissemination, adoption and scaling up	 This is a knowledge intensive innovation especially the configurations. Training is key Intercropping systems may impede mechanization of the production system 	
VMG related opportunities	 System diversification and yield stability will increase food availability leading to food and nutrition security at household level Improved income from production and marketing of intercropped produce 	
E: Case studies/profiles of suc	ccess stories	
Success stories	Plant village.psu.edu/posts/8345. Best weed control in coconut plantation.	
Application guidelines for users	https//www.quora.com. Which is the best weed control in coconut.	
F: Status of TIMP Readiness (1. Ready for up scaling; 2.2. Require validationRequires validation; 3. Requires further research)2. Require validation		
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
T 1 1 1	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.	
Lead organization and scientists	Centre Director KALRO-Kabete, P.O. Box 14/33-00800, NAIROBI. Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u> , Dr Hottensiah Mwangi, Dr Violet N. Momanyi and Francis Muniu.	
i artifer organizations	County Extension Sunt, I armer Groups and CDOS, 10005	

2.7.14. Cover cropping for Coconut weed management	
Categories (i.e. technology	Technology
innovation or management	
practice)	

2.7.14. Cover cropping for Coconut weed management		
A: Description of the technology	ogy, innovation or management practice	
Problem addresses	Different annual grass weeds and perennial weed species and poor weed management lead to yield losses and lack of profitability in Coconut cropping systems especially at nursery management. Some key weed grass species including Crab sanguinalis (<i>Digitaria spp.</i>), goose grass (<i>Eleusine indica</i>), Crawsfoot (<i>Dactyloctenium aegyptium</i>), Sateria spp., double thorn (Oxygonum sinuatum) Palmer amaranths (<i>Amaranthus palmeri</i>), Red pigweed (<i>A. retroflexus</i>) and Sedges including Yellow nutsedge (<i>Cyperus esculentus</i>), and Purple nutsedge (<i>Cyperus rotundus</i>) are more a challenge in coconut growing fields where they succeed due to their biological characteristics and associating habits.	
	Grasses and broadleaved (Senecio disciplia) associating	
description)	biomass/canopy to cover soil, act as physical barriers, and cut off light for weed seedlings growth. This may be used live cover or dead crop residue. After cover crop has produced biomass, it may later be killed by rolling them down or desiccated with a post emergence herbicide to form a mart soil cover. This cover acts as a physical barrier cutting off light to stop germinating weed seeds from emerging once they exhaust energy from seeds stores. Large amounts of cover crop biomass suppress weeds in a subsequent season and duration of effective suppression depends on type of cover crop and amounts of biomass applied.	
Justification	Cover cropping with appropriate variety of cover crop (technology) works well with coconut in no till system. Large amounts of biomass developed by cover crops suppress weeds in subsequent season. Rolled down cover crop straws will reduce weed emergence by forming a physical barrier. Also the cover crop such as black oats may produce allellochemicals that inhibit small seeded weeds germination and emergence. Physical chemical suppression may last a month depending on amount of biomass. Cover crops may also be left to conserve moisture and modify soil temperatures where necessary as an added benefit. Different crops could be good cover crops particularly legumes. Cultivation followed by cover crop like rye increase productivity and profitability.	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, Extension Staff	
Approaches used in dissemination	 FFBS AIP Creation of awareness through demonstrations and farmer field days help in adoption of the varieties Availability of market Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Demos and field days 	

2.7.14. Cover cropping for Coconut weed management		
Critical/essential factors	• Research to test, validate and release cover cropping in Coconut varieties	
for successful promotion	• A platform for interaction of coconut value chain stakeholders.	
	• Conduct demos and the field days with farmers groups and stakeholders	
Partners/stakeholders for	County extension staffs	
scaling up and their	• NGOs	
respective roles.	• Private sectors e.g. seed company and seed dealers	
	• Research organizations (KALRO, County staff)	
C: Current situation and futu	re scaling up	
Counties where already	Kilifi, Kwale, Lamu	
promoted if any		
Counties where TIMPs will	Kilifi	
be up scaled		
Challenges in development	• Lack of coconut innovation platforms to facilitate interaction of farmers with	
and dissemination	relevant stakeholders	
	• Low use of the agronomic practice	
	• Labour intensity in planting and weeding	
	• Inadequate training and limited extension staff	
Suggestion for addressing	Establish cococnut innovation platforms	
the challenges	• Information dissemination on the technology	
	• Promotion of the technology in the suitable areas	
	• Facilitation of training of county extension staffs	
	• Contact demos and field days	
Lesson learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders	
scaling if any	collaborate in an innovation platform	
	• 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 and this can be	
	facilitated through innovation platforms	
	• Cover crop technology is knowledge intensive. Such a change calls for intensive	
	training and demonstration for farmers to familiarize with the technology use to	
	gain its benefits	
Social, environmental,	A farmer learning platform is essential for training on how to deploy the technology.	
policy and market		
conditions necessary for		
development and up-		
scaling		
D: Economic, gender, vulnera	ble and marginalized groups (VMGs) considerations	
Basic costs	Depends on crop variety used and method used to manage it.	
Estimated returns		
Gender issues and concerns	• Cover cropping system reduces labour, which could impact on the women who	
in development,	are key players during planting and weeding	
dissemination adoption and	• Need to train, especially women, on how to implement the cover cropping	
scaling up	systems	
Gender related	• Diversity and yield stability are a major win for the entire household.	
opportunities		
VMG issues and concerns	• This is a knowledge intensive technology especially the configurations. Training	
in development,	is key	

2.7.14. Cover cropping for	2.7.14. Cover cropping for Coconut weed management	
dissemination, adoption	• Cover cropped systems may require specialized implements during planting	
and scaling up		
VMG related opportunities	• System diversification and yield stability will increase food availability leading to	
	food and nutrition security at household level.	
	• Improved income from production and marketing of coconut and the cover crops	
	gives diversified incomes	
E: Case studies/profiles of success stories		
Success stories	Tamil Nadu Agric University. (Tnau.ac.iu/crs-aliyarnagar/wced)	
Application guidelines for	Mwangi, H.W., Kihurani, A.W., Wesonga, J.M., Ariga, E.S. & Kanampiu, F.	
users	(2015a). Factors influencing adoption of cover crops for weed management in	
	Machakos and Makueni counties of Kenya. European Journal of Agronomy	
	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. 2. Require validation		
Requires validation; 3. Require	s further research)	
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283	
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: cd.narl@kalro.org Dr Hottensiah Mwangi,	
	Dr Violet N. Momanyi, Francis Muniu	
Partner organizations	County Extension Staff, Farmer Groups and CBOs, NGOs	

2.7.15. Mulching	
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the technolo	gy, innovation or management practice
Problem addressed	Weed competition for soil nutrients, moisture and space. High unfavorable soil temperatures.
What is it? (TIMP description)	The practice of managing weeds using natural or synthetic materials to cover the soil/ground. Mulches can effectively control emerging weed seedlings and seeds that germinate near or at the soil surface. There are two types of mulches: biodegradable or natural mulches. Biodegradable include straw, dead leaves and compost to make more favourable conditions for coconut growth, development and efficient production. The mulches should be between 2-4 inches deep to be effective. Black plastic, Polypropylene and Polyester mulch. Edges should overlap to cut off sunlight

2.7.15. Mulching	
	in Non degradable or synthetic mulches can be used in growing of coconu Benefits: Organic mulches suppress weeds; retain moisture in the soil; keep the so cool; and help improve soil fertility (as the mulches decompose providing calcium boron, zinc, Nitrogen, Potassium, and trace elements) and improves microclimat hence increasing biodiversity. Synthetic mulches will solarize soils, control weed and weed seeds, retain soil moisture and controls diseases. Inspect and pull ou emerging weeds timely.
Justification	Synthetic mulches (Plastic or fabric) screen out light and provide a physical barrier to weed seedling development. Weeds can easily choke and kill out young cocont seedlings. In Sand box or seed bends use of Black polythene prevents light from reaching the small weeds and prevent germination. Organic mulching (straws or dr leaves) 3"thick on rows have added benefits other than effectively minimizin weeds infestation. It facilitates retention of soil moisture and helps in control of temperature fluctuations, improves physical, chemical and biological properties of soil, as it adds nutrients to the soil and ultimately enhances the growth and yield of crops. It also improves soil structure directly by preventing raindrop impact an indirectly by promoting biological activity. Fabric synthetic mulch which are porou are preferred over plastic ones because they allow water flow and air. Drip basin mulch could be profitable in the coconut cropping system.
B: Assessment of dissemin	ation and scaling un/out approaches
Users of TIMP	Coconut Farmers
Approaches to be used in dissemination	 FFBS AIP Farmer field Business schools On-farm demonstrations during farmer field days Training in workshops
Critical/essential factors for successful promotion	 Research to test, validate and release mulching technology in coconut varieties A platform for interaction of Coconut value chain stakeholders Organic Availability of plant or crop residues for organic mulches. Size of the land Competing uses of crop residues Type of the crop residues Synthetic (Plastic or fabric) Cost of materials Disposal of material after use

2.7.15. Mulching		
Partners/stakeholders for	County government extension services; Provide link with farmers	
scaling up and their roles	• Community farmer groups; play coordination role for ease in problem	
	identification and dissemination	
C: Current situation and future	e scaling up	
Counties where already	None in Kenya	
promoted	Tamil Nadur Agricultural University, Aliyar Nagar, India	
	https://plant village.psu.edu>5546-coconut.weed control.	
Current extent of reach	Negligible	
Counties where TIMP will	Kilifi	
be promoted		
Challenges in	Lack of coconut innovation platforms to facilitate interaction of farmers with	
dissemination	relevant stakeholders.	
Suggestions for addressing	Establish coconut innovation platforms.	
the challenges		
Lessons learned	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform	
	• Creation of awareness through demonstrations and farmer field days help in adoption of the varieties	
	• Creation of awareness through demonstrations and farmer field days help in	
	adoption of the technology/ IWM	
	Availability of market is essential	
	• Partnership is important in technology dissemination and adoption and this can	
	be facilitated through innovation platforms	
	• There is need to adapt to alternative mulching technologies in addition to use of	
0 1 1 1 1	organic materials like straws dry leaves, and dry grass	
Social, environmental,	Practice is socially acceptable	
conditions necessary	• Environmentally friendly	
conditions necessary	Increased productivity will provide supply to the markets Supporting frequencies are sucilable	
D: Economic gender vulnerat	• Supporting frameworks/policies are available.	
D. Economic, gender, vullerat	Organia mulah is law aast but labour intensive during the initial application	
Basic costs	Dependent variation of Coccept but about intensive during the initial application.	
Estimated returns	Dependent varieties of Coconut but generally about 100% of the initial investments	
Candan issues and concome	The prostice uses comparts from provious energ/plants that may offer compatition in	
in development	terms of fuelwood and livestock thus bringing a conflict those performing the	
dissemination adoption	specific tasks e g women in case of fuelwood and men for livestock feed. This will	
and scaling up	negatively affect the adoption and scaling up.	
Gender related	Women who mainly perform the weeding tasks will get a relief and spend their	
opportunities	efforts elsewhere. Similarly, the improved productivity will benefit both gender in	
••	terms of higher earnings.	
VMG issues and concerns	Though easy to use, it is labour intensive for VMGs, hence its adoption and scaling	
in development,	up is a challenge.	
dissemination, adoption		
and scaling up		
VMG related opportunities	Mulch is locally available on-farm, and thus has low costs implying that all	
	including VMGs can take advantage of the practice.	

2.7.15. Mulching		
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	User guidelines are dependent on value chain	
users	Plant clean Coconut seeds in clean seed bed	
	Apply mulch around the Coconut trees	
	Mulch management	
	• Hand pull or kill weeds that grow out of the mulch	
F: Status of TIMP readiness (1=Ready for upscaling: Ready to use.		
2=Requires validation; 3=Requires further research		
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: cd.narl@kalro.org Dr Hottensiah Mwangi,	
	Dr Violet Momanyi. Francis Muniu.	
Partner organizations	County governments	

2.7.16. Herbicide (chemic	al) Weed Control
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the technology	ogy, innovation or management practice
Problem addressed	High weed pressure giving coconut tough competition for soil nutrients, moisture and space resulting to weak and stunted growth. This leads to production below optimal potential, reduced productivity and low returns. Amount of damage on young coconut depends on weed density and diversity, stage of weed growth and environment. The grass weed problems include crab sanguinalis (<i>Digitaria sanguinalis</i>), and goose grass (<i>Eleusine indica</i>). Broadleaved weeds including Palmer amaranths (<i>A. palmer</i>), Red pigweed (<i>A. retroflexus</i>), Black bindweed (<i>Convolvulus arvensis</i>) Purple nutsedge (<i>Cyperus rotundus</i>) and Yellow nutsedge (<i>C. Esculentus</i>) are more challenging. The weed problem is aggrevated by poor timing and management practices. This poses a problem to coconut enterprise.
What is it? (TIMP description)	Chemical weed control refers to any technique that involves the application of herbicide to weeds or soil to control the germination and growth of the weed species. Herbicide weed control is a technology that requires intensive knowledge on herbicides mode of action, the one selective for coconut, conditions necessary for effective application, type of soil, when to apply and how to application is done. Use only recommended herbicides listed by Pesticide Control Board as per label. eg Post emergence –non selective control of use glyphosate 10ml +20g NHSO ₊₄ + 2ML Soap; Atrazine 1.0kg /L to control grasses and sedges pre and early post.

2.7.16. Herbicide (chemic	al) Weed Control
	Hand weede d(fore) compared to herbicide sprayed coconut plot background)
Justification	Laborious hand weedingWeeds compete with your coconut for water, nutrients in the soil; and, too many weeds can lead to coconuts or a stressed tree. It is advisable to use herbicide marked as safe to use with coconut trees.Image: Image: Image
	the right rate and according to label).
Region promoted	Not yet.
Counties where TIMP will be upscaled	Kilifi
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Farmers and extension agencies
Approaches used in	• FFBS
dissemination	• AIP
	On-farm experimentation and dissemination
	Field days and shows

2.7.16. Herbicide (chemical) Weed Control		
	Farmer to farmer communication	
	• Leaflets	
	• Demonstrations	
	• Training on safe use of herbicides.	
Most effective approach	On-farm experimentation and larger plot effect demonstrations.	
Critical/essential factors	• Research to test, validate and release herbicide weed control in coconut varieties.	
for successful promotion	• A platform for interaction of Coconut value chain stakeholders	
	• Capacity building and training on appropriate and safe use of herbicide for all	
	users because incorrect application will lead to injury in coconut, reduced yields,	
	decreased fruits, reduced plant vigour, increased susceptibility to diseases and	
	pest and sometimes can result in plant death.	
	• Weed killers can also be dangerous to fruit trees because people worry about the chemicals reaching into the fruit.	
Partners/stakeholders for	• Public and private partners –[MoALFC) for extension,	
scaling up and their	Chemical companies for back stopping.	
respective roles	• FIPs (Farmer Input Promotion) for promotion.	
	• Farmer Groups for activity implementation and promotion.	
	• Service provider agencies e.g. Micro-finance agencies and banks for credit	
	provision, agro-vets for input supply.	
	• Processors and manufacturers to create market for produce, aggregators e.g.	
	and marketing. NGOs CBOs and EBOs to provide specialist services like	
	community mobilization nutrition training etc	
C: Current situation and futu	re scaling up	
Current extent of reach	Validation of these herbicides need to be done under different agroecological zones	
	and soils before recommendations are given to the farmers.	
Challenges in	• Lack of coconut innovation platforms to facilitate interaction of farmers with	
dissemination	relevant stakeholders	
	Low use of agronomic practice	
	• Limited knowledge and information and low literacy levels among the farmers or sprayers to read and interpret label instructions	
	• Capacity building is required to impart knowledge and skills in safe use and	
	application of herbicides	
	• The farmers need to understand the proper use and application of herbicides to	
	avoid buying inappropriate herbicides and minimize health, environmental and	
	social hazards	
Recommendations for	Establish coconut innovation platforms	
addressing the chanenges	• There is need to train the advisory and service providers as ToTs on appropriate	
	Use of herbicides. This help in reaching the farmers with the information.	
	health and social bazards. Liaise with the Agricultural extension and	
	environmental officers on the ground for farmer empowerment and guidance on	
	safe use of herbicides.	
Lessons learned	• Chances of successful scaling are higher when diverse value chain stakeholders	
	collaborate in an innovation platform	
	• Creation of awareness through demonstrations and farmer field days help in	
	adoption of the technology- chemical weed control	
	• Consumers concerns of herbicide residues in the soil and subsequent crops needs	

2.7.16. Herbicide (chemical) Weed Control		
	attention	
	Availability of Coconut market is essential	
	• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms	
	• Access to and use of information on different methods of weed control will	
	reduce drudgery and cost of weed management. It could give room to increase	
	area under cultivation and increase productivity.	
Social, environmental,	Sensitization of communities on alternative methods of weed control and appropriate	
policy and market	use of herbicides is vital.	
conditions necessary		
D: Economic, gender, vulnera	able and marginalized groups (VMGs) considerations	
Basic costs	Herbicide use is cheaper than manual weed control because it requires less labour and achieves timely weed management.	
Estimated returns	Not yet estimated.	
Gender issues and concerns in development and dissemination	Need to sensitize both men and women on value of crop losses caused by weed competition.	
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 and children. The children can get time for school work, while the women can engage in other economic activities.	
Gender related	Women stand to benefit in increased production due to timely operations, increased	
opportunities	yields and sales.	
VMG issues and concerns in development and dissemination	Due to prejudice associated with their social status, VMGs are excluded from access to benefits from improved technologies. Thus, affirmative action is required to promote the Coconut for the VMGs including value addition aspects.	
VMG issues and concerns in adoption and scaling up	Timely operations will lead to enhanced production by VMGs.	
VMG related opportunities	Use of herbicides will improve weed management leading to increased productivity, increase availability of coconut for consumption which will improve food security hence improved health; high value of crop will lead to economic empowerment	
E: Case studies/profiles of suc	ccess stories	
Success stories	Tamil Nadur Agricultural University. arsalia@tnau.ac.in	
Application guidelines for users	Https//tnau.ac.in>crs.aliyarnagar> weed-management.	
F: Status of TIMP Read	liness (1. Ready for up-scaling; 2. Requires validation and more research	
Requires validation; 3. Requ	ires Research)	
G: Contacts	•	
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.	
Lead organization and scientists	KALRO Dr Hottensiah W. Mwangi, Dr Violet N. Momanyi, Francis muniu.	
Partner organizations	MoALFC in Counties, Chemical companies.	
<u> </u>	· · · · · · · · · · · · · · · · · · ·	

2.7.17. Rapid Response to	Invasive weed species
	1.0 Awareness, 1.1 Prevent, 1.2 Detect, 1.3 Control, (APDC) 1.3.1 surveillance, 1.3.2

2.7.17. Rapid Response to Invasive weed species	
	quarantine.
Category (i.e. technology, innovation or management practice)	Innovation
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	 Increasing spread of invasive weed species dodders (<i>Cuscuta campestris</i>) on life fences getting their way to orchards Limited attention given to control of invasive weeds
	Limited awareness and knowledge on invasive Parasitic weeds species.
description)	This is an early detection and rapid response precise method where prevention, technologies, innovations or management practices of weed control are applied depending on the type of weed species and severity of weed pressure to contain weeds. Stakeholders are sensitized on weed impact and consistent follow up is done. Preventative, early detection, Intensive repetitive removal and disposal, application of herbicide (basal or bark painting or re-growths of weeds can be used to control weeds before planting (post emergence herbicides). In addition, post emergence is applied on the actively growing weeds. Non selective, broad spectrum; All herbicides are applied as recommended in the manufacturers label, and all instruction followed.
Justification	To control spread of Invasive weed species problems a holistic line of action with multi-disciplinary approaches is needed to bring together Invasive Weeds Technical Working group and stakeholders who shared a common goal with CABI Global programme on Action on Invasive species (AoI): which, focuses on strengthening national systems to better prevent, eradicate, control and manage Invasive Species. Coconut is an important crop for food and nutrition security; and, income generation in Kenya.
Region promoted	All counties where weeds invasive weeds pose a risk.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Farmers
Approaches used in dissemination	 On-farm demonstrations Field days Agricultural shows FFS CIGs Farmer to farmer Mass media

2.7.17. Rapid Response to Invasive weed species		
	Seminars, Meeting, Trainings	
Critical/essential factors	Sustained demand for effective weed control methods	
for successful promotion	Favorable climatic conditions for coconut production	
	Collaboration between all partners	
Partners/stakeholders for	• KALRO, will conduct sensitization and mobilize management of parasitic	
scaling up and their roles	invasive species in hotspots	
	• County governments and extension farmers' groups/CBOs and NGOs, will	
	implement extension.	
C: Current situation and fu	iture scaling up	
Counties where already	Kilifi, Lamu, Kwale	
promoted if any		
Counties where TIMP will	Kilifi	
be upscaled		
Challenges in	Limited knowledge on weed biology	
dissemination	Limited resource personnel	
Suggestions for addressing	Create awareness on invasive weed species.	
the challenges	• Share knowledge of weeds ecology and biology.	
	• Training on weeds identification.	
	• Training and demonstrate on mechanical hand control and disposal.	
	• Economic analysis to convince growers on cost effectiveness	
Lessons learned in	The current mindset and dependence on manual weeding to produce healthy Coconut	
upscaling, if any	needs to be addressed.	
Social, environmental,	Favourable climatic conditions for coconut production	
policy and market	• Sustained market demand for high quality coconuts.	
conditions necessary for		
development and		
upscaling.		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	KES depends on spread of weed invasion per acre	
Gender issues and concerns	None	
in development,		
dissemination, adoption		
and scaling up		
Gender related	Any gender can participate in use of trap crops in coconut production and marketing	
opportunities	which increases opportunities for income	
VMG issues and concerns	None	
in development,		
dissemination, adoption		
and scaling up		
VMG related opportunities	VMGs can utilize the practice as they engage in different parts of the coconut value chain.	
E: Case studies/profiles of s	success stories	
Success stories from	IWM Research work done in Tamil Nadu Agricultural University in coconut.	
previous similar projects	Farmers fields at the Coast.	
Application guidelines for	Guidelines are needed	
users		

2.7.17. Rapid Response to Invasive weed species		
F: Status of timp readines	ss (Ready for upscaling; 2. Requires	Requires validation and upscaling.
validation; 3. Requires furthe	er research)	
F: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O.	Box 14733-00800, NAIROBI.
	Tel: +254-020-2464435 Ext. 300, E-m	ail: <u>cd.narl@kalro.org</u>
	KALRO-Mtwapa-Nuts Crops Programme	e Coordinator, +254 722887283.
Lead organization and	Centre Director KALRO-Kabete, P.O.	Box 14733-00800, NAIROBI.
scientists	Tel: +254-020-2464435 Ext. 300, E-m	nail: <u>cd.narl@kalro.org</u> Dr Hottensiah Mwangi,
	Dr Violet N. Momanyi. Francis Muniu	1.
Partner organizations	MoALFC, County governments.	

2.7.18. Solarisation Bed for Weed Control		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the tech	nology, innovation or management practice	
Problem addressed	Diversity of weed species (grasses, broadleaved, annuals and perennials) that emerge to compete with Coconut seedling for available nutrients moisture and space	
	to compete with Coconut seeding for available nutrients, moisture and space.	
what is it? (TIMP	Solarisation is a method where you use transparent polythene films and increase solit	
	Basic phenomena is building up of lethally high temperatures in top soil where most dormant and viable seeds are present. The Mechanism is mainly breaking dormancy of weed seeds and solar scotching of emerged weed seedlings and direct killing of weed seeds by heat. The mechanism can increases soil temperature by 8-12 °C over non mulched soil. Rhizomes of perennial weeds may be killed if not deeply buried. Effectiveness is species specific and also depends on length of period of heating.	
Justification	Solarization for two consecutive years is successful in controlling perennial weeds such as sedges. Solarization with 0.05mm T Polythene sheets 40 days is effective in controlling weeds than use of 0.01mm polythene and takes shorter time duration. This is a good ecological and environmentally friendly method that is sustainable for small scale seedling producers.	
Region promoted	Coast	
Counties where TIMP will be upscaled	Kilifi	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers and extension agencies	
Approaches used in	• FFBS	
dissemination	• AIP	

2.7.18. Solarisation Bed for Weed Control		
	• On-farm experimentation and dissemination, field days, shows, farmer to farmer communication, leaflets, larger plot demonstrations, training on how to use solarization	
Most effective approach	On-farm experimentation and larger plot effect demonstrations.	
Critical/essential factors for successful promotion	 Research to test, validate and release solarisation bed technology weed control in coconut varieties A platform for interaction of coconut value chain stakeholders Development of the agronomic practice for coconut 	
Dontrong /stalkaholdong for	• Capacity building and training on use of polytnene and solar power.	
Partners/stakeholders for	• Public and private partners –[MoALFC) for extension	
respective roles	Chemical companies for back stopping EIDs (Former Input Promotion) for promotion	
respective roles	 FIPs (Farmer Input Promotion) for promotion Farmer Groups for activity implementation and promotion 	
	 Farmer Groups for activity implementation and promotion Service provider agencies a g Micro finance agencies and banks for credit. 	
	provision, agro-vets for input supply	
	• Processors and manufacturers to create market for produce, aggregators e.g. CARD (Community Action for Rural Development) for economy of scale sales and marketing], NGOs, CBOs, and FBOs to provide specialist services like community mobilization, nutrition training etc	
C: Current situation and fu	iture scaling up	
Current extent of reach	Requires Validation before recommendations are given to the farmers.	
Challenges in dissemination	 Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Low use of the agronomic practice 	
	Labour intensity	
	 Limited knowledge and information and low literacy levels among the farmers Capacity building is required to impart knowledge and skills in appropriate use and application of solarization 	
	• The farmers need to understand the proper use and application of solarization to avoid buying inappropriate polythene and minimize health, environmental and social hazards	
Recommendations for addressing the challenges	 Establish coconut innovation platforms There is need to train the agricultural extension county officers as ToTs on appropriate use of solarization. This help in reaching the farmers with the information. Polythene disposal should be done carefully to avoid environmental, health and social hazards. Liaise with the Agricultural extension and environmental officers on the ground for farmer empowerment and guidance on reuse and polythene disposal. 	
Lessons learned	 Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform. Creation of awareness through demonstrations and farmer field days help in 	
	adoption of the technology of Solarisation bed for weed control	
	Availability of market for coconut is essential	
	• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms.	
	Access to and use of information on different methods of wood control will	
	reduce drudgery and cost of weed management. It could give room to increase area under cultivation, productivity and profitability productivity.	

2.7.18. Solarisation Bed for Weed Control		
Social, environmental, policy and market conditions necessary	Sensitization of communities on alternative methods of weed control and appropriate use of polythene is very necessary.	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	Solarization to control weeds is cheaper than manual weed control because it requires less labour and achieves timely weed management.	
Estimated returns	Not yet estimated	
Gender issues and concerns in development and dissemination	Need to sensitize both men and women on value of crop losses caused by weed competition	
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 and children. The children can get time for school work, while the women can engage in other economic activities.	
Gender related opportunities	Women stand to benefit in increased production due to timely operations, increased yields and sales.	
VMG issues and concerns in development and dissemination	Due to prejudice associated with their social status, VMGs are excluded from access to benefits from improved technologies. Thus, affirmative action is required to promote the solarization for the VMGs including value addition aspects.	
VMG issues and concerns in adoption and scaling up	Timely operations will lead to enhanced production by VMGs.	
VMG related opportunities	Increased production will lead to increased consumption of coconut of high value which are high in natural antioxidants (Omega 3&6) hence improved health; high value of crop will lead to economic empowerment of VMGs.	
E: Case studies/profiles of	success stories	
Success stories	Coast	
Application guidelines for users	Travis bean (2018). Tropics in UC farm advisors & Specialists in Subtropical Horticulture in California	
F: Status of TIMP Readiness (1. Ready for up-scaling; 2.Requires validation and more researchRequires validation; 3. Requires Research)		
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.	
Lead organization and scientists	KALRO Dr Hottensiah W. Mwangi, Dr Violet N. Momanyi, Francis Muniu.	
Partner organizations	MoALFC in Counties, Chemical companies.	

2.7.19. Stale seed bed for Weed Control	
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the technology, innovation or management practice	

OF10 Stale good had for	Wood Control
Problem addressed	
	Datura stramonium among other weeds
	Competition from weeds prevents Coconut getting available resources and can cause weak and stunted growth. This poses a problem around young Coconut just starting. This depends on weed density and diversity, stage of weed growth and environment. The grass weed problems include crab sanguinalis (<i>Digitaria sanguinalis</i>), and goose grass (<i>Eleusine indica</i>). Broadleaved weeds include Palmer amaranths (<i>A. palmer</i>), Red pigweed (<i>A. retroflexus</i>), Datura (<i>Datura stramonium</i>) Purple nutsedge (<i>Cyperus rotundus</i>) and Yellow nutsedge (C. Esculentus) are more challenging. The weed problem is aggrevated by wrong timing and poor method of weed control activities.
What is it? (TIMP description)	Stale seed bed "false" is where seeds are allowed to germinate by rainfall or wetting and killing them (1-2 flushes of the weeds) before sowing the Clean certified Coconut variety seedlings. They are killed using glyphosate, sulfosate and glufosinate. At this stage shallow or use of non-residue paraquat may be used to destroy dense flush young weed seedlings. This is followed by sowing the selected Coconut seedling. Problem is most weed seeds that have the potential to develop are those where there is adequate soil moisture and temperature of 50 ⁰ F at a depth of 2 inches. Several passes are made in soil with rotoSpike tooth hallow is very useful implement for destroying the emerging weeds during preparation of stale beds. Then weed seeds allowed to germinate as weather permits. Then the weeds are dessicated or plowed.
Justification	With sound knowledge of weed phenology and other factors like temperature,
	irrigation and humidity at the local level it is possible to predict when certain weeds will raise problems in coconut seedbed.
Region promoted	
Counties where TIMP will	Stale bed weed control can be upscaled in all the areas where Coconut is to be
be upscaled	planted.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Farmers and extension agencies
Approaches used in	• FFBS
aissemination	• AIP
	 Iraining workshops, seminars, meetings On form experimentation and discomination field days, shows, former to former to former.
	• On-raim experimentation and dissemination, neid days, snows, farmer to farmer communication leaflets larger plot demonstrations, training on how to use stale
	bed.
Most effective approach	On-farm experimentation and larger plot effect demonstrations.

2.7.19. Stale seed bed for Weed Control	
Critical/essential factors	• Research to test, validate and release stale seed bed for weed control in Coconut
for successful promotion	varieties
	A platform for interaction of coconut value chain stakeholders
	Capacity building and training on use of polythene and stale bed
Partners/stakeholders for	• Public and private partners –[MoALFC) for extension,
scaling up and their	Chemical companies for back stopping.
respective roles	• FIPs (Farmer Input Promotion) for promotion.
	• Farmer Groups for activity implementation and promotion.
	• Service provider agencies e.g. Micro-finance agencies and banks for credit
	provision, agro-vets for input supply.
	• Processors and manufacturers to create market for produce, aggregators e.g.
	CARD (Community Action for Rural Development) for economy of scale sales
	and marketing], NGOS, CBOS, and FBOS to provide specialist services like
C: Current situation and fu	iture scaling up
Current extent of reach	Validation of these stale hade needs to be done hefore recommendations are given to
Current extent of reach	the farmers.
Challenges in	• Lack of Coconut innovation platforms to facilitate interaction of farmers with
dissemination	relevant stakeholders
	• Low use of the technology
	Labour intensity
	• Limited knowledge and information and low literacy levels among the farmers
	• Capacity building is required to impart knowledge and skills in safe use and
	application of stale beds
	• The farmers need to understand the proper use stale beds
Recommendations for	Establish Coconut innovation platforms
addressing the challenges	• There is need to train the agricultural extension county officers as ToTs on
	appropriate use of stale beds. This help in reaching the farmers with the
	information. Polythene disposal should be done carefully to avoid environmental,
	health and social hazards. Liaise with the Agricultural extension and
	environmental officers on the ground for farmer empowerment and guidance on
	use of stale bed.
Lessons learned	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform
	• Creation of awareness through demonstrations and farmer field days help in
	adoption of the technology- Stale seed bed
	 Availability of market is essential
	 Partnership is important in technology dissemination and adoption and this can be
	facilitated through innovation platforms
	• Access to and use of information on different methods of weed control will
	reduce drudgery and cost of weed management. It could give room to increase
	area under cultivation and increase productivity.
Social, environmental,	Sensitization of communities on alternative methods of weed control and appropriate
policy and market	use of stale beds is very necessary.
conditions necessary	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations	
Basic costs	Stale bed use is cheaper than manual weed control because it requires less labour and
	achieves timely weed management.

2710 Stale soud had for Wood Control	
Estimated returns	Not yet estimated
Gender issues and concerns	Need to sensitize both men and women on value of crop losses caused by weed
in development and	competition.
dissemination	
Gender issues and concerns	Women and children are the main sources of labour for this crop. Adoption of
in development,	technology will reduce the labour burden on women and children. The children can
dissemination concerns in	get time for school work, while the women can engage in other economic activities.
adoption and scaling up	
Gender related	Women stand to benefit in increased production due to timely operations, increased
opportunities	yields and sales.
VMG issues and concerns	Due to prejudice associated with their social status, VMGs are excluded from access
in development and	to benefits from improved technologies. Thus, affirmative action is required to
dissemination	promote the coconut for the VMGs including value addition aspects.
VMG issues and concerns	Timely operations will lead to enhanced production by VMGs.
in adoption and scaling up	
VMG related opportunities	Increased production will lead to increased consumption of high antioxidants hence
	improved health; high value of crop will lead to economic empowerment
E: Case studies/profiles of success stories	
Success stories	
Application guidelines for	Weed control leaflets/ manuals. Information and instructions always displayed on the
users	labels attached to container on how to use.
F: Status of TIMP Read	liness (1. Ready for up-scaling; 2. Requires validation and more research
Requires validation; 3. Requ	ires Research)
G: Contacts	
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u> , Dr Hottensiah Mwangi,
	Dr Violet Momanyi, Francis Muniu
Partner organizations	MoALFC in Counties, Chemical companies.

2.7.20. Transplanting Coconut for weed control		
Category (i.e. technology,	Management Practice	
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	Competition from weeds prevents Coconut getting available resources and can cause weak and stunted growth. This poses a problem around young Coconut just starting. This depends on weed density and diversity, stage of weed growth and environment. The grass weed problems include crab sanguinalis (<i>Digitaria sanguinalis</i>), and goose grass (<i>Eleusine indica</i>), broadleaved weeds including Palmer amaranths (<i>A. palmer</i>), Red pigweed (<i>A. retroflexus</i> . Purple nutsedge (<i>Cyperus rotundus</i>) and Yellow nutsedge (<i>C. Esculentus</i>) are more challenging. The weed problem is aggrevated by wrong timing and poor method of weed control activities.	
What is it? (TIMP	Proper transplanting of coconut. The nursery is prepared during the dry season when	
description)	there is less work in the fields. Prepare the holes for planting Coconut with manure as	

2.7.20. Transplanting Coconut for weed control	
	recommended in particular field. Immediately it rains remove the Coconut from nursery, each polyhtene paper with on seedlings, cut and plant in the ready prepared holes. Weed regularly depending on location using a preferred suitable method and the Coconut will develop.
Justification	With sound knowledge of Coconut nursery and weed phenology and other factors like temperature, irrigation and humidity at the local level it is possible to predict when certain weeds will raise problems in Coconut nursery and to remove them easily as compared to the field. Transplanted Coconut has less weeding to be done once the weeding method of choice is used. Transplanting has advantage in that when rainfall is delayed Coconut watering intervals are reduced to make the crop resistant stress in the nursery. This is a climate smart technology for resilience and food security and to improve lively hoods.
Region promoted	Kilifi, Lamu, Kwale
Counties where TIMP will be upscaled	Kilifi.
B: Assessment of dissemi	nation and scaling up/out approaches
Users of TIMP	Farmers and extension agencies
Approaches used in dissemination	 FFBS AIP Training workshops, seminars, meetings On form experimentation and dissemination
	 Field days and shows Farmer to farmer communication Use of leaflets
Most offective approach	Demonstrations and training on now to use coconut transplanting. On farm experimentation and larger plot affect demonstrations
Critical/assential factors	Di-faill experimentation and larger plot effect demonstrations.
for successful promotion	 Research to test, valuate and release transplanting technology. A platform for interaction of coconut value chain stakeholders.
for successful promotion	 A platform for interaction of coconut value chain stakeholders Capacity building and training on use of polythene and transplanting coconut
Partners/stakeholders for	 Public and private partners –[MoALEC] for extension
scaling up and their	 Chemical companies for back stopping.
respective roles	• FIPs (Farmer Input Promotion) for promotion.
	• Farmer Groups for activity implementation and promotion.
	• Service provider agencies e.g. Micro-finance agencies and banks for credit provision, agro-vets for input supply.
	• Processors and manufacturers to create market for produce, aggregators e.g. CARD for economy of scale sales and marketing], and Others e.g. NGOs, CBOs, and FBOs to provide specialist services like community mobilization, nutrition training etc.
C: Current situation and fu	uture scaling up
Current extent of reach	Validation of these stale beds needs to be done before recommendations are given to
	the farmers.
Challenges in dissemination	• Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders
	Low use of technology uptake
	• Labour intensity
	• Limited knowledge and information and low literacy levels among the farmers
	• Capacity building is required to impart knowledge and skills in safe use of

2.7.20. Transplanting Coconut for weed control	
	polythene bags, coconut nursery and transplanting
	• The farmers need to understand the proper use transplanting technology.
Suggestions for addressing	Establish coconut innovation platforms
the challenges	• Promotion of the transplanting technology in the suitable areas
	• There is need to train the agricultural extension county officers as ToTs on appropriate use of transplanting Coconuts. This help in reaching the farmers with the information. Polythene disposal should be done carefully to avoid environmental, health and social hazards. Liaise with the Agricultural extension and environmental officers on the ground for farmer empowerment and guidance.
	on use of transplanting technology.
Lessons learned	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform
	• Creation of awareness through demonstrations and farmer field days help in adoption of technologies
	• Availability of market is essential
	• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms
	• Access to and use of information on different methods of weed control will
	reduce drudgery and cost of weed management. It could give room to increase
	area under cultivation and increase productivity
Social, environmental,	Sensitization of communities on alternative methods of weed control and appropriate
policy and market	use of transplanting technology.
D: Economic gender vuln	orable and marginalized groups (V/MCs) considerations
D. Economic, gender, vum	Transplanting appoint into aloon saddhad is chapper than manual wood control
	because it requires less labour and achieves timely weed management.
Estimated returns	Not yet estimated
Gender issues and concerns	Need to sensitize both men and women on value of crop losses caused by weed
in development and	competition.
dissemination	
Gender issues and concerns	Women and children are the main sources of labour for this crop. Adoption of technology will reduce the labour burden on women and shildren. The shildren can
dissemination concerns in	get time for school work, while the women can engage in other economic activities
adoption and scaling up	get time for school work, while the women can engage in other economic activities.
Gender related	Women stand to benefit in increased production due to timely operations, increased
opportunities	yields and sales.
VMG issues and concerns	Due to prejudice associated with their social status, VMGs are excluded from access
in development and	to benefits from improved technologies. Thus, affirmative action is required to
dissemination	promote the coconut for the VMGs including value addition aspects.
VMG issues and concerns	Timely operations will lead to enhanced production by VMGs.
in adoption and scaling up	
VMG related opportunities	Increased production will lead to increased consumption and supply of coconut hence improved health of VMGs; high value of crop will lead to economic empowerment
E: Case studies/profiles of	success stories
Success stories	Laikipia County, Solio Villages and Siaya.
Application guidelines for	• H.W. Mwangi, F.Mgonja, H. Admassu, F. Opio, I.Rwomshana, J. Karau, and
users	V.Kimani. pg 215-223. 2011. Upscaling of Soil Management Technologies and Drought tolerant Coconut Varieties for increased coconut productivity in the East

2.7.20. Transplanting Coconut for weed control	
	and Central Africa. Advances in Research for Development. ASARECA Success
	Stories. 2011.
	Weed control leaflets/manuals
F: Status of TIMP Readiness (1. Ready for up-scaling; 2. Requires validation and more research.	
Requires validation; 3. Requires Research)	
G: Contacts	
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.
Lead organization and	KALRO Dr Hottensiah Mwangi, Dr Violet Momanyi. Francis Muniu.
scientists	
Partner organizations	MoALFC in Counties, Chemical companies.

2.7.21. Mechanical weeding	ng
Category (i.e. technology,	Management Practice
innovation or management	
practice)	
A: Description of the tech	nology, innovation or management practice
Problem addressed	Weeding using panga in Coconut (left), Weeding using panga (right) and Weeding using jembes (bottom) Weeding using panga in Coconut (left), Weeding using panga (right) and Weeding Drudgery and lack of hand weeding labour. Handweeding manually is commonly
	done to remove weeds.
What is it? (TIMP description)	Using of tools to get a clean coconut field free of weeds. Plant weed free transplant/or certified seeds into a weed free field.
	This should be done timely and carefully tonavoid damaging of feeder roots or trunks. Wound promotes pathogen penetration of which causes infection.

2.7.21. Mechanical weeding	
	Facilitate inter-row weeding timely when weeds emerge
Justification	Weeds if not controlled will take over, win the competition, and use all nutrients and soil moisture leading to low productivity and profitability. The emerged weeds can be managed effectively by timely weeding using appropriate tools to avoid shock- stress on Coconut due to disturbance and root damage since they are shallow therefore very sensitive. The weeds near the roots can be removed by hand pulling.
Region promoted	All areas where Coconut are grown.
Counties where TIMP will be upscaled	Kilifi.
B: Assessment of dissemi	nation and scaling up/out approaches
Users of TIMP	Farmers and Agricultural extension officers.
Approaches used in dissemination	 FFBS AIP On-farm experimentation and dissemination, field days, shows, farmer to farmer communication, leaflets, larger plot demonstrations.
Most effective approach	On-farm experimentation and larger plot effect demonstrations.
Critical/essential factors for successful promotion	 Research to test, validate and release improved mechanical weeding. A platform for interaction of Coconut value chain stakeholders Participatory Implementation, stakeholder sensitization.
Partners/stakeholders for scaling up and their respective roles	 Public and private partners –[MoALFC) for extension, Processors and manufacturers to create market for produce, aggregators e.g. CARD for economy of scale sales and marketing, and Others e.g. NGOs, CBOs, and FBOs to provide specialist services like community mobilization, nutrition training etc.
C: Current situation and future scaling up	
Current extent of reach	Limited research done on gender responsive weeding implements.
Challenges in dissemination	 Lack of Coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Labour intensity Low use of agronomic practices Labour intensity Appropriate implements are not readily available in the market such as subsoilers.

2.7.21. Mechanical weeding			
	Subsoiling for minimum soil disturbance and exposure of weed seeds		
Suggestions for addressing	Establish Coconut innovation platforms		
the challenges	Work with Jua Kali industries for fabrication of appropriate implements.		
Lessons learned	 Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform. Creation of awareness through demonstrations and farmer field days help in adoption of the technologies Availability of market is essential 		
	• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms.		
	• Access and use of appropriate weeding tools (technology) will provide timely weed control with reduced drudgery to enhance crop production.		
Social, environmental,	Sensitization of communities on the mechanical weed management practices for		
policy and market	sensitive coconut young plants.		
conditions necessary			
D: Economic, gender, vuln	nerable and marginalized groups (VMGs) considerations		
Basic costs	Basic costs include weeding, seeds and tool which approximate to KES 20,000 per acre		
Estimated returns	Gross margin KES 107,325 per acre per season in 8 th year		
Gender issues and concerns in development and dissemination	Need to sensitize both men and women on value of weed losses caused by weeds and timely weed control		
Gender issues and concerns in development, dissemination concerns in adoption and scaling up	Women and children are the main sources of labour. Increased workload of weeding is likely to directly impact on women and school going children.		
Gender related opportunities	 Women stand to benefit in increased production as this is a nutritious food crop which will improve the diets. Sale of extra coconut improve the household income. Also weeding labour will be reduced. 		
VMG issues and concerns in development and dissemination	Due to prejudice associated with their social status, VMGs are excluded from access to and benefits from improved technologies. Thus, affirmative action is required to promote the crop for the VMGs including value addition aspects.		
VMG issues and concerns in adoption and scaling up	Timely operations will lead to enhanced production by VMGs.		
VMG related opportunities	Increased production will improve food and nutrition security and economic empowerment		
E: Case studies/profiles of	success stories		
2.7.21. Mechanical weeding	ng		
-------------------------------	--	--	--
Success stories	Tharaka nithi.		
Application guidelines for	ToT Manuals to include weed management TIMPs.		
users			
F: Status of TIMP Read	liness (1. Ready for up-scaling; 2. Ready for up-scaling		
Validation 3. Requires furthe	lidation 3. Requires further research)		
G: Contacts			
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.		
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>		
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.		
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.		
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: cd.narl@kalro.org, Dr Hottensiah Mwangi,		
	Dr Violet Momanyi, Francis Muniu.		
Partner organizations	MoALFC in Counties		

2.7.22. Crop Rotation in	Coconut
Category (i.e. technology,	Management Practice
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	Occurrence of diverse weed spp. and rich weed seed banks in Coconut cropping systems contribute to high weed infestations resulting to losses coconut yield losses.
What is it? (TIMP	This is a planned sequence of crops growing same field year after year organized for
description)	a long term weed management. A good successive weed control strategy starts with a Farm Plan with a crop rotation schedule incorporated for optimal Coconut production. Land is divide into a number of distinct areas. Detailed weed information (annual broad leaved or grasses) recoded or maps are kept over time to help improve management decision in crop rotation. Keep plants of same type together. eg Watermelon – Beans – Pursley - carrot or onions. Rotation adds diversity to the cropping system and increases productivity of the system sustainably. Sow certified melon seeds in rows or transplant watermelon seedlings into a clean weed free coconut seed bed. Rotation is the most critical time for obtaining good crop weed control but emphasize before making decision should be on environment, weeds present, time of year, crop rotation, irrigation methods and herbicide cost. Good rotation is achieved by combining cultural and herbicide weed management strategies. Two options 1. Form beds well before planting. Flush weeds grow. Knock them down with a post emergence herbicide or shallow weeding. 2. Form beds just before planting. Remove any emerged weeds. Or use pre-plant herbicides such as

2.7.22. Crop Rotation in Coconut		
	(glyphosate, paraquat and diquat) depending on weeds present, stage of weed growth and herbicide cost. You can start by applying appropriate herbicide targeting specific weeds on your land eg Glyphosate 0.3-1.0. Use hooded spray and direct to coconut row middles. When weeds are small this reduces weeding costs.	
Justification	Planting a wide variety of crops with varied characteristics reduces the likelihood that specific weed species will become adapted to the system and become problematic. The successive rotation systems for weed suppression appears to be based on the use of crop sequences that employ varying patterns of resources competition, allellopathy interference, soil disturbance and mechanical damage to provide an unstable and frequently inhospitable environment that provides the proliferation of a particular weed species. Correct timely Crop Rotation minimizes weed population in Coconut crop and reduces weed seed banks so there is less future infestations. Different crops grown in rotation break the cycle of weeds. The diversity of weed management strategies used for different crops also increases weed diversity and reduces prevalence of problem weeds that can build over time. Planting dates are important. The most effective management must be made before crop is planted and this is taken care of when planning the rotation.	
Region promoted	All areas where Coconut are grown.	
Counties where TIMP will be upscaled	Coast	
B: Assessment of dissemi	nation and scaling up/out approaches	
Users of TIMP	Farmers and Agricultural extension officers	
Approaches used in	• FFBS	
dissemination	• AIP	
	• On-farm experimentation and dissemination, field days, shows, farmer to farmer communication, leaflets, larger plot demonstrations.	
Most effective approach	On-farm experimentation and larger plot effect demonstrations.	
Critical/essential factors for successful promotion	 Research to test, validate and release rotation practice in coconut varieties A platform for interaction of Coconut value chain stakeholders Participatory Implementation Stakeholder sensitization. 	
Partners/stakeholders for	Public and private partners –[MoALFC) for extension	
scaling up and their	Jua Kali artisans	
respective roles	• Processors and manufacturers to create market for produce, aggregators e.g. CARD for economy of scale sales], NGOs, CBOs, and FBOs to provide specialist services like community mobilization and nutrition training	
C: Current situation and fu	iture scaling up	
Current extent of reach	Limited research done on appropriate rotations for coconut systems systems.	
Challenges in dissemination	Lack of Coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders	
Suggestions for addressing the challenges	Establish Coconut innovation platforms	
Lessons learned	 Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform Use of appropriate crop rotation will provide timely weed control which will 	
	enhance crop production.	
Social, environmental, policy and market	Sensitization of communities on the crop rotation practices in weed management	

2.7.22. Crop Rotation in (Coconut	
conditions necessary		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 3600 hand weeding	
Estimated returns	Gross margin KES 107,325 per acre per season in 8th year	
Gender issues and concerns in development and dissemination	Need to sensitize both men and women on value of crop rotation for timely weed control and reduction of weed seed banks.	
Gender issues and concerns in development, dissemination concerns in adoption and scaling up	Women and children are the main sources of labour. Reduced workload of weeding is likely to directly impact positively on women and school going children.	
Gender related opportunities	 Women stand to benefit in increased production as Coconut is a nutritious food crop which will boost health. Sale of extra produce improve the household income Also weeding labour will be reduced 	
VMG issues and concerns	Due to prejudice associated with their social status. VMGs are excluded from access	
in development and dissemination	to and benefits from improved technologies. Thus, affirmative action is required to promote the coconut crop for the VMGs including value addition aspects.	
VMG issues and concerns in adoption and scaling up	Timely operations will lead to enhanced production by VMGs.	
VMG related opportunities	Increased production will improve food and nutrition security and economic empowerment	
E: Case studies/profiles of s	success stories	
Success stories	Coconut farmers in Coast region.	
Application guidelines for users	Production manuals to include crop rotation weed management TIMP	
F: Status of TIMP Read Validation 3. Requires furthe	liness (1. Ready for up-scaling; 2. Ready for validation er research)	
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.	
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u> , Dr Hottensiah Mwangi, Dr Violet Mumanyi, Francis Muniu	
Partner organizations	MoALFC in Counties	

2.7.23. Mowing to control weeds in Coconut		
Category (i.e. technology,	Management Practice	
innovation or management		
practice)		
A: Description of the techno	logy, innovation or management practice	
Problem addressed	Occurrence of diverse weed spp. and rich weed seed banks in Coconut cropping systems contribute to high weed infestations resulting to losses coconut yield losses.	

2.7.23. Mowing to control	l weeds in Coconut
	Richardia brasiliensis, Trichodesma zeylenicum among
	other weeds
What is it? (TIMP description)	This is a planned sequence of mowing the coconut fields to control weeds and leaving the crop residue on the field to decompose and rot there covering soil. A good successive mowing of weeds as a control strategy starts with a Farm Plan with time schedules of when to implement mowing for optimal Coconut production.Detailed weed information (annual broad leaved or grasses) recoded or maps are kept over time to help improve management decision in mowing.
Justification	Mowing keeps the infestation of weeds down but they will regrow. Correct timely mowing before weed flowering minimizes weed population in Coconut crop and reduces weed seed banks so there is less future infestations.
Region promoted	All areas where Coconut are grown.
Counties where TIMP will be upscaled	Kilifi
B: Assessment of dissemination	tion and scaling up/out approaches
Users of TIMP	Farmers and Agricultural extension officers
Approaches used in dissemination	 FFBS AIP On-farm experimentation and dissemination Field days and shows Farmer-to-farmer communication Demostrations
Most effective approach	On-farm experimentation and larger plot effect demonstrations.

2.7.23. Mowing to control	weeds in Coconut	
	Farmers learning on weeds in the a weedy field	
Critical/essential factors for successful promotion	 Research to test, validate and release rotation practice in coconut varieties A platform for interaction of Coconut value chain stakeholders Participatory implementation Stakeholder sensitisation 	
Partners/stakeholders for scaling up and their respective roles	 Public and private partners –[MoALFC) for extension, Jua Kali artisans Processors and manufacturers to create market for produce, aggregators e.g. CARD for economy of scale sales], NGOs, CBOs, and FBOs to provide specialist services like community mobilization, nutrition training etc 	
C: Current situation and futu	re scaling up	
Current extent of reach	Limited research done on appropriate mowing schedule for coconut systems.	
Challenges in	Lack of Coconut innovation platforms to facilitate interaction of farmers with	
dissemination	relevant stakeholders	
Suggestions for addressing	Establish Coconut innovation platforms	
the challenges		
Lessons learned	 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 Creation of awareness through demonstrations and farmers field days help in adoption of varieties Availability of market is essential Use of appropriate crop rotation will provide timels weed control whi will enhance crop production 	
Social, environmental, policy and market conditions necessary	Sensitization of communities on mowing practices in weed management	
D: Economic, gender, vulner	able and marginalized groups (VMGs) considerations	
Basic costs	Basic cost of mowing of Coconut field:KES 2000 per acre	
Estimated returns	Gross margin KES 107,325 per acre per season in 8 th year	
Gender issues and concerns in development and dissemination	Need to sensitize both men and women on value of mowinng for timely weed control and reduction of weed seed banks.	
Gender issues and concerns in development, dissemination concerns in adoption and scaling up	Women and children are the main sources of labour. Reduced workload of weeding is likely to directly impact positively on women and school going children.	
Gender Telated	• women stand to benefit in increased production as Coconut is a nutritious food	

2.7.23. Mowing to control	weeds in Coconut	
opportunities	crop which will boost health. Sale of extra produce improve the household	
	income	
	Also weeding labour will be reduce	red
VMG issues and concerns	Due to prejudice associated with their	r social status, VMGs are excluded from access
in development and	to and benefits from improved technology	ologies. Thus, affirmative action is required to
dissemination	promote the coconut crop for the VMC	Gs including value addition aspects.
VMG issues and concerns	Timely operations will lead to enhanced production by VMGs.	
in adoption and scaling up		
VMG related opportunities	Increased production will improve	food and nutrition security and economic
	empowerment of VMGs.	
E: Case studies/profiles of success stories		
Success stories	Coconut farmers in Coast region.	
Application guidelines for	https//www.quorus.com –which is the best method of weed control in coconut.	
users		
F: Status of TIMP Readine	ss (1. Ready for up-scaling; 2.	Ready for validation
Validation 3. Requires furthe	er research)	
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O.	. Box 14733-00800, NAIROBI.
	Tel: +254-020-2464435 Ext. 300, E-m	nail: <u>cd.narl@kalro.org</u>
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.	
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: cd.narl@kalro.org, Dr Hottensiah Mwangi,	
	Dr Violet Mumanyi, Francis Muniu	
Partner organizations	MoALFC in Counties	

2.7.24. Biological Control	in Coconut
Category (i.e. technology,	Management Practice
innovation or management	
practice)	
A: Description of the techno	logy, innovation or management practice
Problem addressed	Occurrence of diverse weed species and rich weed seed banks in Coconut cropping systems contribute to high weed infestations resulting to losses coconut yield losses.
What is it? (TIMP	This is a planned sequence of grazing of goats in coconut fields field year after year
description)	organized for a long term weed management. A good successive weed control
	strategy starts with a Farm Plan with a field divided into portions for grazing
	schedule incorporated for optimal Coconut production. Land is divide into a number
	of distinct areas. Detailed weed information (annual broad leaved or grasses) recoded

2.7.24. Biological Control in Coconut		
	or maps are kept over time to help improve management decision in crop rotation.	
	Weedy coconut field in Mtwapa	
Justification	Grazing goats in the already established coconut orchard in a systematic plan will	
	manage most weeds and goats will add income to the farmer producing coconuts.	
Region promoted	All areas where Coconut are grown.	
Counties where TIMP will be upscaled	Kilifi	
B: Assessment of disseminat	tion and scaling up/out approaches	
Users of TIMP	Farmers and Agricultural extension officers	
Approaches used in	• FFBS	
dissemination	• AIP	
	• On-farm experimentation and dissemination, field days, shows, farmer to farmer communication, leaflets, larger plot demonstrations.	
Most effective approach	On-farm experimentation and larger plot effect demonstrations.	
Critical/essential factors	Research to test, validate and release rotation practice in coconut varieties	
for successful promotion	A platform for interaction of Coconut value chain stakeholders	
	Participatory implementation	
	Stakeholder sensitization	
Partners/stakeholders for	• Public and private partners –[MoALFC) for extension,	
respective roles	 Jua Kall artisans Dreassons and manufacturars to areate market for produce aggregators of a 	
	• Frocessors and manufacturers to create market for produce, aggregators e.g. CARD for economy of scale sales] NGOs CBOs and FBOs to provide specialist	
	services like community mobilization, nutrition training etc.	
C: Current situation and futu	ire scaling up	
Current extent of reach	Limited research done on appropriate mowing schedule for coconut systems.	
Challenges in	Lack of Coconut innovation platforms to facilitate interaction of farmers with	
dissemination	relevant stakeholders	
Suggestions for addressing	Establish Coconut innovation platforms	
the challenges	Information dissemination on the practices	
	• Promotion of the technology in the suitable areas	
	• Work with farmers to validate known schedules from other researchers or	
Lagonglearnad	countries in different coconut growing regions.	
Lessons learned	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform	
	Creation of awareness through demonstrations and farmer field days	

2.7.24. Biological Control in Coconut		
	• Availability of market is essential	
	• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms	
	• Use of appropriate crop rotation will provide timely weed control which will	
	enhance crop production.	
Social, environmental,	Sensitization of communities on the grazingschedule in weed management	
policy and market		
conditions necessary		
D: Economic, gender, vulner	rable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns	Need to sensitize both men and women on value of gazing for timely weed control	
in development and	and reduction of weed seed banks.	
dissemination		
Gender issues and concerns	Women and children are the main sources of labour. Reduced workload of weeding	
in development,	is likely to directly impact positively on women and school going children.	
dissemination concerns in		
adoption and scaling up		
Gender related	• Women stand to benefit in increased production as Coconut is a nutritious food	
opportunities	crop which will boost health. Sale of extra produce improve the household	
	income.	
	• Also weeding labour will be reduced.	
VMG issues and concerns	Due to prejudice associated with their social status, VMGs are excluded from access	
dissemination	to and benefits from improved technologies. Thus, affirmative action is required to	
VMC issues and concorrect	Timely operations will load to enhanced production by VMCs	
in adoption and scaling up	Timery operations will lead to enhanced production by VMOS.	
VMG related opportunities	Increased production will improve food and nutrition security and economic	
vivio related opportunities	empowerment of VMGs	
E: Case studies/profiles of su	iccess stories	
Success stories	Coconut farmers in Coast region.	
Application guidelines for	Production manuals to include glazing for weed management	
users	Trouverent management	
F: Status of TIMP Readine	ss (1. Ready for up-scaling: 2. Ready for validation	
Validation 3. Requires furthe	er research)	
G: Contacts		
Contacts	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>	
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.	
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.	
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: cd.narl@kalro.org, Dr Hottensiah Mwangi,	
	Dr Violet Mumanyi, Francis Muniu	
Partner organizations	Counties	

2.7.25. Safe Use of herbicides in Coconut cropping systems	
Category (i.e. technology,	Management practice

2.7.25. Safe Use of herbici	ides in Coconut cropping systems
innovation or management practice)	
A: Description of the techno	logy, innovation or management practice
Problem addressed	Excessive herbicide application to crops and the soil, use of herbicides for spraying crops without wearing the right protective clothing, storage of herbicides in non-designated stores, wrong application techniques, spraying at the wrong times and against the wind direction, and use without following the guidelines provided on the labels (eg rate and Pre-Harvest Interval), disposal of expired herbicides and regulation on use of pesticides.
What is it? (TIMP description)	Safe handling and use of herbicides right from transportation from the agro-dealers to storage in their houses, mixing procedures and their application in the field in order to ensure safety of the crop, the person handling them and the environment at large. The technology will include proper methodologies for proper herbicide disposal to minimize pollution of the environment.
Justification	Although reported cases of improper and misuse of herbicides are common in many areas where Coconut is grown, they are not documented. However, there has been reports of increase of chronic diseases in human beings. In addition there have been 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. Most of these irregularities can easily be corrected through sensitization and capacity building forums for end users to be made aware of the best practices when handling herbicides.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, Coconut producers
Approaches used in dissemination	 FFBS AIP Farmer trainings, farmer participatory demonstrations/farmer field schools Shows Trade fairs Plant clinics Pesticides spray demonstrations.
Critical/essential factors for successful promotion	 Research to test, validate and employ safe use herbicide application in coconut varieties A platform for interaction of coconut value chain stakeholders Development of agronomic practices for cabbage

2.7.25. Safe Use of herbicides in Coconut cropping systems		
	• Collaboration between all partners, willingness of farmers to adhere to proper	
	guidelines.	
	Adequate facilitation: funds, logistics (transport)	
Partners/stakeholders for	MoALFC Extension	
scaling up and their roles	Individual farmers and farmers groups/CBOs	
	• KALRO and Universities to develop the technologies and conduct ToTs	
	Agrochemical Association of Kenya (AAK)	
	• PCPB	
	• KEPHIS.	
C: Current situation and futu	re scaling up	
Counties where technology	Kilifi, Kwale, Lamu	
is already being promoted		
if any		
Counties where TIMPs will	Kilifi	
be up scaled		
Challenges in	• Lack of Coconut innovation platforms to facilitate interaction of farmers with	
dissemination	relevant stakeholders	
	• Change of mindset in favour of current practices maybe difficult to achieve.	
	• Illiteracy and inadequate capacity to use herbicides correctly. Most farmers	
	cannot read and interpret the labels properly resulting to overuse or underuse of	
	herbicides.	
	• Inadequate capacity by farmers and agrochemical companies to dispose harbicides (negticides) preparely	
Suggestions for addressing	Establish Coconnet innervation plotforms	
the challenges	• Establish Coconut innovation platforms	
the chancinges	• Capacity building and sensitization forums for both farmers and agro dealers	
	Example of youth spray tooms	
	 Formation of youth spray teams. Establishment of aggregation centres for pesticide containers. 	
Lessons learned in	 Establishment of aggregation centres for pesticide containers Changes of successful scaling are higher when diverse value chain stakeholders 	
upscaling if any	• Chances of successful scaling are higher when urverse value chain stakeholders collaborate in an innovation platform	
apseuling it uny	• Creation of awareness through demonstrations and farmer field days help in	
	adoption of the technologies	
	 Availability of market is essential 	
	 Partnership is important in technology dissemination and adoption and this can be 	
	facilitated through innovation platforms	
	• Upscaling of this technology needs young men and youth due to its hazardous	
	nature. Some of the aspects of this technology need a lot of capital to actualize.	
	For instance, the collection and incineration of pesticide containers needs a lot of	
	money that may not be accessible by most men or youth groups. The illiteracy	
	levels of some farmers may hinder the use of correct information/knowledge in	
	the use of herbicides in some areas.	
Social, environmental,	Organized collective marketing channels critical for benefits to be derived from	
policy and market	practice	
conditions necessary		
D: Economic, gender, vulner	able and marginalized groups (VMGs) considerations	
Basic costs	KES - per acre	
Estimated returns	KES - per acre	
Gender issues and concerns	• Technology is not safe for use by expectant women and the physically challenged	

2.7.25. Safe Use of herbicides in Coconut cropping systems	
in development,	individuals because of it hazardous/dangerous nature.
dissemination, adoption	• Herbicides and protective gear are expensive and most women may not afford
and scaling up	them.
	• Lack of knowledge by men and women on the dangers of herbicides especially
	on storage and disposal.
	• Low levels of illiteracy and inability to read and interpret the content of the
	herbicide labels especially on re-entry period after spraying and PHI. This can
Gender related	Cause herbicides poisoning to get into contact.
opportunities	 Formation of surveillance/scouting groups by women
VMG issues and concerns	These are dangerous products that may not be handled by vulnerable groups
in development	 Herbicides are expensive for most youths and physically challenged groups that
dissemination, adoption	may not utilize them.
and scaling up	
VMG related opportunities	• Safe use of herbicides practice can easily be undertaken by the youth as an
	enterprise by forming Spray teams in the wards in each county.
	• Youths to offer spray calibration services to farmers as an enterprise.
	• Youths to help in the collection of pesticide containers and assist in the
	incineration processes by AAK.
	• Youth to own and operate agro chemicals that stock right pesticides and offer
E. Constanting / and files of an	advisory services to farmers at the agrovet shops
E: Case studies/profiles of su	
Success stories	• The AAK has trained youth spraying teams that have helped in the spraying of
	the farms in a few counties thus reducing cases of people being exposed to
	 Some counties who have aggregation centres by AAK for collection of pesticide
	containers. This has led to reduction of these containers on farms
	 Safe use of Pesticide campaigns by AAK, PCPB, KALRO and MOLF.
Application guidelines for	Sensitization of farmers on the harmful effects of the pesticides on human beings and
users	environment. Capacity build farmers and youth on spraying techniques using
	developed curriculum by AAK and PCPB. Assist youth to form spraying teams and
	equip them with PPEs. Train Extension staff as Plant doctors using the CABI
	modules, manuals and establish Plant Clinics in the target counties. Develop and
	equip the Plant Doctors and youth spraying teams with pest decision guidelines,
	manuals, brochures developed by KALRO and CABI as reference material
Status of TIMP readiness (1.	Ready for upscaling; 2. Requires Ready for upscaling
validation; 5. requires turtile	r research)
F: Contacts	
Contacts	Centre Director KALRO-Kabete, P.O. Box 14/33-00800, NAIROBI.
	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u>
	KALRO-Mtwapa-Nuts Crops Programme Coordinator, +254 722887283.
Lead organization and	Centre Director KALRO-Kabete, P.O. Box 14733-00800, NAIROBI.
scientists	Tel: +254-020-2464435 Ext. 300, E-mail: <u>cd.narl@kalro.org</u> : Dr Hottensiah Mwangi,
	Dr N. Momanyi and Francis Muniu
Partner organizations	MoALFC, CABI, PCPB, AAK, KEPHIS, County Governments, Universities

2.8 HARVEST AND POSTHARVEST MANAGEMENT

2.8.1. Maturity indices		
Category (i.e. technology, innovation or management practice)	Management Practice	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Losses due to incorrect timing of harvest and inappropriate maturity indices; and lack of awareness on maturity indices.	
What is it? (TIMP description)	 This is a management practice involving determination of the following correct maturity indices. Coconut matures in 350 to 375 days after appearance of the inflorescence Colour of fruit changes from green to yellowish or brownish green. A grey skin indicates that the nut is old. The fruit produces peculiar metabolic sound on thumping All nuts in a bunch mature at the same time and uniformity Once mature, the nut produces the sound of water when shaken 	
Justification	Harvesting of immature nuts causes the production of rubbery copra with high moisture content. The copra loses quality and may eventually rot.	
B: Assessment of dissemina	ition and scaling up/out approaches	
Users of TIMP	Farmers, traders, consumers in urban centres	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment. Creating awareness on effects of improper postharvest handling. It is advisable to use at least 3 of the maturity indices to have more confidence in the harvest maturity state.	
Partners/stakeholders for scaling up and their roles	 Farmers- for activity implementation and promotion Private sector, County Government, NGOs, NOCD, Micro-Enterprises Support Programme Trust (MESPT) to upscale the technology 	
C: Current situation and future scaling up		
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in dissemination	 Lack of awareness of the correct maturity indices of coconut by farmers and users Negative attitude by farmers on adoption of new agricultural TIMPs 	
Suggestions for addressing the challenges	Awareness creation and capacity building of stakeholders on appropriate harvesting indices (maturity indices). Availing data on the economics and the gains to be made	

2.8.1. Maturity indices		
	through adoption of the TIMP	
Lessons learned in upscaling, if any	 Involvement of stakeholders such as CIG, CBOs and NGOs enhances adoption Continuous capacity building is key to attitude change. Consistent trainings, demonstrations and sensitisations would motivate farmers to adopt the technology 	
Social, environmental, policy and market conditions necessary for development and upscaling	Policies targeting the empowerment of women and youth as entrepreneurs in society	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	Yet to be determined	
Estimated returns	Increased incomes due to reduced postharvest losses from immature crop. Increased nutrition due to utilization of the saved coconut.	
Gender issues and concerns in development, dissemination adoption and scaling up	 The TIMP requires keen observation and knowledge of crop maturity which may be a challenge to both men and women. The TIMP is easily adoptable after training and many farmers can use the TIMP since it reduces losses incurred during and after harvesting. However, women and youths have limited access to education, training and extension services than men 	
Gender related opportunities	The TIMP increases farm income through reduction of harvest losses. Men can capitalize on this aspect of coconut production to reduce harvest losses.	
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 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	Adoption of the TIMP will reduce losses, hence more coconut for consumption and sale.	
E: Case studies/profiles of success stories		
Success stories	Many households within coastal Kenya have educated their children using proceeds from sale of coconuts and working in coconut based enterprises.	
Application guidelines for users	Coconut harvesting leaflets and manuals	
F: Status of TIMP readine	ss (1-Ready for upscaling, 2-requires Require validation	
validation, 3-requires further	research)	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: <u>director.icri@kalro.org</u> , 0202024751	
Lead organization and scientists	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu Menza, O., Violet K., Wasilwa L.	

Research gaps:

- Validating maturity indices of the various coconut varieties / landraces
- Quantification of the losses due to incorrect timing of the right maturity for harvesting different coconut varieties

2.8.2. Coconut harvestin	g	
Category (i.e. technology, innovation or management practice)	Management Practice	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Yield losses due to inappropriate harvesting methods. This could be as high as 10% of the total harvest especially with varieties that are early germinating.	
What is it? (TIMP description)	 This is a management practice involving determination of harvesting procedure. <i>Harvesting methods:</i> Climbing Climbing robot Power operated harvesting tool Climbing cycle / equipment 	
Instification	• Use of trained monkeys Correct harvesting reduces losses and ensure high quality of the produce	
B: Assessment of disseming	tion and scaling un/out approaches	
Users of TIMP	Farmers	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows. Brochures, leaflets and manuals	
Critical/essential factors for successful promotion	Apply good agronomic practices to have a good crop. Linkages with private sector to improve production capacity and empowerment. Creating awareness on effects of improper harvesting	
Partners/stakeholders for scaling up and their roles	 Farmers- for activity implementation and promotion Private sector, County Government, NGOs, NOCD, MESPT for dissemination VMGs are recipients of the technologies and will benefit from the grants as they adopt the technologies 	
C: Current situation and future scaling up		
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in dissemination	Lack of awareness of the technology by farmers and users	
Suggestions for addressing the challenges	Awareness creation and capacity building of stakeholders, link farmers to Micro- Finance Institutions (MFIs), sensitize county governments to support farmers, adopt PPP, intensify research to improve the technology	
Lessons learned in	• Involvement of stakeholders such as CIG, CBOs and NGOs enhances adoption	

2.8.2. Coconut harvesting		
upscaling, if any	Continuous capacity building is key to attitude change.	
	• Consistent trainings, demonstrations and sensitisations would motivate farmers to adopt the technology	
Social, environmental,	• Understanding the community culture, preferences, and practices	
policy and market	• Market being able to absorb increased supply of coconut	
conditions necessary for		
development and upscaling		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Reduced losses, better income and nutrition (due to utilisation of saved coconut)	
Gender issues and concerns	Women and youths usually perform the task of coconut harvesting. The TIMP is	
in development,	easily adoptable after training and many farmers can use the TIMP since it reduces	
dissemination adoption and	losses incurred during harvesting	
scaling up		
Gender related	The TIMP increases farm income through reduction of harvest losses. Men and youth	
opportunities	can capitalize on this aspect of coconut production to reduce harvest losses.	
	Employment opportunities for men and youths who usually perform this task	
VMG issues and concerns	Youth and VMGs will need practical observation over time to learn the skill since it	
in development,	is technical	
scaling up		
VMC related opportunities	Adaption of the TIMP means reduced losses hance more account available for	
v MO related opportunities	consumption and sale. This will enable VMGs to have enough coconut to consume	
	hence get macro- and micro-nutrients (especially minerals). There will be more	
	income for the farmers (VMGs).	
E: Case studies/profiles of success stories		
Success stories	Many households within coastal Kenya have educated their children using proceeds	
	from sale of coconuts and working in coconut based enterprises.	
Application guidelines for	Coconut harvesting guidelines, brochures and leaflets	
users		
F: Status of TIMP readine	ess (1-Ready for upscaling, 2-requires Ready for upscaling	
validation, 3-requires further	research)	
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu	
	Menza, O., Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202024751	

2.8.3. De-husking and de	-husking machine
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the techn	ology, innovation or management practice
Problem addressed	Losses due to inappropriate de-husking methods, poor equipment for coconut de- husking and low levels of value addition. Traditional de-husking is time consuming and difficult process.
What is it? (TIMP description) Justification	Coconut de-husking involves removal of the husk from the coconut. De-husking of nuts should be done using a pointed iron bar, a strong and pointed stick (5 cm diameter), or a de-husking machine. The use of <i>panga</i> may damage the shell. De-husking machine comprise usage of two horizontal rollers with series of sharp tools which would shear the husk from coconut when rolling against each other. Coconut de-husking in Msambweni (Source: www.jkuat.ac.ke) Traditional de-husking is time consuming and difficult process. A de-husking machine will enable SMEs to increase value addition. Up to date, processors utilize only 25% of the total available coconuts, leaving the country with an excess of an
B • Assessment of disseming	ation and scaling un/out annroaches
Users of TIMP	Farmers, traders, consumers in urban cities
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.
Critical/essential factors for successful promotion	Linkages with private sector for fabrication of de-husking machines and capacity development
Partners/stakeholders for scaling up and their roles	 Farmers- to adopt the oil processing technology Private sector, County Government, NGOs, NOCD, MESPT KIRDI and (JKUAT) Jomo Kenyatta University of Agriculture and Technology to fabricate the de-husking machines
C: Current situation and fu	iture scaling up
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties

2.8.3. De-husking and de-husking machine		
Counties where TIMPs will	Kilifi	
be up scaled		
Challenges in	Lack of awareness of the technology by farmers and users; initial costs of acquiring	
dissemination	the de-husking machine are high.	
Suggestions for addressing	Awareness creation and capacity building of stakeholders, link farmers to Micro-	
the challenges	Finance Institutions (MFIs), sensitize county governments to support farmers, adopt	
y 1 1.	PPP, intensity research to improve the technology	
Lessons learned in	Capacity building and availing starter funds for acquisition of the de-husking	
upscalling, if any		
Social, environmental,	• Opportunities for increased returns due to cracking technologies	
conditions necessary for	• Enhance outreach partnerships	
development and upscaling		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 25.000-100,000	
Estimated returns	Increased incomes due to reduced broken and reduced postharvest losses.	
Gender issues and concerns	• Women and youths usually perform the task of debusking the nut. Consequently	
in development,	the technology may not be adopted if women are already over whelmed with	
dissemination adoption and	other chores	
scaling up	• Women and youth have limited access to education, training and extension	
	services than men	
	Men dominant most decisions at the household and community levels	
Gender related	Employment opportunities for women and youth who usually perform this task	
opportunities		
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge	
in development,	• VMGs have limited access to training and extension services	
scaling up	• Due to their social status VMGs are often excluded from decision making in development and dissemination activities	
seaming ap	 There is low adoption by VMGs due lack of awareness 	
VMG related opportunities	Production trade in and consume locally produced coconut based products	
F: Coso studios/profiles of success stories		
Success stories	Many households within coastal Kenya have educated their children using proceeds	
	from sale of coconuts and working in coconut based enterprises.	
Application guidelines for	Coconut dehusking guidelines, brochures and leaflets	
users		
F: Status of TIMP readine	ess (1-Ready for upscaling, 2-requires Ready for upscaling	
validation, 3-requires further research)		
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu	
	Menza, O., Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202024751	

2.8.4. Drying of copra	
	Sun drying
	Solar dryer
	• Electric drying
Category (i.e. technology,	Technology
practice).	
A: Description of the techn	lology, innovation or management practice
Problem addressed	Losses due to inadequate drying of copra. Inadequate drying gives rise to the growth
	of aflatoxins and affects the amount of coconut oil that can be derived from the nut
What is it? (TIMP description)	This is a technology for reducing the moisture content of copra from 50% to the optimum moisture content of 5-6%. Drying of the copra should take place within 48 hours of harvesting. Commonly used drying methods are sun drying, smoke drying, kiln drying and indirect hot air drying. <u>Sun drying</u> The copra is split open into cups and spread on any open surface for sun drying. It takes about 8 days for sun drying. However, the ddeposition of dirt and dust on wet meat during sun drying results in deterioration of copra quality. <u>Solar dryer</u> Use of a closed type solar dryer avoids the quality deterioration of copra due to deposition of dirt. Drying time is reduced to 3-4 days. Examples of solar dryers include batch type cabinet solar dryer and greenhouse solar dryer. <u>Greenhouse solar dryer of husks</u> <u>Electric copper dryers</u> This is an electrically operated dryer with forced hot air circulation.
Justification	Copra is produced by drying the coconut kernel. The copra quality is strongly
	depended on drying techniques. Inadequate drying gives rise to the growth of aflatoxins and affects the amount of coconut oil that can be derived from a nut.

2.8.4. Drying of copra		
	Proper post-harvesting methods including drying and storage can increase the oil yield per nut by about 20%.	
B: Assessment of dissemina	ition and scaling up/out approaches	
Users of TIMP	Farmers, traders and processors	
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, training workshop	
dissemination	and seminars, agricultural shows.	
Critical/essential factors	• Existence of effective extension services to demonstrate the technology.	
for successful promotion	Strong partnerships and linkages	
	• Linkages with private sector to improve production capacity and empowerment	
	• Accessibility and cost of the dryers by farmers: low-cost agricultural practices are	
	easily promoted and accepted	
Partners/stakeholders for	• Farmers- to adopt the drying technology	
scaling up and their roles	• Private sector, County Government, NGOs, NOCD, MESPT, JKUAT, KIRDI to	
	disseminate the technology dissemination and capacity-build farmers and avail	
	• Financial institutions to provide funds for acquisition of drivers	
C: Current situation and fu	thre scaling up	
Counties where already	Kwale Kilifi Mombasa Lamu Tana River Taita-Taveta Tharaka Nithi counties	
promoted, if any	Kwale, Kinn, Wonlousa, Land, Tana Kiver, Tana Taveta, Tharaka Win Counties	
Counties where TIMPs will	Kilifi	
be up scaled		
Challenges in	• Lack of awareness of the technology by farmers and users	
dissemination	• Lack of funds to acquire the dryers	
Suggestions for addressing	Awareness creation and capacity building of stakeholders, link farmers to Micro-	
the challenges	Finance Institutions (MFIs), sensitize county governments to support farmers, adopt	
	PPP, intensify research to improve the technology	
Lessons learned in	Need to continue capacity building of the farmers and users on repair and	
upscaling, if any	maintenance of the technology	
Social, environmental,	• Understand the community culture, preferences and practices	
policy and market	• Market being able to absorb increased supply of coconut	
development and upscaling		
D: Economic gondor vuln	arable and marginalized groups (VMCs) considerations	
Basic costs	To be determined	
Estimated returns	Peduced losses better income and nutrition (due to utilization of saved coconut):	
Estimated returns	enhanced food safety due to reduced aflatoxin contamination of the coconut	
Gender issues and concerns	• Women and youth may not be able to mobilise resources needed to acquire the	
in development.	drvers	
dissemination adoption and	• Women and youth have limited access to education training and extension	
scaling up	services than men	
	• Men dominant most decisions at the household and community levels	
Gender related	Employment opportunities for women and youth in fabrication, sale and repair of the	
opportunities	dryers	
VMG issues and concerns	The technology reduces postharvest losses, hence more coconut to be consumed and	
in development,	sold. The technology also enhances food safety by reducing aflatoxin contamination	
dissemination adoption and	of the coconut during drying.	
scaling up		

2.8.4. Drying of copra		
VMG related opportunities	• Opportunity for VMGs to engage in fabrication of dryers	
	• Production, trade in, and consume locally produced coconut-based products	
E: Case studies/profiles of success stories		
Success stories	Many households within coastal Kenya have educated their children using proceeds	
	from sale of coconuts and working in coconut based enterprises.	
Application guidelines for	Coconut processing guidelines, brochures and leaflets	
users		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling		
validation, 3-requires further	research)	
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu	
	Menza, O., J. Ndambuki, C. Gathambiri, Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202024751	

2.8.5. Copra grading			
TIMP name			
Category (i.e. technology, innovation or management practice)	Management practice		
A: Description of the technology, innovation or management practice			
Problem addressed	Low quality due to inappropri	ate grading methods	
What is it? (TIMP description)	Copra grading is mainly based on moisture content, foreign matter and black copra. The maximum limits are 10%, 2% and 5%, respectively. However, good quality copra should have the following requirements:		
	Particulars	Percentage (%)	
	Moisture	6	-
	Oil	71	
	Acid value	2.5	
	Foreign matter	0.5	
	Mould cups	5	
	Wrinkled cups	5	
	Black copra	1	
Justification	Copra is produced by dryir depended on drying technic aflatoxins and affects the ar Proper post-harvesting metho	g the coconut kernel. The copr ues. Inadequate drying gives r nount of coconut oil that can be ods including drying and storage	ra quality is strongly ise to the growth of e derived from a nut. e can increase the oil

2.8.5. Copra grading		
	yield per nut by about 20%	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers and traders	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment	
Partners/stakeholders for scaling up and their roles	 Farmers to adopt the oil processing technology Private sector, County Government, NGOs, NOCD, Micro-Enterprises Support Programme Trust (MESPT) 	
C: Current situation and fu	iture scaling up	
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in dissemination	Lack of awareness of the technology by farmers and users	
Suggestions for addressing the challenges	Awareness creation and capacity building of stakeholders	
Lessons learned in upscaling, if any	Proper grading of copra increases quality and value.	
Social, environmental, policy and market conditions necessary for development and upscaling	Opportunities for increased returns due to grading technologies Enhance outreach	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Increased incomes due to better grade which has better market value	
Gender issues and concerns in development, dissemination adoption and scaling up	 Women and youths usually perform the task of grading the coconut. Consequently the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to education, training and extension services than men Men dominant most decisions at the household and community levels 	
Gender related opportunities	Employment opportunities for women and youth who usually perform this 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 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	Production, trade in, and consume locally produced coconut based products	
E: Case studies/profiles of s	success stories	
Success stories	Many households within coastal Kenya have educated their children using proceeds from sale of coconuts and working in coconut based enterprises.	
Application guidelines for	Coconut processing guidelines, brochures and leaflets	

2.8.5. Copra grading		
users		
F: Status of TIMP readine	ess (1-Ready for upscaling, 2-requires	Ready for upscaling
validation, 3-requires further research)		
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wa	yua, F.N. Pole, Stella Mwashumbe, Mwalimu
	Menza, O., Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwa	pa; P.O. Box 16-80109, Mtwapa
scientists	E-mail: director.icri@kalro.org, 0202	024751

2.9 VALUE ADDITION IN COCONUT

2.9.1. Virgin coconut oil		
TIMP name		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Shortage of edible oil in the country (massive importation of edible oils by the government to the tune of 25 billion annually); limited diversification of coconut products.	
What is it? (TIMP description)	This is edible oil obtained from fresh, mature endosperm (kernel-meat) of coconut by mechanical or natural means, with or without the use of heat and no chemical refining, bleaching or de-odorizing. It is called "virgin" because the oil obtained is pure, raw and maintains all the natural constituents, aroma and antioxidants.	
Justification	Processing of virgin coconut oil avails high quality edible oil for household, medicinal and industrial use. This makes use of locally available resource and saves on foreign exchange used to import edible oils (about KES 25 billion annually)	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors	Linkages with private sector to improve production capacity and empowerment	
for successful promotion		
Partners/stakeholders for	• Farmers to adopt the oil processing technology	
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT	
C: Current situation and fu	iture scaling up	
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will	Kilifi	

2.9.1. Virgin coconut oil	
be up scaled	
Challenges in dissemination	 Lack of awareness of the processing technology and appropriate equipment by farmers and users of the product. Lack of funds to acquire the processing technology
Suggestions for addressing the challenges	 Awareness creation and capacity building of stakeholders Link farmer to Micro-Finance Institutions
Lessons learned in upscaling, if any	Virgin coconut oil is a high quality oil which can be processed using low-cost methods for smallholder household income generation.
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to processing technologies Enhance outreach and partnerships
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs Estimated returns	To be determined Increased incomes due to quality product processing using low cost processing equipment.
Gender issues and concerns in development, dissemination adoption and scaling up	 Women and youths usually perform the task of oil processing. Consequently the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to education, training and extension services than men
Gender related opportunities	Men dominate most decisions at the household and community levels Employment opportunities for women and youths who usually perform this 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 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	Production, trade in, and consume locally produced coconut based products
E: Case studies/profiles of s	success stories
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their livelihoods from the processing and sale of virgin coconut oil
Application guidelines for users	Coconut manuals, brochures and leaflets
F: Status of TIMP readiness (1-Ready for upscaling, 2-requiresReady for upscalingvalidation, 3-requires further research)Ready for upscaling	
G: Contacts	
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu Menza, O., Violet K., Wasilwa L.
Lead organization and scientists	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa E-mail: <u>director.icri@kalro.org</u> , 0202024751

292 Grated coconut		
innovation or management	Technology	
practice)		
A: Description of the techn	lology, innovation or management practice	
Problem addressed	Inadequate quality grated coconut products in the market have led to the importation of grated coconuts from other countries thereby leading to a reduction in the county's foreign exchange. At the same time the imported grated coconut products become unaffordable to the local citizens.	
What is it? (TIMP description)	 Extraction of is edible oil from fresh, mature endosperm (kernel-meat) of coconut by mechanical or natural means, with or without the use of heat and no chemical refining, bleaching or de-odorizing. It is called "virgin" because the oil obtained is pure, raw and maintains all the natural constituents, aroma and antioxidants: Step 1: Dehusking of raw coconut Step 2: Deshelling of fresh coconut Step 3: Paring of raw coconut Step 4: Blanching of fresh coconut Step 5 Draining of coconut Step 6: Disintegration process Step 7: Extract the milk Step 8: Centrifugation Step 9:Filtration 	
Justification	Grated coconut is a high value product that fetches better prices in the market and is simple to process. There is high demand for grated coconut in the market especially in the urban areas where residents require products that are ready to use.	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment	
Partners/stakeholders for scaling up and their roles	Farmers to adopt the oil processing technologyPrivate sector, County Government, NGOs, NOCD, MESPT	
C: Current situation and fu	ature scaling up	
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	

Counties where TIMPs will Kilifi be up scaled Kilifi Challenges in Lack of awareness of the processing technology and appropriate equipment by farmers and users of the product. Suggestions for addressing Awareness creation and sensaity building of stable alders		
be up scaled Challenges in Challenges in Lack of awareness of the processing technology and appropriate equipment by farmers and users of the product. Suggestions for addressing Awareness creation and constitute building of states alders.		
Challenges in disseminationLack of awareness of the processing technology and appropriate equipment by farmers and users of the product.Suggestions for addressingAwareness creation and constitute building of stable alders		
dissemination farmers and users of the product. Suggestions for addressing Autorepass creation and constitute building of stableholders		
Suggestions for addressing Assumption and suggitt building of statisheddars		
suggestions for addressing Awareness creation and capacity building of stakenoiders		
the challenges		
Lessons learned in Grated coconut is a high quality product which can be processed using low-cost		
upscaling, if any methods for smallholder household income generation.		
Social, environmental, • Opportunities for increased returns due to processing technologies		
• Enhance outreach and partnerships		
conditions necessary for		
development and upscaling		
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs To be determined		
Estimated returns Increased incomes due to quality product processing using low cost processing		
equipment.		
Gender issues and concerns • Women and youths usually perform the task of processing grated coconut.		
in development, Consequently the technology may not be adopted if women are already over		
dissemination adoption and whelmed with other chores		
• Women and youth have limited access to education, training and extension		
services than men		
Men dominate most decisions at the household and community levels		
Gender related Employment opportunities for women and youths who usually perform this task		
opportunities		
• VMG issues and concerns		
• 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		
I here is low adoption by VMGs due lack of awareness WMC related encount hered products		
VMG related opportunities Production, trade in, and consume locally produced coconut based products		
E: Case studies/profiles of success stories		
Success stories Some farmer groups and individuals in coastal Kenya are currently earning their livelihoods from the processing and cole of virgin account oil		
Inventioods from the processing and sale of virgin coconut off		
Application guidelines for Coconut manuals, brochures and leaflets		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling validation, 3-requires further research)		
G: Contacts		
Contacts KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu		
Menza, O., Violet K., Wasilwa L.		
Lead organization and The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa		
scientists E-mail: director.icri@kalro.org, 0202024751		

2.9.3. Coconut milk and coconut cream		
Category (i.e. technology, innovation or management practice)	Technology	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited diversification of coconut products	
What is it? (TIMP description)	Coconut milk is a sweet, milky white liquid obtained by grating the meat of mature coconut kernel and thereafter adding water twice the volume of grated coconut to produce milk. Coconut milk is used to make desserts and sauces, soups, tea and general cocking. Coconut milk is packed in packages of different sizes and preserved	
	for long storage and for sale. Concentrated coconut milk is called coconut cream.	
Justification	Coconut milk is a high value product from coconut that fetches better prices in the market and is simple to process. There is high demand for coconut milk in the market especially in the urban areas where residents require products that are ready to use.	
B: Assessment of dissemina	ition and scaling up/out approaches	
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment	
Partners/stakeholders for scaling up and their roles	 Farmers to adopt the oil processing technology Private sector, County Government, NGOs, NOCD, MESPT 	
C: Current situation and fu	iture scaling up	
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in	Lack of awareness of the processing technology and appropriate equipment by	
dissemination	farmers and users of the product.	
Suggestions for addressing	Awareness creation and capacity building of stakeholders	
the challenges	N	
Lessons learned in upscaling, if any	INORE	
Social, environmental,	• Opportunities for increased returns due to processing technologies	
policy and market	• Enhance outreach and partnerships	
conditions necessary for		
development and upscaling		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	

2.9.3. Coconut milk and	coconut cream	
Basic costs	To be determined	
Estimated returns	Increased incomes due to quality product processing using low cost processing equipment.	
Gender issues and concerns in development, dissemination adoption and scaling up	 Women and youths usually perform the task of coconut processing. Consequently the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to education, training and extension services than men Men dominate most decisions at the household and community levels 	
Gender related opportunities	Employment opportunities for women and youths who usually perform this 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 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	Production, trade in, and consume locally produced coconut based products	
E: Case studies/profiles of success stories		
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their livelihoods from the processing and sale of virgin coconut oil	
Application guidelines for users	Coconut manuals, brochures and leaflets	
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires validation, 3-requires further research) Ready for upscaling		
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu Menza, J. Ndambuki, C. Gathambiri, O., Violet K., Wasilwa L.	
Lead organization and scientists	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa E-mail: <u>director.icri@kalro.org</u> , 0202024751	

2.9.4. Coconut flour	
Category (i.e. technology,	Innovation
innovation or management	
practice)	
A: Description of the technology, innovation or management practice	
Problem addressed	Limited utilization of coconut
What is it? (TIMP	This is flour prepared from drying and grinding the residue which remains after

2.9.4. Coconut flour	
description)	expelling the coconut milk. The flour so obtained contains 7-8% protein, 3-5% moisture and 17% fat. It can be used as an ingredient in weight control foods because of its high fibre content. Coconut flour can also be used in baked goods, soups, stews and burgers.
Justification	Processing of coconut flour avails high value product from coconut. There is high demand for coconut flour in rural and urban centres
B: Assessment of dissemina	ition and scaling up/out approaches
Users of TIMP	Farmers, traders, industrial and commercial processors
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment
Partners/stakeholders for scaling up and their roles	 Farmers to adopt the oil processing technology Private sector, County Government, NGOs, NOCD, MESPT Microfinance institutions to avail funds for engaging in coconut processing
C: Current situation and fu	iture scaling up
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties
Counties where TIMPs will be up scaled	Kilifi
Challenges in dissemination	Lack of awareness of the processing technology and appropriate equipment by farmers and users of the product.
Suggestions for addressing the challenges	Awareness creation and capacity building of stakeholders
Lessons learned in upscaling, if any	Virgin coconut oil is a high quality oil which can be processed using low-cost methods for smallholder household income generation.
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to processing technologies Enhance outreach and partnerships
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs	To be det.ermined
Estimated returns	Increased incomes due to quality product processing using low cost processing equipment.
Gender issues and concerns in development, dissemination adoption and	• Women and youths usually perform the task of coconut processing. Consequently the technology may not be adopted if women are already over whelmed with other chores
scaling up	• Women and youth have limited access to education, training and extension services than men
0 1 1 1	Men dominate most decisions at the household and community levels
Gender related opportunities	Employment opportunities for women and youths who usually perform this task
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge
in development,	VMGs have limited access to training and extension services
scaling up	• Due to their social status VMGs are often excluded from decision making in development and dissemination activities

2.9.4. Coconut flour			
	• There is low adoption by VMGs due lack of awareness		
VMG related opportunities	Production, trade in, and consume locally produced coconut based products		
E: Case studies/profiles of s	E: Case studies/profiles of success stories		
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their		
	livelihoods from the processing and sale of virgin coconut oil		
Application guidelines for	Coconut manuals, brochures and leaflets		
users			
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Requires validation			
validation, 3-requires further research)			
G: Contacts			
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu		
	Menza, J. Ndambuki, C. Gathambiri, Violet Kirigua, Wasilwa L.		
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa		
scientists	E-mail: director.icri@kalro.org, 0202024751		

GAPS

- Optimizing blending *ratio* and processing *procedures* for coconut flour.
- Cost-benefit analysis of coconut flour processing
- Research on innovative investment options for farmers and farmer groups
- Develop business model/enterprise for the VMG on coconut flour production

2.9.5. Tender coconut water (<i>Madafu</i>)		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited market niches for diversification coconut products. The coconut tree has the largest number of products compared to other crops. However, many of the valuable products are little known to the larger Kenyan population.	
What is it? (TIMP description)	This is the water of tender coconut, technically the liquid endosperm. Tender coconut water is at its optimum level of acceptability and economic viability for commercial use when nuts are 6-7 months of maturity. It offers many health benefits in addition to being a refreshing drink. It involves harvesting of the immature nuts and removing the husks. Thereafter the shell is cut using a sharp and stainless knife and the water is either extracted from the nut and emptied in a clean container or is drunk from the nut using a straw.	
Justification	Processing and packaging of tender coconut water offers a special market niche that has not been exploited fully. There is high demand for tender coconut water since it	

2.9.5. Tender coconut water (<i>Madafu</i>)		
	is a natural refreshing drink with medicinal values.	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment	
Partners/stakeholders for scaling up and their roles	 Farmers to adopt the oil processing technology Private sector, County Government, NGOs, NOCD, MESPT, tourists 	
C: Current situation and fu	iture scaling up	
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in dissemination	Lack of awareness of the processing technology and appropriate equipment by farmers and users of the product.	
Suggestions for addressing the challenges	Awareness creation and capacity building of stakeholders	
Lessons learned in upscaling, if any	Virgin coconut oil is a high quality oil which can be processed using low-cost methods for smallholder household income generation.	
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to processing technologies Enhance outreach and partnerships 	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Increased incomes due to quality product processing using low cost processing equipment.	
Gender issues and concerns in development, dissemination adoption and scaling up	 Women and youths usually perform the task of oil processing. Consequently the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to education, training and extension services than men Men dominate most decisions at the household and community levels 	
Gender related opportunities	Employment opportunities for women and youths who usually perform this 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 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	Production, trade in, and consume locally produced coconut based products	
E: Case studies/profiles of s	success stories	
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their livelihoods from the processing and sale of virgin coconut oil	
Application guidelines for	Coconut manuals, brochures and leaflets	

2.9.5. Tender coconut water (<i>Madafu</i>)		
users		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling		Ready for upscaling
validation, 3-requires further research)		
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Way	ua, F.N. Pole, Stella Mwashumbe, Mwalimu
	Menza, O., Violet K., Wasilwa L.	
Lead organization and	Lead organization and The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 020202	24751

2.9.6. Snow ball tender coconut		
Category (i.e. technology,	Technology	
innovation or management practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited utilization of coconut products	
What is it? (TIMP	Snow ball tender coconut is the tender coconut without the husk, shell and testa,	
description)	which is a ball in shape and white in colour. This white ball contains tender coconut water, which can be consumed by just inserting a straw through the top white tender kernel. In this process, coconuts of 8-month maturity are more suitable for making snow ball tender coconut. Since snowball tender coconut can be individually packaged and refrigerated, the shelf-life of this product is prolonged and, therefore, this ready-to-serve product is to becoming popular.	
Justification	Snow balls made from tender coconuts are very rare commodities that have a niche market and fetch better prices.	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment	
Partners/stakeholders for	Farmers to adopt the oil processing technology	
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT	
C: Current situation and future scaling up		
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	

2.9.6. Snow ball tender coconut		
Challenges in	Lack of awareness of the processing technology and appropriate equipment by	
dissemination	farmers and users of the product.	
Suggestions for addressing	Awareness creation and capacity building of stakeholders	
the challenges		
Lessons learned in	Virgin coconut oil is a high quality oil which can be processed using low-cost	
upscaling, if any	methods for smallholder household income generation.	
Social, environmental,	Opportunities for increased returns due to processing technologies	
policy and market	Enhance outreach and partnerships	
conditions necessary for		
development and upscaling		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Increased incomes due to quality product processing using low cost processing	
	equipment.	
Gender issues and concerns	• Women and youths usually perform the task of oil processing. Consequently the	
in development,	technology may not be adopted if women are already over whelmed with other	
dissemination adoption and	chores	
scanng up	• Women and youth have limited access to education, training and extension	
	• Mon dominate most decisions at the household and community levels	
Gender related	Employment opportunities for women and youths who usually perform this task	
opportunities	Employment opportunities for women and youths who usuary perform this task	
VMG issues and concerns	• VMGs have less access to agricultural information technology and knowledge	
in development,	 VMGs have limited access to training and extension services 	
dissemination adoption and	• Due to their social status VMGs are often excluded from decision making in	
scaling up	development and dissemination activities	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	Production, trade in, and consume locally produced coconut based products	
E: Case studies/profiles of success stories		
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their	
	livelihoods from the processing and sale of virgin coconut oil	
Application guidelines for	Coconut manuals, brochures and leaflets	
users		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling		
validation, 3-requires further	research)	
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu	
	Menza, J. Ndambuki, C. Gathambiri, Violet Kirigua, Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202024751	

2.9.7. T	7. Tender coconut kernel products	
	• I	Dehydrated young tender coconut kernel in syrup
	• I	Dried chips

2.9.7. Tender coconut kernel products		
Category (i.e. technology, innovation or management practice)	Technology	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited utilization of coconut	
What is it? (TIMP description)	These are kernels of tender coconut. It is a good source of carbohydrates and fibre. Processed young tender coconut kernel could be in the form of sweetened dehydrated young coconut kernel in syrup or dried chips. These young coconut kernel products are ideal for dessert or snack food.	
Justification	The fresh kernels left after the use of tender nut water is in many cases not put into effective use though it has high nutritional quality. Processing of the tender kernel products increases the value of the tender coconut.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Linkages with private sector to improve production capacity and empowerment	
Partners/stakeholders for scaling up and their roles	Farmers to adopt the oil processing technologyPrivate sector, County Government, NGOs, NOCD, MESPT	
C: Current situation and fu	ature scaling up	
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in dissemination	Lack of awareness of the processing technology and appropriate equipment by farmers and users of the product.	
Suggestions for addressing the challenges	Awareness creation and capacity building of stakeholders	
Lessons learned in upscaling, if any	Not yet determined	
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to processing technologies Enhance outreach and partnerships 	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Increased incomes due to quality product processing using low cost processing equipment.	

2.9.7. Tender coconut kernel products		
Gender issues and concerns in development, dissemination adoption and	• Women and youths usually perform the task of coconut processing. Consequently the technology may not be adopted if women are already over whelmed with other chores	
scaling up	• Women and youth have limited access to education, training and extension services than men	
	Men dominate most decisions at the household and community levels	
Gender related opportunities	Employment opportunities for women and youths who usually perform this task	
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge	
in development,	• VMGs have limited access to training and extension services	
dissemination adoption and scaling up	• 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	Production, trade in, and consume locally produced coconut based products	
E: Case studies/profiles of success stories		
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their livelihoods from the processing and sale of virgin coconut oil	
Application guidelines for users	Coconut manuals, brochures and leaflets	
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling		
validation, 3-requires further	research)	
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu	
	Menza, O., J. Ndambuki, C. Gathambiri, Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202024751	

Products Derived from Coconut Water of Mature Coconuts

2.9.8. Mature coconut water		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	Limited utilization of products from the coconut tree	
What is it? (TIMP	This is soft drink produced from the coconut water of mature nuts. The process	
description)	involves collection of water, pasteurization, filtration and bottling. The water from	
	the mature nuts is nutritious and has medicinal values.	

2.9.8. Mature coconut water			
Justification	Processing of water from mature coconuts increases the value of the coconut in terms		
	of income generation. There is high demand for coconut water.		
B: Assessment of dissemina	B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, traders, industrial and commercial processors		
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, training workshop		
dissemination	and seminars, agricultural shows.		
Critical/essential factors	Linkages with private sector to improve production capacity and empowerment		
for successful promotion			
Partners/stakeholders for	• Farmers to adopt the oil processing technology		
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT		
C: Current situation and fu	iture scaling up		
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties		
Counting where TIMPs will	17:1: <i>C</i> :		
be up scaled			
Challenges in	Lack of awareness of the processing technology and appropriate equipment by		
dissemination	farmers and users of the product.		
Suggestions for addressing	Awareness creation and capacity building of stakeholders		
the challenges	Linking farmers to microfinance institutions		
Lessons learned in	To be determined		
upscaling, if any			
Social, environmental,	Opportunities for increased returns due to processing technologies		
policy and market	Enhance outreach and partnerships		
conditions necessary for			
development and upscaling			
D: Economic, gender, vuin	erable and marginalized groups (VMGs) considerations		
Basic costs	To be determined		
Estimated returns	Increased incomes due to quality product processing using low cost processing equipment.		
Gender issues and concerns	• Women and youths usually perform the task of coconut processing. Consequently		
in development,	the technology may not be adopted if women are already over whelmed with		
dissemination adoption and	other chores		
scaling up	• Women and youth have limited access to education, training and extension		
	services than men		
Candan mlatad	Men dominate most decisions at the household and community levels		
Gender related	Employment opportunities for women and youths who usually perform this task		
VMG issues and concorres	• VMCs have less access to activultural information, task along and brownlades		
in development	• VMGs have less access to agricultural information, technology and knowledge		
dissemination adoption and	• VMGs have limited access to training and extension services		
scaling up	• Due to their social status vivios are often excluded from decision making in development and dissemination activities		
8 uF	 There is low adoption by VMGs due lack of awareness 		
VMG related opportunities	Production, trade in, and consume locally produced coconut based products		
E: Case studies/profiles of	success stories		
Success stories	Some farmer groups and individuals in coastal Kenva are currently earning their		
	livelihoods from the processing and sale of virgin coconut oil		

2.9.8. Mature coconut water		
Application guidelines for	Coconut manuals, brochures and leaflets	
users		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling		
validation, 3-requires further research)		
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wa	yua, F.N. Pole, Stella Mwashumbe, Mwalimu
	Menza, O., Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202	024751

2.9.9. Palm wine / Toddy (<i>mnazi</i>)		
Category (i.e. technology, innovation or management practice)	Technology	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited utilization of products from the coconut tree	
What is it? (TIMP	Palm wine also called Toddy or simply Toddy (locally called <i>mnazi</i>) is an alcoholic	
description)	beverage prepared from mature coconut water through spontaneous fermentation.	
Justification	Processing of <i>mnazi</i> is a way of diversifying products from coconut water. Consumption of <i>mnazi</i> , however, need to be properly regulated.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, innovation platform, practical demonstrations, training workshop and seminars, agricultural shows.	
Critical/essential factors for successful promotion	Development of policies to regulate the production and consumption of <i>mnazi</i> , to mainstream <i>mnazi</i> as a product with commercial potential, just like other alcoholic drinks.	
Partners/stakeholders for scaling up and their roles	 Farmers to adopt the oil processing technology Private sector, County Government, NGOs, NOCD, Micro-Enterprises Support Programme Trust (MESPT), Kenya Coconut Development Authority (KCDA) KEBS (Kenya Bureau of Standards) and MoH (Ministry of Health) to develop standards for <i>mnazi</i> to regulate the production and consumption of <i>mnazi</i> 	
C: Current situation and future scaling up		
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
2.9.9. Palm wine / Toddy	r (mnazi)	
--------------------------------	--	
Challenges in	• Difficulties in mainstreaming <i>mnazi</i> as an alcoholic beverage with commercial	
dissemination	potential	
	Mnazi is quite often considered as an illegal alcoholic beverage	
Suggestions for addressing	Enforcing the mainstreaming of <i>mnazi</i> standards and specifications developed by	
the challenges	KCDA	
Lessons learned in	Awareness creation and capacity building of <i>mnazi</i> brewers to produce a product	
upscaling, if any	which meets the established specifications; and enforcing these specifications, so that <i>mnazi</i> is not considered as an illegal alcoholic beverage.	
Social, environmental,	Opportunities for increased returns due to processing technologies	
policy and market	• Enhance awareness creation to brewers to produce mnazi which is safe and meets	
conditions necessary for	the established specifications	
development and upscaling		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Increased incomes due to production and sale of quality product.	
Gender issues and concerns	• Women and youths usually perform the task of coconut processing.	
in development,	Consequently, the technology may not be adopted if women are already over	
dissemination adoption and	whelmed with other chores	
scaling up	• Women and youth have limited access to education, training and extension	
	services than men	
	• Men dominate most decisions at the household and community levels	
opportunities	sale, as a product with commercial potential, just like other alcoholic drinks.	
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge	
in development,	• VMGs have limited access to training and extension services	
dissemination adoption and	• Due to their social status VMGs are often excluded from decision making in	
scaling up	development and dissemination activities	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	Production, trade in, and consume locally produced coconut based products	
E: Case studies/profiles of s	success stories	
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their	
	livelihoods from the processing and sale of <i>mnazi</i> .	
Application guidelines for	Coconut manuals, brochures and leaflets	
users		
F: Status of TIMP readine	ess (1-Ready for upscaling, 2-requires Requires validation	
validation, 3-requires further	research)	
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu	
	Menza, J. Ndambuki, C. Gathambiri, Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202024751	

GAPS

- Most of the *mnazi* being consumed is not properly regulated. Hence, there is need for mainstreaming its production as a product with commercial potential, just like other alcoholic drinks.
- Optimising *mnazi* production processes
- Providing data on gross margins and market demand for *mnazi* production

2.9.10 Coconut vinegar		
Category (i.e. technology.	Technology	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited utilization of products from the coconut tree: difficulty in obtaining locally	
	produced vinegar	
What is it? (TIMP	This is vinegar made from fermented coconut water by fermentation and inoculation	
description)	with acetic acid bacteria in vinegar generators. Coconut vinegar is used extensively	
	as a preservative and flavoring agents in pickles, salads, sauces and many other	
	condiments.	
Justification	The utilization of coconut water which is considered a waste material in copra	
	making or in desiccated coconut factories gives added income to rural families in the	
	coconut farming communities	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, traders, industrial and commercial processors	
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, training workshop	
dissemination	and seminars, agricultural shows.	
Critical/essential factors	Linkages with private sector to improve production capacity and empowerment	
for successful promotion		
Partners/stakeholders for	Farmers to adopt the oil processing technology	
scaling up and their roles	Private sector, County Governments, NGOs, NOCD, MESPT	
C: Current situation and fu	iture scaling up	
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counting where TIMPs will		
be up scaled	KIIII	
Challenges in	Lack of awareness of the processing technology	
dissemination	Lack of awareness of the processing technology	
Suggestions for addressing	Awareness creation and capacity building of stakeholders	
the challenges	in moness creation and capacity containing of stantonersets	
Lessons learned in	To be determined	
upscaling, if any		
Social, environmental,	Opportunities for increased returns due to processing technologies	
policy and market	Enhance outreach and partnerships	
conditions necessary for		
development and upscaling		
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	To be determined	
Estimated returns	Increased incomes due to quality product processing using low cost processing	
	equipment.	
Gender issues and concerns	• Women and youths usually perform the task of coconut processing. Consequently	
in development,	the technology may not be adopted if women are already over whelmed with	
dissemination adoption and	other chores	
scanng up	• Women and youth have limited access to education, training and extension	
	services than men	

2.9.10. Coconut vinegar	2.9.10. Coconut vinegar	
	• Men dominate most decisions at the household and community levels	
Gender related opportunities	Employment opportunities for women and youths who usually perform this 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 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	Production, trade in, and consume locally produced coconut based products	
E: Case studies/profiles of success stories		
Success stories	Some farmer groups and individuals in coastal Kenya are currently earning their livelihoods from the processing and sale of virgin coconut oil	
Application guidelines for users	Coconut manuals, brochures and leaflets	
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires validation, 3-requires further research)Requires validation		
G: Contacts		
Contacts	KALRO, Francis Muniu, Francis Wayua, F.N. Pole, Stella Mwashumbe, Mwalimu Menza, O., Violet K., Wasilwa L.	
Lead organization and	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
scientists	E-mail: director.icri@kalro.org, 0202024751	

Gaps

- Optimizing the vinegar production processesCost-benefit analysis of vinegar production
- Validating investment options for farmers and SMEs

2.9.11. Coconut fibre	
	Processing of coconut husk into Coconut fibre
	Coconut decorticating machine
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the technology, innovation or management practice	
Problem addressed	Limited availability of natural fibres
What is it? (TIMP description)	This is coir fibre processed from coconut husks.

2.9.11. Coconut fibre	
Justification	Coconut husks pose environmental dangers and processing into fibre eliminates this
	source of firewood Processing of the husks into coconut fibre creates cottage
	industries for income generation
B: Assessment of dissemina	ition and scaling up/out approaches
Users of TIMP	Farmers, traders, consumers in urban cities
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, technical training
dissemination	and re-tooling of project staff, local FM stations
Critical/essential factors	Resources to support acquisition and establishment of small-scake coir processing
for successful promotion	plants, communal land to establish the processing plants; involvement of the private sector
Partners/stakeholders for	• Farmers to adopt the oil processing technology
scaling up and their roles	 Private sector, County Government, NGOs, NOCD, MESPT, KIRDI
C: Current situation and fu	iture scaling up
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties
promoted, if any	
Counties where TIMPs will	Kilifi
be up scaled	
dissemination	 Cost and labour intensive Communal conflicts where the processing facility is communally owned
dissemination	 Sometimes high level skills are required especially for the operation and
	maintenance
Suggestions for addressing	Resource mobilization through partnerships with private sector; engaging a
the challenges	participatory process during planning and implementation of the project; training of
x 1 1	the local community on maintenance and operation skills
Lessons learned in	Potential to cushion the community against conflict
Social environmental	Opportunities for increased returns due to creaking technologies
policy and market	 Opportunities for increased returns due to cracking technologies Enhance outreach
conditions necessary for	
development and upscaling	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	Not determined
Estimated returns	Income from sales of fibre and fibre-based products
Gender issues and concerns	• Women and youths usually perform the task of coconut processing. Consequently
in development,	the technology may not be adopted if women are already over whelmed with
scaling up	• Women and youth have limited access to education training and extension
souring up	services than men
	• Men dominant most decisions at the household and community levels
Gender related	Employment opportunities for women and youth in rural areas
opportunities	
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge
in development,	VMGs have limited access to training and extension services
scaling up	• Due to their social status VMGs are often excluded from decision making in development and discomination activities
scanng up	There is low adoption by VMGs due lack of awareness
	- There is now adoption by Threes due tack of awareliess

2.9.11. Coconut fibre	
VMG related opportunities	The technology will: 1) help women and girls to earn a living 2)VMG maximize on
	availability of enterprises to engage in small cottage industries
E: Case studies/profiles of s	success stories
Success stories	CBOs who adopted coir processing technology have had sustained source of income
	and improved livelihoods
Application guidelines for	Coconut fibre processing guidelines and brochures and leaflets
users	
F: Status of TIMP readines	ss (1-Ready for upscaling, 2-requires Ready for upscaling
validation, 3-requires further	research)
G: Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org, 0202024751
Lead organization and	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki
scientists	
	County government, PPP, KIRDI, KEBS, NOCD, MESPT

2.9.12. Coconut fibre rope	
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	Limited availability of natural fibres
What is it? (TIMP	This is rope weaved rom coir fibre
description)	
Justification	Coconut husks pose environmental dangers and processing into coco fibre rope
	reduces this danger. Coco fibre rope is also an alternative use of husks apart from
	using them as source of firewood. Processing of the husks into coco fibre ropes
	creates cottage industries for income generation. Coir fibre ropes cannot easily rot.
B: Assessment of dissemina	ntion and scaling up/out approaches
Users of TIMP	Farmers, traders, consumers in urban cities
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, technical training
dissemination	and re-tooling of project staff, local FM stations
Critical/essential factors	Resources to support acquisition and establishment of small-scake coir processing
for successful promotion	plants, communal land to establish the processing plants; involvement of the private
	sector.
Partners/stakeholders for	• Farmers to adopt the oil processing technology
scaling up and their roles	• Private sector, County Government, NGOs, NOCD, MESPT, KIRDI
C: Current situation and future scaling up	
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties
promoted, if any	
Counties where TIMPs will	Kilifi
be up scaled	
Challenges in	Cost and labour intensive
dissemination	• Communal conflicts where the processing facility is communally owned
	• Sometimes high level skills are required especially for the operation and
	maintenance

2.9.12. Coconut fibre rope	e	
Suggestions for addressing the challenges	Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills	
Lessons learned in upscaling, if any	Potential to cushion the community against conflict	
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to cracking technologies Enhance outreach 	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	Not determined	
Estimated returns	Income from sales of coconut fibre rope	
Gender issues and concerns in development, dissemination adoption and scaling up	 Women and youths usually perform the task of cracking the nut. Consequently, the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to education, training and extension services than men Men dominant most decisions at the household and community levels 	
Gender related	Employment opportunities for women and youth in rural areas	
opportunities		
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 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	The technology will: 1) help women and girls to earn a living 2)VMG maximize on availability of enterprises to engage in small cottage industries	
E: Case studies/profiles of s	success stories	
Success stories	CBOs who adopted coir processing technology have had sustained source of income and improved livelihoods	
Application guidelines for users	Coconut fibre processing guidelines and brochures and leaflets	
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling validation, 3-requires further research)		
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa E-mail: <u>director.icri@kalro.org</u> , 0202024751	
Lead organization and scientists	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki	
Partner organisations	County government, PPP, KIRDI, KEBS, NOCD, MESPT	

2.9.13. Door mat from coconut fibre	
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the technology, innovation or management practice	

Problem addressed Limited availability of natural carpets What is it? (TIMP description) This is mat processed from coir fibre description) Justification Coconut busks pose environmental dangers and processing into ecco fibre rope creates cottage industries for income generation. Coir fibre ropes cannot easily rot. B: Assessment of dissemination and scaling up/out approaches Coconut busks pose environmental dangers and processing of the husks into ecco fibre ropes creates cottage industries for income generation. Coir fibre ropes cannot easily rot. B: Assessment of dissemination dissemination Agricultural innovation platform. FFBS, practical demonstrations, technical training dissemination Approaches to be used in dissemination Agricultural innovation platform. FFBS, practical demonstrations, technical training dissemination Critical/sessential factors for successful promotion Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector. Partners/stakeholders for sector. • Farmers to adopt the oil processing technology Counties where already for successful promotion • Farmers to adopt the oil processing technology Counties where already for successful promotion • Cost and labour intensive Counties where already discemination • Cost and labour intensive • Cost and labour intensive • Cost an	2.9.13. Door mat from coconut fibre		
What is it? (TIMP description) This is mat processed from coir fibre description) Justification Coconut husks pose environmental dangers and processing in tho lusks apart from using them as source of fibre wood. Processing of the husks into coco fibre ropes creates cottage industries for income generation. Coir fibre ropes cannot easily rot. B: Assessment of discemination and scaling up/out approaches Users of TIMP B: Assessment of discemination and scaling up/out approaches Coconut husks approaches Users of TIMP Farmers, traders, consumers in urban cities Approaches to be used in dissemination Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local PM stations Critical/essential factors for successful promotion Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing technology Partners/stakeholders for scaling up and bheir roles • Farmers to adopt the oil processing technology Counties where already promoted, if any Kwale. Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties Counties where TIMPs will be up scaled • Cost and labour intensive Challenges in dissemination • Cost and labour intensive Soggestions for addressing the challenges • Cost and labour intensive Suggestions for addressing development a	Problem addressed	Limited availability of natural carpets	
Justification Cocount husks pose environmental dangers and processing into coco fibre rope reduces this danger. Coco fibre rope is also an alternative use of husks apart from using them as source of firewood. Processing of the husks into coco fibre ropes creates cottage industries for income generation. Coir fibre ropes cannot easily rot. B: Assessment of dissemination and scaling up/out approaches Easers of TIMP Parmers, traders, consumers in urban cities Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations Critical/essential factors Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector. Partners/stakeholders for scaling up and their roles • Farmers to adopt the oil processing technology Counties where already promoted, if any Killfi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties Counties where TIMPs will be up scaled • Cost and labour intensive Challenges in discernination • Cost and labour intensive Suggestions for addressing the challenges • Cost and labour intensive Suggestions for addressing the coal community on maintenance and operation skills • Contrast where the project; training of the local community againt conflict Descret and upscaling, if any • Opportunities for increased returns due to cracking technologies Dicital, env	What is it? (TIMP description)	This is mat processed from coir fibre	
B: Assessment of dissemination and scaling up/out approaches Users of TIMP Farmers, traders, consumers in urban cities Approaches to be used in dissemination Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local PM stations Critical/essential factors for successful promotion Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector. Partners/stakeholders for scaling up and their roles • Farmers to adopt the oil processing technology Counties where already promoted, if any • Farmers to adopt the oil processing facility is communally owned Counties where TIMPs will be up scaled • Cost and labour intensive Counties where TIMPs will be up scaled • Cost and labour intensive Communal conflicts where the processing facility is communally owned • Sometimes high level skills are required especially for the operation and maintenance Suggestions for addressing the challenges • Opportunities for increased returns due to cracking technologies • Detential to cushion the community against conflict upscaling, if any • Opportunities for increased returns due to cracking technologies • Detential to cushion the community against conflict upscaling, if any • Opportunities for increased returns due to cracking the nut. Consequently the techology may not b	Justification	Coconut husks pose environmental dangers and processing into coco fibre rope reduces this danger. Coco fibre rope is also an alternative use of husks apart from using them as source of firewood. Processing of the husks into coco fibre ropes creates cottage industries for income generation. Coir fibre ropes cannot easily rot.	
Users of TIMP Farmers, traders, consumers in urban cities Approaches to be used in dissemination Agricultural innovation platform, FPBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations Critical/essential factors for successful promotion Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector. Partners/stakeholders for scaling up and their roles • Farmers to adopt the oil processing technology Counties where already promoted, if any • Farmers to adopt the oil processing facility is counties where TIMPs will Counties where TIMPs will Kilifi Will • Cost and labour intensive Challenges in dissemination • Cost and labour intensive • Cost and labour intensive • Communal conflicts where the processing facility is communally owned Suggestions for addressing the challenges • Cost and labour intensive • Communal conflicts where the processing facility is communally owned Suggestions for addressing the challenges • Optortunities for increased returns due to cracking technologies • Detential to cushion the community against conflict Uspecaling, if any • Opportunities for increased returns due to cracking technologies • Enhance outreach Social, environmental, policy and market conditions neceresary for development,	B: Assessment of dissemina	ition and scaling up/out approaches	
Approaches to be used in disseminationAgricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stationsCritical/essential factors rsuccessful promotionResources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector.Partners/stakeholders for scaling up and their roles• Farmers to adopt the oil processing technology • Private sector, County Government, NGOs, NOCD, MESPT, KIRDICounties where already promoted, if anyKwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties • Counties where TIMPs will be up scaledCounties where TIMPs will dissemination• Cost and labour intensive • Communal conflicts where the processing facility is communally owned • Sometimes high level skills are required especially for the operation and maintenance and operation skillsSuggestions for addressing the challengesPotential to cushion the community against conflict • Detential to cushion the community against conflictSocial, environmental, policy and market conditions necessary for development, and upscaling• Opportunities for increased returns due to cracking technologies • Die technology and the chores • Women and youths usally perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other choresBasic costsTo be determinedGender related opportunities• Women and youth have limited access to education, training and extension services than men • Women and youth have limited access to education, training and extension services than	Users of TIMP	Farmers, traders, consumers in urban cities	
Critical/essential factors for successful promotionResources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector.Partners/stakeholders for scaling up and their roles• Farmers to adopt the oil processing technology • Private sector, County Government, NGOs, NOCD, MESPT, KIRDIC: Current situation and Twate scaling up promoted, if any• Farmers to adopt the oil processing technology • Private sector, County Government, NGOs, NOCD, MESPT, KIRDICounties where already promoted, if anyKwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi countiesCounties where TIMPs will be up scaled• Cost and labour intensive • Communal conflicts where the processing facility is communally owned • Sometimes high level skills are required especially for the operation and maintenanceSuggestions for addressing the challengesResource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skillsLessons learned in upsciling, if any• Opportunities for increased returns due to cracking technologies • Enhance outreachSocial, environmental, evoley and market conditions necessary for development and upscaling• Objectunities for increased returns due to cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other choresBasic costsTo be determined Income from sales of the productGender related oupportunities• Women and youth have limited access to education, training and ext	Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations	
Partners/stakeholders for scaling up and their roles • Farmers to adopt the oil processing technology • Private sector, County Government, NGOs, NOCD, MESPT, KIRDI Counties where already promoted, if any Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties Counties where already promoted, if any Kilifi Counties where already promoted, if any • Cost and labour intensive Challenges in dissemination • Cost and labour intensive • Sometimes high level skills are required especially for the operation and maintenance • Sometimes high level skills are required especially for the operation and maintenance Suggestions for addressing the challenges • Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills Lessons learned in upscaling, if any • Opportunities for increased returns due to cracking technologies • Enhance outreach • Enhance outreach outreach • Opportunities for increased returns due to cracking technologies • Enhance outreach • Women and youth sually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores Social, environmental, policy and market conditions neesosary for in development, dissemination adoption and scaling up • Women and youth	Critical/essential factors for successful promotion	Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector.	
C: Current situation and future scaling up Counties where already promoted, if any Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties Counties where TIMPs will be up scaled Kilifi Challenges in dissemination • Cost and labour intensive Suggestions for addressing the challenges • Cost and labour intensive despecially for the operation and maintenance Suggestions for addressing the challenges Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills Lessons learned in upscaling, if any • Opportunities for increased returns due to cracking technologies Social, environmental, policy and market conditions neccessary for development and upscaling • Opportunities for increased returns due to cracking technologies Basic costs To be determined Estimated returns Income from sales of the product Gender issues and concerns in development, dissemination adoption and scaling up • Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores Gender related opportunities • Women and youth have limited access to education, training and extension services than men • Women and youth have limited access to education, training and extension services than men<	Partners/stakeholders for scaling up and their roles	 Farmers to adopt the oil processing technology Private sector, County Government, NGOs, NOCD, MESPT, KIRDI 	
Counties where already promoted, if anyKwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi countiesCounties where TIMPs will be up scaledKilifiChallenges in dissemination• Cost and labour intensive • Communal conflicts where the processing facility is communally owned • Sometimes high level skills are required especially for the operation and maintenance • Sometimes high level skills are required especially for the operation and maintenanceSuggestions for addressing the challengesResource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skillsLessons learned in upscaling, if any• Opportunities for increased returns due to cracking technologies • Enhance outreachSocial, environmental, policy and market conditions necessary for development and upscaling• Opportunities for increased returns due to cracking technologies • Enhance outreachBasic costsTo be determinedEstimated returnsIncome from sales of the productGender issues and concerns in development, dissemination adoption and scaling up• Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other choresGender related opportunities• Wenden and youth have limited access to education, training and extension services than men • Men dominant most decisions at the household and community levelsGender related opportunitiesEmployment opportunities for women and youth in rural areas	C: Current situation and fu	iture scaling up	
Counties where TIMPs will be up scaledKilifiChallenges in dissemination• Cost and labour intensive • Communal conflicts where the processing facility is communally owned • Sometimes high level skills are required especially for the operation and maintenanceSuggestions for addressing the challengesResource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skillsLessons learned in upscaling, if anyPotential to cushion the community against conflict • Deportunities for increased returns due to cracking technologies • Enhance outreach • Enhance outreachD: Economic, gender, vulnerable and marginalized groups (VMGs) considerations• Opportunities for heroductBasic costsTo be determinedEstimated returnsIncome from sales of the productGender issues and concerns 	Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Challenges in dissemination• Cost and labour intensive • Communal conflicts where the processing facility is communally owned • Sometimes high level skills are required especially for the operation and maintenanceSuggestions for addressing the challengesResource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skillsLessons learned in upscaling, if anyPotential to cushion the community against conflictSocial, environmental, policy and market conditions necessary for development and upscaling• Opportunities for increased returns due to cracking technologies • Enhance outreachBasic costsTo be determinedEstimated returnsIncome from sales of the productGender issues and concerns scaling up• Women and youth susually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other choresScaling up• Women and youth have limited access to education, training and extension services than men • Men dominant most decisions at the household and community levelsGender related opportunitiesEmployment opportunities for women and youth in rural areasWMG issues and concerns of of the chores• Women and youth have limited access to education, training and extension services than men • Men dominant most decisions at the household and community levels	Counties where TIMPs will be up scaled	Kilifi	
Suggestions for addressing the challengesResource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skillsLessons learned in upscaling, if anyPotential to cushion the community against conflictSocial, environmental, policy and market conditions necessary for development and upscaling• Opportunities for increased returns due to cracking technologies • Enhance outreach D: Economic, gender, vul>t=ble and marginalized groups (VMGs) considerations Basic costsTo be determinedEstimated returnsIncome from sales of the productGender issues and concerns in development, dissemination adoption and scaling up• Women and youth have limited access to education, training and extension services than men • Men dominant most decisions at the household and community levelsGender related opportunitiesEmployment opportunities for women and youth in rural areasOpportunities• VMGs have less access to agricultural information, technology and knowledge	Challenges in dissemination	 Cost and labour intensive Communal conflicts where the processing facility is communally owned Sometimes high level skills are required especially for the operation and maintenance 	
Lessons learned in upscaling, if anyPotential to cushion the community against conflictSocial, environmental, policy and market conditions necessary for development and upscaling• Opportunities for increased returns due to cracking technologies • Enhance outreach • Enhance outreach D: Economic, gender, vul	Suggestions for addressing the challenges	Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills	
Social, environmental, policy and market conditions necessary for development and upscaling• Opportunities for increased returns due to cracking technologies • Enhance outreach D: Economic, gender, vul	Lessons learned in upscaling, if any	Potential to cushion the community against conflict	
D: Economic, gender, vul	Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to cracking technologies Enhance outreach 	
Basic costsTo be determinedEstimated returnsIncome from sales of the productGender issues and concerns in development, dissemination adoption and scaling up• Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores• Women and youth have limited access to education, training and extension services than men • Men dominant most decisions at the household and community levelsGender related opportunitiesEmployment opportunities for women and youth in rural areas • VMGs have less access to agricultural information, technology and knowledge	D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Estimated returnsIncome from sales of the productGender issues and concerns in development, dissemination adoption and scaling up• Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores• Women and youth have limited access to education, training and extension services than men• Men dominant most decisions at the household and community levelsGender related opportunities• VMG issues and concerns• VMGs have less access to agricultural information, technology and knowledge	Basic costs	To be determined	
Gender issues and concerns in development, dissemination adoption and scaling up• Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores• Women and youth have limited access to education, training and extension services than men • Men dominant most decisions at the household and community levelsGender related opportunitiesEmployment opportunities for women and youth in rural areas • VMG issues and concerns• WMGs have less access to agricultural information, technology and knowledge	Estimated returns	Income from sales of the product	
Gender related opportunities Employment opportunities for women and youth in rural areas VMG issues and concerns • VMGs have less access to agricultural information, technology and knowledge	Gender issues and concerns in development, dissemination adoption and scaling up	 Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to education, training and extension services than men Men dominant most decisions at the household and community levels 	
VMG issues and concerns • VMGs have less access to agricultural information, technology and knowledge	Gender related opportunities	Employment opportunities for women and youth in rural areas	
in development, • VMGs have limited access to training and extension services	VMG issues and concerns in development,	 VMGs have less access to agricultural information, technology and knowledge VMGs have limited access to training and extension services 	

2.9.13. Door mat from coo	2.9.13. Door mat from coconut fibre	
dissemination adoption and	• Due to their social status VMGs are often excluded from decision making in	
scaling up	development and dissemination activities	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	The technology will: 1) help women and girls to earn a living 2)VMG maximize on	
	availability of enterprises to engage in small cottage industries	
E: Case studies/profiles of s	success stories	
Success stories	CBOs who adopted coir processing technology have had sustained source of income	
	and improved livelihoods	
Application guidelines for	Coconut fibre processing guidelines and brochures and leaflets	
users		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling		
validation, 3-requires further research)		
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki	
organization/scientists		
	County government, PPP, KIRDI, KEBS, NOCD, MESPT	

2.9.14. Coco peat	
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	Limited availability of natural plant growing media, and high cost of importing coco peat. The horticultural industry imports over 1000 tons of coco peat annually.
What is it? (TIMP description)	Plant growing media processed from coconut husks. Coco peat is a multipurpose growing media that provides new opportunities for Potting Mix Suppliers, seedling nurseries, hydroponic growers and golf green constructors. Coco peat is also used as a bedding in animal farms and pet houses to absorb animal waste so the farm is kept clean and dry.

2.9.14. Coco peat		
	Coco peat used as potting media in seedling nursery	
Justification	Coconut husks pose environmental dangers and processing into coco peat eliminates this danger. Processing of the husks into coco peats creates cottage industries for income generation. The horticultural industry in kenya currently imports over 1000 tons per annum of coco peat and the demand appears to be growing.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, traders, golf green constructors	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations	
Critical/essential factors for successful promotion	Resources to support acquisition and establishment of small-scale coco peat processing plants, communal land to establish the processing plants; involvement of the private sector.	
Partners/stakeholders for scaling up and their roles	 Farmers to adopt the oil processing technology Private sector, County Governments, NGOs, NOCD, MESPT, KIRDI, JKUAT Potting Mix Suppliers, seedling nurseries, hydroponic growers and golf green constructors. 	
C: Current situation and future scaling up		
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in dissemination	 Cost and labour intensive Communal conflicts where the processing facility is communally owned Sometimes high level skills are required especially for the operation and maintenance 	
Suggestions for addressing the challenges	Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills	
Lessons learned in upscaling, if any	Potential to cushion the community against conflict	
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns from using husks to make coco peat which have market Enhance outreach 	
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Increased income from converting husks into valuable products	

2.9.14. Coco peat		
Gender issues and concerns	• Women and youths usually perform the task of coconut processing.	
in development,	Consequently, the technology may not be adopted if women are already over	
dissemination adoption and	whelmed with other chores	
scaling up	• Women and youth have limited access to education, training and extension	
	services than men	
	Men dominant most decisions at the household and community levels	
Gender related	Employment opportunities for women and youth in rural areas	
opportunities		
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge	
in development,	• VMGs have limited access to training and extension services	
dissemination adoption and	• Due to their social status VMGs are often excluded from decision making in	
scaling up	development and dissemination activities	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	The technology will: 1) help women and girls to earn a living 2)VMG maximize on	
	availability of enterprises to engage in small cottage industries	
E: Case studies/profiles of	success stories	
Success stories		
Application guidelines for	Coconut fibre processing guidelines and brochures and leaflets	
users		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling		
validation, 3-requires further	research)	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki	
scientists		
	County government, PPP, KIRDI, KEBS, NOCD, MESPT	
	•	

2.9.15. Coconut shell ear ring		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	Limited use of coconut shells	
What is it? (TIMP	Ear rings processed from coconut husks	
description)		
Justification	Coconut shells pose environmental dangers and processing into ear rings minimises	
	this danger. Coconut shell earing is also an alternative use of husks apart from using	
	them as source of firewood. Processing of the coconut shell into earrings creates	
	cottage industries for income generation	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, traders, consumers in urban cities	
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, technical training	
dissemination	and re-tooling of project staff, local FM stations	
Critical/essential factors	Resources to support acquisition and establishment of small-scale coir processing	
for successful promotion	plants, communal land to establish the processing plants; involvement of the private	

2.9.15. Coconut shell ear ring			
	sector.		
Partners/stakeholders for	Farmers to adopt the oil processing technology		
scaling up and their roles	• Private sector, County Government, NGOs, NOCD, MESPT, KIRDI		
C: Current situation and fu	iture scaling up		
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties		
promoted, if any			
Counties where TIMPs will	Kilifi		
be up scaled			
Challenges in	Cost and labour intensive		
dissemination	Communal conflicts where the processing facility is communally owned		
	• Sometimes high level skills are required especially for the operation and		
	maintenance		
Suggestions for addressing	Resource mobilization through partnerships with private sector; engaging a		
the challenges	participatory process during planning and implementation of the project; training of		
	the local community on maintenance and operation skills		
Lessons learned in	Potential to cushion the community against conflict		
upscaling, if any			
Social, environmental,	 Opportunities for increased returns due to cracking technologies 		
policy and market	Enhance outreach		
conditions necessary for			
development and upscaling			
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations			
Basic costs	Not determined		
Estimated returns	The sales that are yet to be determined		
Gender issues and concerns	• Women and youths usually perform the task of cracking the nut. Consequently		
in development,	the technology may not be adopted if women are already over whelmed with		
dissemination adoption and	other chores		
scanng up	• Women and youth have limited access to education, training and extension services than men		
	• Men dominant most decisions at the household and community levels		
Gender related	Employment opportunities for women and youth in rural areas		
opportunities			
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge		
in development,	• VMGs have limited access to training and extension services		
dissemination adoption and	d • Due to their social status VMGs are often excluded from decision making		
scaling up	development and dissemination activities		
	• There is low adoption by VMGs due lack of awareness		
VMG related opportunities	The technology will: 1) help women and girls to earn a living 2)VMG maximize on		
	availability of enterprises to engage in small cottage industries		
E: Case studies/profiles of s	E: Case studies/profiles of success stories		
Success stories	CBOs who adopted coir processing technology have had sustained source of income		
	and improved livelihoods		
Application guidelines for	Coconut fibre processing guidelines and brochures and leaflets		
users			
F: Status of TIMP readines	s (1-Ready for upscaling, 2-requires Ready for upscaling		
validation, 3-requires further	research)		
G: Contacts			

2.9.15. Coconut shell ear ring	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org, 0202024751
Lead organization and	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki
scientists	
	County government, PPP, KIRDI, KEBS, NOCD, MESPT

2.9.16. Coconut shell hair	clip		
Category (i.e. technology, innovation or management practice)	Technology		
A: Description of the techn	A: Description of the technology, innovation or management practice		
Problem addressed	Limited use of coconut shells		
What is it? (TIMP description)	Hair clips processed from coconut husks		
Justification	Coconut shells pose environmental dangers and processing into hair clips minimises this danger. Coconut shell hair clips is also an alternative use of husks apart from using them as source of firewood. Processing of the coconut shell into hair clips creates cottage industries for income generation		
B: Assessment of dissemina	ation and scaling up/out approaches		
Users of TIMP	Farmers, traders, consumers in urban cities		
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations		
Critical/essential factors for successful promotion	Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector.		
Partners/stakeholders for	Farmers to adopt the oil processing technology		
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT, KIRDI		
C: Current situation and future scaling up			
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties		
Counties where TIMPs will be up scaled	Kilifi		
Challenges in	Cost and labour intensive		
dissemination	 Communal conflicts where the processing facility is communally owned Sometimes high level skills are required especially for the operation and maintenance 		
Suggestions for addressing the challenges	Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills		
Lessons learned in upscaling, if any	Potential to cushion the community against conflict		
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to cracking technologies Enhance outreach 		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations		

2.9.16. Coconut shell hair clip		
Basic costs	Not determined	
Estimated returns	Income from sales of the product	
Gender issues and concerns in development, dissemination adoption and scaling up	 Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to education, training and extension services than men Men dominant most decisions at the household and community levels 	
Gender related opportunities	Employment opportunities for women and youth in rural areas	
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 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	The technology will: 1) help women and girls to earn a living 2)VMG maximize on availability of enterprises to engage in small cottage industries	
E: Case studies/profiles of success stories		
Success stories		
Application guidelines for users	Coconut fibre processing guidelines and brochures and leaflets	
F: Status of TIMP readiness (1-Ready for upscaling, 2-requiresReady for upscalingvalidation, 3-requires further research)Ready for upscaling		
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa E-mail: <u>director.icri@kalro.org</u> , 0202024751	
Lead organization and scientists	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki	
	County government, PPP, KIRDI, KEBS, NOCD, MESPT	

2.9.17. Coconut shell bangles		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	Limited use of coconut shells	
What is it? (TIMP	Bangles processed from coconut husks	
description)		
Justification	Coconut shells pose environmental dangers and processing into bangles minimises	
	this danger. Coconut shell bangles is also an alternative use of husks apart from using	
	them as source of firewood. Processing of the coconut shell into bangles creates	
	cottage industries for income generation	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Farmers, traders, consumers in urban cities	
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, technical training	

2.9.17. Coconut shell bangles		
dissemination	and re-tooling of project staff, local FM stations	
Critical/essential factors	Resources to support acquisition and establishment of small-scake coir processing	
for successful promotion	plants, communal land to establish the processing plants; involvement of the private	
	sector.	
Partners/stakeholders for	• Farmers to adopt the oil processing technology	
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT, KIRDI	
C: Current situation and fu	iture scaling up	
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
promoted, if any		
Counties where TIMPs will	Kılıfı	
be up scaled		
Challenges in	• Cost and labour intensive	
dissemination	• Communal conflicts where the processing facility is communally owned	
	• Sometimes high level skills are required especially for the operation and maintenance	
Suggestions for addressing	Resource mobilization through partnerships with private sector; engaging a	
the challenges	participatory process during planning and implementation of the project; training of	
	the local community on maintenance and operation skills	
Lessons learned in	Potential to cushion the community against conflict	
upscaling, if any		
Social, environmental,	• Opportunities for increased returns due to cracking technologies	
policy and market	• Enhance outreach	
development and upscaling		
D: Economic gender vulne	arable and marginalized groups (VMCs) considerations	
D: Economic, gender, vumerable and marginanzed groups (viviGs) considerations		
Estimated returns	Income from colors of the product	
Condentionage and concome		
in development	• Women and youths usually perform the task of cracking the nut. Consequently the task pology may not be adopted if women are already over whelmod with	
dissemination adoption and	other chores	
scaling up	• Women and youth have limited access to education training and extension	
seaming up	• women and youth have initied access to education, training and extension services than men	
	 Men dominant most decisions at the household and community levels 	
Gender related	Employment opportunities for women and youth in rural areas	
opportunities		
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge	
in development,	• VMGs have limited access to training and extension services	
dissemination adoption and	• Due to their social status VMGs are often excluded from decision making in	
scaling up	development and dissemination activities	
	• There is low adoption by VMGs due lack of awareness	
VMG related opportunities	The technology will: 1) help women and girls to earn a living 2)VMG maximize on availability of enterprises to engage in small cottage industries	
F. Case studies/profiles of a	availability of energines to engage in small cottage industries	
Success stories	CBOs who adopted coir processing technology have had sustained source of income	
5000000 5101105	and improved livelihoods	
Application guidelines for	Coconut fibre processing guidelines and brochures and leaflets	
users	coconat here processing guidennes and prochares and realiets	

2.9.17. Coconut shell bangles		
F: Status of TIMP readiness (1-Ready for upscaling, 2-requires Ready for upscaling validation, 3-requires further research)		Ready for upscaling
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa	a; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org, 020202	24751
Lead organization and scientists	F.N. Pole, F.K. Muniu, F. Wayua, J. Nd	ambuki
	County government, PPP, KIRDI, KEB	S, NOCD, MESPT

2.9.18. Coconut shell cups		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited use of coconut shells; need to diversify cup sources and designs	
What is it? (TIMP	Cups processed from coconut shells	
description)		
Justification	Coconut shells pose environmental dangers and processing into cups minimises this	
	danger. Processing of the coconut shell into cups creates cottage industries for	
D. Accordment of discoming	ation and cooling un/out annroaches	
B: Assessment of dissemina	Energy traders, consumers in when sitiss	
	Farmers, traders, consumers in urban cities	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations	
Critical/essential factors for successful promotion	Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector.	
Partners/stakeholders for	Farmers to adopt the oil processing technology	
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT, KIRDI	
C: Current situation and future scaling up		
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in	Cost and labour intensive	
dissemination	Communal conflicts where the processing facility is communally owned	

2.9.18. Coconut shell cups		
	• Sometimes high level skills are required especially for the operation and maintenance	
Suggestions for addressing the challenges	Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills	
Lessons learned in upscaling, if any	Potential to cushion the community against conflict	
Social, environmental, policy and market conditions necessary for development and upscaling	 Opportunities for increased returns due to cracking technologies Enhance outreach 	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	Not determined	
Estimated returns	Income from sales of the product	
Gender issues and concerns in development, dissemination adoption and	 Women and youths usually perform the task of cracking the nut. Consequently the technology may not be adopted if women are already over whelmed with other chores Women and youth have limited access to advection training and extension 	
scaling up	 women and youth have infinted access to education, training and extension services than men Men dominant most decisions at the household and community levels 	
Gender related	• Men dominant most decisions at the nousehold and community levels Employment opportunities for women and youth in rural areas	
opportunities	Employment opportunities for women and youth in fural areas	
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 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	The technology will: 1) help women and girls to earn a living 2)VMG maximize on availability of enterprises to engage in small cottage industries	
E: Case studies/profiles of success stories		
Success stories	CBOs who adopted coir processing technology have had sustained source of income and improved livelihoods	
Application guidelines for users	Coconut fibre processing guidelines and brochures and leaflets	
F: Status of TIMP readin	ess (1-Ready for upscaling, 2-requires Ready for upscaling	
Vandation, 3-requires further	research)	
G: Contacts	The Institute Director KALDO Mayone, D.O. Day 16 90100 Mayone	
Contacts	E-mail: <u>director.icri@kalro.org</u> , 0202024751	
Lead organization and scientists	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki	
	County government, PPP, KIRDI, KEBS, NOCD, MESPT	

2.9.19. Coconut shell belt	
Category (i.e. technology,	Technology
innovation or management	

2.9.19. Coconut shell belt	2.9.19. Coconut shell belt		
practice)			
A: Description of the techn	ology, innovation or management practice		
Problem addressed	Limited use of coconut shells		
What is it? (TIMP	Belts processed from coconut husks		
description)			
Justification	Coconut shells pose environmental dangers and processing into belts minimises this		
	danger. Coconut shell belts is also an alternative use of husks apart from using them		
	as source of firewood. Processing of the coconut shell into belts creates cottage		
	industries for income generation		
B: Assessment of dissemina	tion and scaling up/out approaches		
Users of TIMP	Farmers, traders, consumers in urban cities		
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations		
Critical/essential factors	Resources to support acquisition and establishment of small-scake coir processing		
for successful promotion	plants, communal land to establish the processing plants; involvement of the private		
	sector.		
Partners/stakeholders for	• Farmers to adopt the oil processing technology		
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT, KIRDI		
C: Current situation and fu	iture scaling up		
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties		
promoted, if any			
Counties where TIMPs will			
be up scaled			
dissemination	• Cost and labour intensive		
dissemination	• Communal conflicts where the processing facility is communally owned		
	• Sometimes ligh level skills are required especially for the operation and maintenance		
Suggestions for addressing	Resource mobilization through partnerships with private sector; engaging a		
the challenges	participatory process during planning and implementation of the project; training of		
Y 1 1'	the local community on maintenance and operation skills		
Lessons learned in	Potential to cushion the community against conflict		
Social environmental	• Opportunities for increased noturns due to preaking technologies		
policy and market	Opportunities for increased returns due to cracking technologies Enhance outroach		
conditions necessary for			
development and upscaling			
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations		
Basic costs	Not determined		
Estimated returns	Income from sales of the product		
Gender issues and concerns	• Women and youths usually perform the task of cracking the nut. Consequetly the		
in development,	technology may not be adopted if women are already over whelmed with other		
dissemination adoption and	chores		
scaling up	• Women and youth have limited access to education, training and extension		
	services than men		
~	Men dominant most decisions at the household and community levels		
Gender related	Employment opportunities for women and youth in rural areas		
opportunities			

2.9.19. Coconut shell belt	
VMG issues and concerns in development, dissemination adoption and scaling up VMG related opportunities	 VMGs have less access to agricultural information, technology 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 VMGs due lack of awareness The technology will: 1) help women and girls to earn a living 2)VMG maximize on
	availability of enterprises to engage in small cottage industries
E: Case studies/profiles of s	success stories
Success stories	CBOs who adopted coir processing technology have had sustained source of income and improved livelihoods
Application guidelines for users	Coconut fibre processing guidelines and brochures and leaflets
F: Status of TIMP readi requires validation, 3-require	iness (1-Ready for upscaling, 2-Ready for upscalinges further research)Ready for upscaling
G: Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org, 0202024751
Lead organization and scientists	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki
	County government, PPP, KIRDI, KEBS, NOCD, MESPT

2.9.20. Coconut shell doll	
Category (i.e. technology,	Technology
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	Limited use of coconut shells
What is it? (TIMP	Doll processed from coconut husks
description)	
Justification	Coconut shells pose environmental dangers and processing into dolls minimises this
	danger. Coconut shell doll is also an alternative use of husks apart from using them
	as source of firewood. Processing of the coconut shell into dolls creates cottage
	industries for income generation
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Farmers, traders, consumers in urban cities
Approaches to be used in	Agricultural innovation platform, FFBS, practical demonstrations, technical training
dissemination	and re-tooling of project staff, local FM stations
Critical/essential factors	Resources to support acquisition and establishment of small-scake coir processing
for successful promotion	plants, communal land to establish the processing plants; involvement of the private
	sector.
Partners/stakeholders for	• Farmers to adopt the oil processing technology
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT, KIRDI
C: Current situation and future scaling up	
Counties where already	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties
promoted, if any	
Counties where TIMPs will	Kilifi

2.9.20. Coconut shell doll		
be up scaled		
Challenges in	Cost and labour intensive	
dissemination	• Communal conflicts where the processing facility is communally owned	
	• Sometimes high level skills are required especially for the operation and	
	maintenance	
Suggestions for addressing	Resource mobilization through partnerships with private sector; engaging a	
the challenges	participatory process during planning and implementation of the project; training of	
T 1 1 ·	the local community on maintenance and operation skills	
Lessons learned in	Potential to cushion the community against conflict	
upscaling, if any		
Social, environmental,	• Opportunities for increased returns due to cracking technologies	
conditions necessary for	• Enhance outreach	
development and upscaling		
D: Economic gender vuln	erable and marginalized groups (VMCs) considerations	
Basic costs	Not determined	
Estimated returns	Income from sales of the product	
Conden issues and concerns	We were and exactly a set of the form the task of an abian the set. Concernently the	
in development	• women and youths usually perform the task of cracking the nut. Consequely the technology may not be adopted if women are already over whelmed with other	
dissemination adoption and	chores	
scaling up	• Women and youth have limited access to education training and extension	
6 T	services than men	
	 Men dominant most decisions at the household and community levels 	
Gender related	Employment opportunities for women and youth in rural areas	
opportunities		
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge	
in development,	• VMGs have limited access to training and extension services	
dissemination adoption and	• Due to their social status VMGs are often excluded from decision making in	
scaling up	development and dissemination activities	
	There is low adoption by VMGs due lack of awareness	
VMG related opportunities	The technology will: 1) help women and girls to earn a living 2)VMG maximize on	
	availability of enterprises to engage in small cottage industries	
E: Case studies/profiles of success stories		
Success stories	CBOs who adopted coir processing technology have had sustained source of income	
	and improved livelihoods	
Application guidelines for	Coconut fibre processing guidelines and brochures and leaflets	
users		
F: Status of TIMP readines	ss (1-Ready for upscaling, 2-requires Ready for upscaling	
validation, 3-requires further	research)	
G: Contacts		
Contacts	I ne Institute Director, KALKO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024/51	
Lead organization and	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki	
scientists		
	County government, PPP, KIRDI, KEBS, NOCD, MESPT	

2.9.21. Coconut shell charcoal/activated carbon		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Limited use of coconut shells, and also shortage of charcoal	
What is it? (TIMP description)	Charcoal obtained from coconut shell. Coconut shell is manufactured by burning the shell of fully matured nuts in a limited supply of air sufficient for carbonization, but not for complete destruction. The output of burning in the traditional pith method is just below 30% of the original 100% of the shells.	
	Coconut shell charcoal / activated carbon	
Justification	Making coconut shell / activated carbon makes use of the shells and addresses the shortage of charcoal. The heat generated while burning the coconut shell is used for drying copra.	
B: Assessment of dissemina	ition and scaling up/out approaches	
Users of TIMP	Farmers, traders, consumers in urban cities	
Approaches to be used in dissemination	Agricultural innovation platform, FFBS, practical demonstrations, technical training and re-tooling of project staff, local FM stations	
Critical/essential factors for successful promotion	Resources to support acquisition and establishment of small-scake coir processing plants, communal land to establish the processing plants; involvement of the private sector.	
Partners/stakeholders for	Farmers to adopt the oil processing technology	
scaling up and their roles	Private sector, County Government, NGOs, NOCD, MESPT, KIRDI	
C: Current situation and future scaling up		
Counties where already promoted, if any	Kwale, Kilifi, Mombasa, Lamu, Tana River, Taita-Taveta, Tharaka Nithi counties	
Counties where TIMPs will be up scaled	Kilifi	
Challenges in dissemination	 Cost and labour intensive Communal conflicts where the processing facility is communally owned Sometimes high level skills are required especially for the operation and maintenance 	
Suggestions for addressing the challenges	Resource mobilization through partnerships with private sector; engaging a participatory process during planning and implementation of the project; training of the local community on maintenance and operation skills	
Lessons learned in	Potential to cushion the community against conflict	

2.9.21. Coconut shell charcoal/activated carbon		
upscaling, if any		
Social, environmental,	Opportunities for increased returns due to cracking technologies	
policy and market	• Enhance outreach	
development and upscaling		
D: Economic gender vuln	arable and marginalized groups (VMCs) considerations	
Basic costs	Not determined	
Estimated returns	The sales that are yet to be determined	
Condentionage and concome	The sales that are yet to be determined	
in development	• Women and youths usually perform the task of cracking the nut. Consequely the technology may not be adopted if women are already over wholmed with other	
dissemination adoption and	chores	
scaling up	• Women and youth have limited access to education, training and extension	
	services than men	
	• Men dominant most decisions at the household and community levels	
Gender related	Employment opportunities for women and youth in rural areas	
opportunities		
VMG issues and concerns	• VMGs have less access to agricultural information, technology and knowledge	
in development,	 VMGs have limited access to training and extension services 	
dissemination adoption and	• Due to their social status VMGs are often excluded from decision making in	
scaling up	development and dissemination activities	
	There is low adoption by VMGs due lack of awareness	
VMG related opportunities	The technology will: 1) help women and girls to earn a living 2)VMG maximize on	
	availability of enterprises to engage in small cottage industries	
E: Case studies/profiles of s	success stories	
Success stories	CBOs who adopted coir processing technology have had sustained source of income	
	and improved livelihoods	
Application guidelines for	Coconut fibre processing guidelines and brochures and leaflets	
users		
F: Status of TIMP readines	s (1-Ready for upscaling, 2-requires Ready for upscaling	
Validation, 5-requires further	Tesearch)	
G: Contacts	The Institute Dissector KALDO Marrow DO Der 16 00100 Marrows	
Contacts	E meile director iori@lealea erg. 0202024751	
x x x x	E-mail: <u>director.icri@kairo.org</u> , 0202024/51	
Lead organization and	F.N. Pole, F.K. Muniu, F. Wayua, J. Ndambuki	
Partner organisations	County government, PPP, KIRDI, KEBS, NOCD, MESPT	

2.10 MECHANIZATION OF COCONUT PRODUCTION ACTIVITIES

2.10.1. Power tiller		
Category (i.e. technology,	Technology	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem to be addressed	• Slow and tedious processes of seedbed preparation, in a commercialized coconut	
	plantation	
	• Difficult to prepare a uniform fine tilth seedbed manually	
	Delayed operation lead to late planting	
	High cost of manual labour	
What is it? (TIMP	A Power tiller is a low powered two-wheeled agricultural implement, also referred to	
description)	as a walking tractor 8-16hp that can be fitted with a rotary tiller, disk harrow,	
	mouldboard plougn, trailer, water pump or chisel at alternate times for easing farm	
	though the machine could do more with a different operator. This will vary	
	depending on the climatic conditions soil types soil moisture content operator.	
	stamina and experience. Fuel consumption is about 15 litres per ha. Though these	
	results may vary with the technical ability of the operator.	
Justification	It has multiple uses and other advantages. A Power Tiller can be used in seedbed	
	preparation, sowing seed, planting seed, spraying fertilizer, herbicide and even	
	irrigation. In addition, can also be used for transporting produce. A power Tiller is	
	ideal where the land size is small. Farm sizes less than one hectare may limit	
	maneuverability of conventional tractors and manual labour is costly and slow, hence	
	the need for a power tiller.	
B: Assessment of dissemina	ntion and scaling up/out approaches	
Users of TIMP	Coconut farmers and researchers	
Approaches used in	• FFBS	
dissemination	• AIP	
	• Field Demonstrations and training, Agricultural shows (ASK) and other	
	exhibitions	
for successful promotion	• Research to test, validate and release improved coconut varieties	
for successful promotion	• A platform for interaction of coconut value chain stakeholders	
Doute and /stalkabaldana fan	Multiple usage, timeliness, efficiency and low cost	
Partners/stakenoiders for	• KALRO, Universities (for information)	
scaling up and then toles	Machinery fabricators	
C. Current situation and fo	• NGO supporting farmers for dissemination	
Counting where almost large	Rure scaling up	
Counties where already	Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi	
promoted if any		

2.10.1. Power tiller		
Counties where TIMP will	Kilifi	
be up scaled		
Challenges in	• Lack of coconut innovation platforms to facilitate interaction of farmers with	
dissemination	relevant stakeholders	
	• Lack of appropriate machines for different farm activities	
	Lack of facilitation to demonstration sites	
	• High initial cost for small-scale machines	
Suggestions for addressing	Establish coconut innovation platforms	
the challenges	• Acquisition of the machines	
	• Build capacity through efficient agricultural production to afford the cost	
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders	
scaling if any	collaborate in an innovation platform	
	• Partnership is important in technology dissemination and adoption and this can be	
	facilitated through innovation platforms	
	Mechanization in agriculture increases production	
	• Mechanization releases labour to alternative requirement areas	
	• Provides low cost farm operations	
Social, environmental,	• Creation of awareness on mechanization importance in agricultural production	
policy and market	• Include all gender groups in research, and validation.	
conditions necessary for	• Appropriate policy formulation of agricultural mechanization	
development and up		
scaling		
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	KES 280,000	
Estimated returns	KES 180,000/ month gross income	
Gender issues and concerns	• Gender Unfriendly and expensive machines	
in development,	• Mango machines should be designed for easy start and operation.	
dissemination, adoption	• Up-scaling should target all the gender	
and scaling up	• Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	• Reduces drudgery for women farmers as well as men	
VMG issues and concerns	Facilitation to access information	
in development,	• Affordability and easy to maintain machines	
dissemination, adoption		
and scaling up		
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of success stories		
Success stories from		
previous similar projects		
Application guidelines for	Demonstrations and training	
users	• User manuals	
F: Status of TIMP readine	ss (1-ready for up scaling;, 2-requires Ready for up scaling	
validation; 3-requires further research)		
G: Contacts		
Contacts	The Institute Director, KALRO AMRI - Katumani: P.O. Box 340 Machakos	
	Email: cd katumani@kalro org. Phone: 0711369535	
	-2.11011, -0.1801001, -0.11100, -0.1100, -0	

2.10.1. Power tiller	
Lead organization and	KALRO, Egerton University
scientists	Nasirembe W, Pole F.N.
Partner organizations	Local Fabricators

2.10.2. Four-wheeled Tra	ctor 50Hp
Category (i.e. technology, innovation or management practice)	Technology
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Slow and tedious processes of seedbed preparation, in a commercialized Coconut commodity, difficult to prepare a uniform fine tilth seedbed manually, delayed operation lead to late planting and high cost of manual labour
What is it? (TIMP description)	A small sized, four-wheeled tractor is a low powered agricultural implement of 40- 55hp that can be fitted with a rotary tiller, disk harrow, mouldboard plough, trailer, water pump or chisel at alternate times for easing farm operations. It can complete 4 hectares per day by one operator but can have two operators to run another 8 hours of 4 hectares coming to 8 per day. This will vary depending on the climatic, soil types, soil moisture content and operator experience. Fuel consumption is about 15 litres per ha. Though these results may vary with the technical ability of the operator.
Justification	It has multiple uses and other advantages. A four wheeled tractor can be used in seedbed preparation, sowing seed, planting seed, spraying fertilizer, herbicide and even irrigation. In addition, can also be used for threshing through a power take off device and transporting produce. Farm sizes less than one hectare may limit maneuverability of conventional tractors and manual labour is costly and slow.
B: Assessment of dissemina	ition and scaling up/out approaches
Users of TIMP	Coconut farmers and researchers
Approaches used in dissemination	 FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions
Critical/essential factors for successful promotion	 Research to test, validate and release improved mango varieties A platform for interaction of mango value chain stakeholders Multiple usage, timeliness, efficiency and low cost
Partners/stakeholders for scaling up and their roles	 KALRO, Universities (for information) Machinery dealers NGO supporting farmers for dissemination
C: Current situation and fu	iture scaling up
Counties where already promoted if any	Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi
Counties where TIMP will be up scaled	Kilifi

Challenges in dissemination Lack of cocouut innovation platforms to facilitate interaction of farmers with relevant stakeholders Lack of fractors Lack of fractors Lack of fractors Lack of facilitation to demonstration site High initial cost for small-scale machines Suggestions for addressing the challenges Establish coconut innovation platforms Acquisition of the machines Lack of facilitation to demonstration site Build capacity through efficient agricultural production to afford the cost Lacks 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 Mechanization in agriculture increases production Mechanization in agriculture increases production Provides low cost farm operations Social, environmental, opplicy and market conditions necessary for development and up scaling DEconomic gender, vulnermble and marginalized groups (VMGs) considerations Resic costs KES 17.80,000.00 Estimated returns KES 51,780,000.00 Estimated returns Gender unfriendly and expensive machines Mango machines should be designed for easy start and operation. Up-scaling should taget all the gender Affordability to all gender Affordability and easy to maintain machines Mechanization ha senabled increased production i	2.10.2. Four-wheeled Tractor 50Hp		
dissemination relevant stakeholders - Lack of facilitation to demonstration site - Lack of facilitation to demonstration site - High initial cost for small-scale machines - Suggostions for addressing - Lack of facilitation to demonstration site - High initial cost for small-scale machines - Lack of facilitation to demonstration site - Build capacity through efficient agricultural production to afford the cost - Build capacity through efficient agricultural production to afford the cost - Build capacity through efficient agricultural production to afford the cost - 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 platform - Partnership is important in technology dissemination adoption and this can be facilitated through innovation platform - Creation of awareness on mechanization importance in agricultural production - Mechanization releases labour to alternative requirement areas - Provides low cost farm operations - Creation of awareness on mechanization importance in agricultural production - Include all gender groups in research, and validation Appropriate policy formulation of agricultural mechanization - Appropriate policy formulation of agricultural mechanization - Posteonomic, gender, vultimetal at the gender - Gender unfriendly and expensive machines - Mango machines should be designed for easy start and operation Up-scaling should target all the gender - Creates employment especially for youth - Reduces drudgery for women farmers as well as men - Yerdivability to all gender - Gender unfriendly and expensive formation - Affordability and easy to maintain machines - Facilitation to access information - Affordability and easy to maintain machines - Facilitation to access information - Affordability and easy to maintain machines - Facilitation to access information - Affordability and easy to maintain machines - Second	Challenges in	• Lack of coconut innovation platforms to facilitate interaction of farmers with	
 Lack of fractors Lack of facilitation to demonstration site High initial cost for small-scale machines Suggestions for addressing the challenges Establish cocont innovation platforms Acquisition of the machines Lack of facilitation to demonstration site Build capacity through efficient agricultural production to afford the cost Lessons learned in up scaling if any Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platforms Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Mechanization releases labour to alternative requirement areas Provides low cost farm operations Social, environmental, policy and market conditions necessary for development, include all gender groups (YMGs) consideration. Appropriate policy formulation of agricultural mechanization development, indevelopment, endotines should be designed for easy start and operation. Affordability to all gender coups (YMGs) considerations Basic costs KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up Affordability to all gender Affordability on all gender Affordability and easy to maintain machines 	dissemination	relevant stakeholders	
e Lack of facilitation to demonstration site Suggestions for addressing the challenges Establish coconut innovation platforms Acquisition of the machines Acquisition of the machines Lessons learned in up scaling 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 efficient agricultural production Social, environmental, policy and market conditions necessary for development and up scaling Creation of awareness on mechanization in agricultural production Social, environmental, policy and market conditions necessary for development and up scaling Creation of awareness on mechanization importance in agricultural provides low cost farm operations Social, environmental, policy and market conditions necessary for development, development, duscenting KES 450,000 0er month gross income Ceration of awareness on mechanization Gender unfriendly and dexpensive machines in development, dissemination, adoption and scaling up Gender unfriendly and expensive machines Margo machines should be designed for easy start and operation. Up-scaling should target all the gender Gender related opportunities Creates employment especially for youth opportunities Reduces drudgery for women farmers as well as men VMG issues and concerns in development, dissemination, adoption and scaling up Create employment for VMG at local level		Lack of tractors	
Suggestions for addressing the challenges • Establish coconu innovation platforms Suggestions for addressing the challenges • Establish coconu innovation platforms Lack of facilitation to demonstration site • Lack of facilitation to demonstration site Lessons learned in up scaling 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 • Mechanization releases labour to alternative requirement areas • Provides low cost farm operations • Creation of awareness on mechanization importance in agricultural production of agricultural mechanization • Social, environmental, policy and market conditions necessary for development and up scaling • Creation of awareness on mechanization importance in agricultural production development, adulgender groups in research, and validation. • Ageugitation releases balour to alternative requirement areas • Provides low cost farm operations Basic costs KES 1,780.000.0 Estimated returns • Gender unfriendly and expensive machines • Margo machines should be designed for easy start and operation. • Mago machines should be designed for easy start and operation. • Up-scaling should target al the gender • Afordability to all gender Gender related		Lack of facilitation to demonstration site	
Suggestions for addressing the challenges • Establish coconut innovation platforms • Acquisition of the machines • Lack of facilitation to demonstration site • Build capacity through efficient agricultural production to afford the cost • Lack of facilitation to demonstration site • Build capacity through efficient agricultural production to afford the cost • 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 • Mechanization in agriculture increases production • Mechanization of agriculture increases production • Mechanization of awareness on mechanization importance in agricultural production • Creation of awareness on mechanization importance in agricultural production • Appropriate policy formulation of agricultural mechanization • Creation of awareness on mechanization • Appropriate policy formulation of agricultural mechanization • Creates and concerns in development, dissemination, adoption and scaling up 0 Economic, gender, vulnerable and marginalized groups (VMGs) considerations • Gender resus and concerns in development, dissemination, adoption and scaling up • Creates moloyment gross income • Gender resus and concerns in development, dissemination, adoption and scaling up 0 Facilitation to access information and scaling up • 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 • KI stuss of TUP readiness for in development, dissemination; adoption and scaling up • Can create employment for VMG at local level • Demonstration has enabled increased productin in other crops such as maize, wheat, finger millet an		• High initial cost for small-scale machines	
the challenges Acquisition of the machines Lack of facilitation to demonstration site Lack of facilitation to demonstration site Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform Partnership is impounding thicking are private requirement areas Provides low cost farm operations Creation of awareness on mechanization releases labour to alternative requirement areas Provides low cost farm operations Creation of awareness on mechanization in agricultural production of and scaling up Creation of awareness on mechanization releases chain to adidation. Appropriate policy formulation of agricultural mechanization KES 1780,000.00 KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up Creates employment especially for youth Reduces drudgery for women farmers as well as men VMG related opportunities Can create employment especially for youth Redues drudgery for women farmers as well as men VMG related opportunities Can create employment especially for youth Affordability and easy to maintain machines Mechanization releases Affordability and easy to maintain machines Can create employment especially for youth Reduces drudgery for women farmers as well as men VMG related opportunities Can create employment for VMG at local level E Case studies/profiles of success stories Success stories from previous similar projects Affordability and easy to maintain machines F: Status of TIMP readiness (1-ready for up scaling; .2-requires VMG related opportunities Contacts Co	Suggestions for addressing	Establish coconut innovation platforms	
 Lack of facilitation to demonstration site Build capacity through efficient agricultural production to afford the cost Lessons learned in up scaling 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 Mechanization releases labour to alternative requirement areas Provides low cost farm operations Creation of awareness on mechanization importance in agricultural production Include all gender groups in research, and validation. Appropriate policy formulation of agricultural mechanization Appropriate policy formulation of agricultural mechanization Bisc costs KES 1,780,000.00 Estimated returns Gender nufriendly and expensive machines Mango machines should be designed for easy start and operation. Up-scaling should target all the gender Gender rulated Creates employment especially for youth Pacilitation to access information Affordability to all gender for youth Reduces drudgery for women farmers as well as men VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from meriation to access information Appropriate and rice Appropriate and rice Application guidelines for User manuals F: Status of TIMP readiness (1-ready for up scaling, 2-requires duite and rice Application guidelines for the cast duite propriate and rice fragmentation site designed for out scaling Contacts The Institute Director, KALRO AMRI -Katumani;	the challenges	 Acquisition of the machines 	
Build capacity through efficient agricultural production to afford the cost Lessons learned in up scaling 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 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 Creation of awareness on mechanization importance in agricultural production of agricultural mechanization Piceconomic, gender, vuln=zble and marginalized groups (VMGs) considerations Appropriate policy formulation of agricultural mechanization Basic costs KES 1,780,000.00 Estimated returns Gender unfriendly and expensive machines Mago machines should be designed for easy start and operation. Up-scaling should target all the gender And scaling up Affordability to all gender Affordability on all gender Gender related Creates employment specially for youth Reduces drudgery for women farmers as well as men VMG issues and concerns in development, dissemination, adoption and scaling up Affordability and easy to maintain machines Immersion well as the advice structure and the advice structure as well as men VMG related opportunities Can create employment f	E .	 Lack of facilitation to demonstration site 	
Lessons learned in up scaling if any • Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform • Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform • Pattnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms • Pattnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms • Mechanization in agriculture increases production • Mechanization in eleases labour to alternative requirement areas • Provides low cost farm operations Social, environmental, policy and market conditions necessary for development and up scaling • Creation of awareness on mechanization importance in agricultural production • Include all gender groups (VMGs) considerations • Gender unfriendly and expensive machines • Gender sustes and concerns in development, dissemination, adoption and scaling up • Gender unfriendly and expensive machines • Gender sustes and concerns in development, dissemination, adoption and concerns in development, dissemination, adoption and concerns in development, dissemination, adoption and the case store and concerns in development, dissemination, adoption and concerns in development, dissemination, adoption and concerns in development, dissemination, adoption and cases to react store		 Build capacity through efficient agricultural production to afford the cost 	
scaling if any For the excitor rate of the excitor of a ware reases on rechanization inportance in agricultural production Social, environmental, policy and market conditions necessary for development and up scaling C Creation of awareness on mechanization importance in agricultural production of agricultural mechanization Social, environmental, policy and market returns C Creation of awareness on mechanization importance in agricultural production of agricultural mechanization evelopment and up scaling C Creation of awareness on mechanization of agricultural mechanization exclusion, adoption and scaling up KES 450,000 per month gross income Gender rissues and concerns in development, dissemination, adoption and scaling up Gender related Opportunities G Gender related Opportunities F Reclification to access information Affordability and easy to maintain machines Affordability and easy to maintain machines VMG issues and concerns in development, dissemination r	Lessons learned in up	 Chances of successful scaling are higher when diverse value chain stakeholders. 	
 Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Mechanization in agriculture increases production Mechanization releases labour to alternative requirement areas Provides low cost farm operations Social, environmental, policy and market Creation of awareness on mechanization importance in agricultural production Include all gender groups in research, and validation. Appropriate policy formulation of agricultural mechanization development and up scaling D: Economic, gender, vulne=vable and marginalized groups (VMGs) considerations Basic costs KES 1,780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, up scaling up Affordability to all gender Gender related Creates employment especially for youth opportunities Reduces drudgery for women farmers as well as men VMG issues and concerns in development, dissemination, adoption and scaling up Affordability and easy to maintain machines Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for tereation for VMG at local level E: Case studies/profiles of success stories Success stories from previous similar projects Demonstrations and training users User manuals F: Status of TMP readimess (1-ready for up scaling; 2-requires altige adpresentex of the adpresent of the scaling develop adpresent of the a	scaling if any	collaborate in an innovation platform	
 Mechanization in agriculture increases production Mechanization releases labour to alternative requirement areas Provides low cost farm operations Creation of awareness on mechanization importance in agricultural production Include all gender groups in research, and validation. Appropriate policy formulation of agricultural mechanization Basic costs KES 1,780,000.00 Estimated returns Gender issues and concerns Mago machines should be designed for easy start and operation. Up-scaling should target all the gender Affordability to all gender Create employment specially for youth Sealing up Affordability and easy to maintain machines Facilitation to access information Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories Success stories Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories Success stories Demonstrations and training Up-scaling and rice Provious similar projects Promotations and training Up-scaling of success stories Success stories from Promotations and training Up-scaling, 2-requires Provious similar projects Prestations and training Up-scaling, 2-requires Pready for up scaling Pready for up scaling		• Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms	
Mechanization releases labour to alternative requirement areas Social, environmental, policy and market conditions necessary for development and up scaling Creation of awareness on mechanization importance in agricultural production D: Economic, gender, vulnerable and marginalized groups in research, and validation. Appropriate policy formulation of agricultural mechanization Basic costs KES 1,780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up Mango machines should be designed for easy start and operation. Up-scaling should target all the gender Creates employment especially for youth Opportunities Reduces drudgery for women farmers as well as men VMG issues and concerns in development, dissemination, adoption and scaling up Facilitation to access information VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for up scaling; 3-requires validation; 3-requires further research) Peomonstrations and training UCCess to UP Scaling Vor UP Scaling Vor UP Scaling Vor UP Scaling Vored Scaling Vor UP Scaling Vor UP Scaling Vor UP Scalin		 Mechanization in agriculture increases production 	
• Provides low cost farm operations Social, environmental, policy and market conditions necessary for development and up scaling • Creation of awareness on mechanization importance in agricultural production • Include all gender groups in research, and validation. • Provides low cost farm operations • Appropriate policy formulation of agricultural mechanization • D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations • Appropriate policy formulation of agricultural mechanization Basic costs KES 1.780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up • Gender unfriendly and expensive machines • Mango machines should be designed for easy start and operation. • Up-scaling should target all the gender • Gender related • 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 • Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice • Demonstrations		 Mechanization releases labour to alternative requirement areas 	
Social, environmental, policy and market conditions necessary for development and up scaling Creation of awareness on mechanization importance in agricultural production D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Appropriate policy formulation of agricultural mechanization Basic costs KES 1,780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up Gender unfriendly and expensive machines should be designed for easy start and operation. VMG issues and concerns in development, dissemination, adoption and scaling up Facilitation to access information VMG issues and concerns in development, dissemination, adoption and scaling up Facilitation to access information VMG issues and concerns in development, dissemination, adoption and scaling up Facilitation to access information VMG issues and concerns in development, dissemination, adoption and scaling up Facilitation to access information VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users User manuals Ready for up scaling 4-ready for out scaling F: Status of TIMP readiness User manuals Ready for		 Provides low cost farm operations 	
 Creation of wareless on invariants in production in production of agricultural market conditions necessary for development and up scaling D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 1,780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up Gender related Orestation of wareless on invariants in marginalized groups (VMGs) considerations Mango machines should be designed for easy start and operation. Up-scaling should target all the gender Affordability to all gender Creates employment especially for youth Opportunities Facilitation to access information Affordability and easy to maintain machines Affordability and easy to maintain machines Affordability and easy to maintain machines Success stories from mervices on the second production in other crops such as maize, wheat, finger millet and rice Application guidelines for User manuals F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research) Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd. katumani@ kalro.org. Phone: 0711369535 	Social environmental	 Creation of awareness on mechanization importance in agricultural production 	
 Appropriate policy formulation of agricultural mechanization D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 1,780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, Up-scaling should target all the gender Affordability to all gender Gender related Creates employment especially for youth Reduces drudgery for women farmers as well as men VMG issues and concerns in development, Affordability and easy to maintain machines Facilitation to access information Affordability and easy to maintain machines Status of TIMP readiness (1-ready for up scaling, 2-requires validation; 3-requires further research) Demonstrations and training User manuals F. Status of TIMP readiness (1-ready for up scaling, 2-requires validation; 3-requires further research) Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd. katumani@kalro.org, Phone: 0711369535 	policy and market	 Include all gender groups in research, and validation 	
development and up scaling • "Appropriate pointy formulation of agricultural mechanization for agricultural mechanization for agricultural mechanization for agricultural mechanization for agricultural mechanization in other constructural mechanization in other component of agricultural mechanization for other component of agricultural mechanization in other component of agricultural mechanization fragmentation agricultural mechanization in	conditions necessary for	 Appropriate policy formulation of agricultural mechanization 	
scaling Image: scaling s	development and up	• Appropriate poncy formulation of agricultural meenanization	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations Basic costs KES 1,780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up • Gender unfriendly and expensive machines • Mango machines should be designed for easy start and operation. Opportunities • Up-scaling should target all the gender Gender related • Creates employment especially for youth opportunities VMG issues and concerns in development, dissemination, adoption and scaling up • Facilitation to access information • Affordability and easy to maintain machines VMG issues and concerns in development, dissemination, adoption and scaling up • Facilitation to access information • Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories Success stories form previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for validation; 3-requires further research) • Demonstrations and training • User manuals F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Di	scaling		
Basic costs KES 1,780,000.00 Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up • Gender unfriendly and expensive machines • Mango machines should be designed for easy start and operation. • 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 machines VMG issues and concerns in development, dissemination, adoption and scaling up • Facilitation to access information • Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories form previous similar projects • Demonstrations and training • User manuals F: Status of TIMP readiness validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Estimated returns KES 450,000 per month gross income Gender issues and concerns in development, dissemination, adoption and scaling up • Gender unfriendly and expensive machines Gender related opportunities • Mango machines should be designed for easy start and operation. VMG issues and concerns in development, dissemination, adoption and scaling up • Creates employment especially for youth VMG issues and concerns in development, dissemination, adoption and scaling up • Facilitation to access information VMG related opportunities • Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users • User manuals Ready for up scaling 4-ready for out scaling F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org_Phone: 0711369535	Basic costs	KES 1.780.000.00	
Gender issues and concerns in development, dissemination, adoption and scaling upGender unfriendly and expensive machines in Mango machines should be designed for easy start and operation.Up-scaling should target all the genderAffordability to all genderGender related opportunitiesCreates employment especially for youth Reduces drudgery for women farmers as well as menVMG issues and concerns in development, dissemination, adoption and scaling upFacilitation to access information Affordability and easy to maintain machinesVMG related opportunitiesCan create employment for VMG at local levelE: Case studies/profiles of success storiesMechanization has enabled increased production in other crops such as maize, wheat, finger millet and riceSuccess stories from previous similar projectsMechanization sand training User manualsF: Status of TIMP readiness validation; 3-requires further research)User manualsG: ContactsThe Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org_Phone: 0711369355Locd accentification and KALRO Exector LivingKALRO Exector Living	Estimated returns	KES 450.000 per month gross income	
 Ochider instates and concerns Ochider uniffernity and expensive machines Ochider uniffernity and expensive machines Indevelopment, Operating and concerns Creates employment especially for youth Reduces drudgery for women farmers as well as men VMG issues and concerns Facilitation to access information Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from previous similar projects Application guidelines for Demonstrations and training User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Contacts Contacts	Gender issues and concerns	Gender unfriendly and expensive machines	
In acception in the complexition is served by the complexition in the complexition is served by the complexition in the complexition in the complexition in the complexition is served by the complexition in the complexition is in development, in development, in development, in development, in development, in development, is served by the complexition is in the complexition in the complexition in the complexition is in the complexition in the complexition in the complexition is in the complexition in the complexitient is interval. The complexitient is interval to the complexitient is interval tore complexitient is interval to the complexitient is interval to	in development	 Mango machines should be designed for easy start and operation 	
 and scaling up Affordability to all gender Gender related Creates employment especially for youth Reduces drudgery for women farmers as well as men VMG issues and concerns Facilitation to access information Affordability and easy to maintain machines Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from previous similar projects Application guidelines for users User manuals F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research) Gender related in cell contacts Contacts Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org. Phone: 0711369535 	dissemination adoption	• Wango machines should be designed for easy start and operation.	
Gender related • Creates employment especially for youth opportunities • Reduces drudgery for women farmers as well as men VMG issues and concerns • Facilitation to access information in development, • Affordability and easy to maintain machines dissemination, adoption • Affordability and easy to maintain machines maintering up • Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users • Demonstrations and training users • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535 Lead organization and KALRO Egentor University	and scaling up	• Op-scaling should target an the gender	
 Creates employment especially for youth opportunities 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 machines Affordability and easy to maintain machines Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Demonstrations and training User 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 The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535 Laad organization and 	Conder related	Altordability to all gender	
Opportunities • 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 machines • Statistic opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users • Demonstrations and training • User manuals • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org. Phone: 0711369535	opportunities	Creates employment especially for youth	
 Facilitation to access information Facilitation to access information Affordability and easy to maintain machines Affordability and easy to maintain machines Affordability and easy to maintain machines Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) G: Contacts Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535 	VMC issues and someores	Reduces drudgery for women farmers as well as men	
 Affordability and easy to maintain machines VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users User manuals F: Status of TIMP readiness (1-ready for up scaling; 2-requires validation; 3-requires further research) G: Contacts Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535 	in development	Facilitation to access information	
uissemination, adoption and scaling up Can create employment for VMG at local level VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users • Demonstrations and training • User manuals • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	discomination adoption	• Affordability and easy to maintain machines	
wild scaling up Image: Staling up VMG related opportunities Can create employment for VMG at local level E: Case studies/profiles of success stories Image: Staling up Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users • Demonstrations and training • User manuals • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535 Load organization and KALRO Egenton University	and scaling up		
E: Case studies/profiles of success stories Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users • Demonstrations and training • User manuals • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535 Lead ercentization and KALBO, Egerton University	VMG related opportunities	Can create employment for VMG at local level	
Success stories from previous similar projects Mechanization has enabled increased production in other crops such as maize, wheat, finger millet and rice Application guidelines for users • Demonstrations and training • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	E: Case studies/profiles of su		
Success stores from previous similar projects Internation has chabited intercased production in other crops such as marze, wheat, finger millet and rice Application guidelines for users • Demonstrations and training • User manuals • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat	
Application guidelines for users • Demonstrations and training • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	previous similar projects	finger millet and rice	
users • User manuals F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts Contacts Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535 Load organization and KALBO Egerton University	Application guidelines for	Demonstrations and training	
F: Status of TIMP readiness (1-ready for up scaling;, 2-requires validation; 3-requires further research) Ready for up scaling 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	users	 User manuals 	
validation; 3-requires further research) 4-ready for out scaling G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	F: Status of TIMP readines	ss (1-ready for up scaling: 2-requires Ready for up scaling	
G: Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	validation; 3-requires further	research) 4-ready for out scaling	
Contacts The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos Email: cd.katumani@kalro.org, Phone: 0711369535	G: Contacts		
Email: cd.katumani@kalro.org, Phone: 0711369535 Load organization and KALRO_Egerton University	Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos	
Land organization and KALDO Egerton University		Email: cd.katumani@kalro.org, Phone: 0711369535	
LEau Organization and INALKO. Egenon University	Lead organization and	KALRO. Egerton University	

2.10.2. Four-wheeled Tractor 50Hp		
scientists	Nasirembe W, Pole F.N.	
Partner organizations	Local Fabricators	

2.10.3. Mouldboard Ploug	h
Category (i.e. technology,	Technology
innovation or management	
practice)	
1 /	
A: Description of the technol	ogy innovation or management practice
Problem to be addressed	Slow and tadious processes of seadbad proparation in a commercialized account
Fioblem to be addressed	some and tedious processes of seedbed preparation, in a commercialized cocondi- commodity difficult to prepare a uniform fine tilth seedbed menually deleved
	operation lead to late planting and high cost of manual labour
what is it? (TIMP	Mouldboard plough is generally considered the most important tillage implement.
description)	Mouldboard ploughs are available for power tiller and tractor operation. A
	mouldboard plough does four jobs namely a) cutting the furrow slice, b) fitting the
	Turrow since. c) inverting the furrow since and d) pulverizing the furrow since.
T	Ploughing accounts for more traction energy than any other field operation.
Justification	High Efficiency. When well-adjusted, the plough automatically seeks the desired
	depth. It is Versatility. Various models have different features that ensure high
	efficiency in preparation of land. weed control. pest control. improved soil health.
B: Assessment of disseminati	on and scaling up/out approaches
Users of TIMP	Potato farmers and researchers
Approaches used in	• FFBS
dissemination	• AIP
	• Field demonstrations and training, agricultural shows and other exhibitions
Critical/essential factors	Research to test, validate and release improved coconut varieties
for successful promotion	A platform for interaction of mango value chain stakeholders
	Multiple usage, timeliness, efficiency and low cost
Partners/stakeholders for	KALRO, universities (for information)
scaling up and their roles	Machinery fabricators
	NGO supporting farmers for dissemination
C: Current situation and futur	re scaling up
Counties where already	Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi
promoted if any	
Counties where TIMP will	Kilifi
be up scaled	
Challenges in	• Lack of mango innovation platforms to facilitate interaction of farmers with
dissemination	relevant stakeholders
	Lack of machines
	Lack of facilitation to demonstration site

2.10.3. Mouldboard Ploug	yh			
Suggestions for addressing	Establish coconut innovation platforms			
the challenges	Acquisition of the machines			
	Lack of facilitation to demonstration site			
	Build capacity through efficient agricultural production to afford the cost			
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders			
scaling if any	collaborate in an innovation platform			
	• Partnership is important in technology dissemination and adoption and this can be			
	facilitated through innovation platforms			
	Mechanization in agriculture increases production			
	Mechanization releases labour to alternative requirement areas			
Social anvironmental	Provides low cost farm operations			
policy and market	• Creation of awareness on mechanization importance in agricultural production			
conditions necessary for	• Include all gender groups in research, and validation.			
development and up	• Appropriate policy formulation of agricultural mechanization			
scaling				
D: Economic, gender, vulner	able and marginalized groups (VMGs) considerations			
Basic costs	KES 550,000			
Estimated returns	KES 180,000 per month gross income			
Gender issues and concerns	Gender Unfriendly and expensive machines			
in development,	• Potato machines should be designed for easy start and operation.			
dissemination, adoption	• Up-scaling should target all the gender			
and scaling up	Affordability to all gender			
Gender related	Creates employment especially for youth			
opportunities	• Reduces drudgery for women farmers as well as men			
VMG issues and concerns	Facilitation to access information			
in development,	Affordability and easy to maintain machines			
dissemination, adoption				
and scaling up				
VMG related opportunities	Can create employment for VMG at local level			
E: Case studies/profiles of su	iccess stories			
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat,			
previous similar projects	finger millet and rice			
Application guidelines for	Demonstrations and training			
users	• User manuals			
F: Status of TIMP readines	ss (1-ready for up scaling;, 2-requires Ready for up scaling			
validation; 3-requires further	research)			
G: Contacts				
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos			
	Email: <u>cd.katumani@kalro.org</u> , Phone: 0711369535			
Lead organization and	Nasirembe W, KALRO, Egerton University, Pole F.N.			
scientists				
Partner organizations	Local Fabricators			

210.4 Hormony	
2.10.4. Harrow	Technology
category (i.e. technology,	rechnology
practice)	<u>89</u>
practice)	
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Slow and tedious processes of seedbed preparation, in a commercialized Coconut
	commodity, difficult to prepare a uniform fine tilth seedbed manually, ddelayed
	operation lead to late planting, low acreage because of lack of manual labour and
	high cost of manual labour
What is it? (TIMP	It is an implement consisting of a heavy frame set with teeth or tines which is
description)	dragged over ploughed land to break up clods, remove weeds, and cover seed and is a
	cultivating tool set with used primarily for breaking up and smoothing the soil in
	preparation of a seedbed for small sized grain planting.
Justification	Creating of a crumbly layer for planting is tedious. It is not possible to manually
	protect the soil surface from rapid drying. Improving both the air and water
	penetrability into soil manually can be too expensive if manually undertaken. Manual
	operation will reduce microbiological processes in the soil. Manual land harrowing
	Improving of nutrient availability to plants.
B: Assessment of dissemina	ation and scaling up/out approaches
B: Assessment of dissemina Users of TIMP	ation and scaling up/out approaches Coconut farmers and researchers
B: Assessment of dissemina Users of TIMP Approaches used in	ation and scaling up/out approaches Coconut farmers and researchers • FFBS
B: Assessment of dissemina Users of TIMP Approaches used in dissemination	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP
B: Assessment of dissemina Users of TIMP Approaches used in dissemination	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other
B: Assessment of dissemina Users of TIMP Approaches used in dissemination	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information)
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already	 Ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination Ature scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already promoted if any	 Ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination Attraction of the state of the
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already promoted if any Counties where TIMP will	ation and scaling up/out approaches Coconut farmers and researchers • FFBS • AIP • Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions • Research to test, validate and release improved coconut varieties • A platform for interaction of coconut value chain stakeholders • Multiple usage, timeliness, efficiency and low cost • KALRO, Universities (for information) • Machinery fabricators • NGO supporting farmers for dissemination atture scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already promoted if any Counties where TIMP will be up scaled	ation and scaling up/out approaches Coconut farmers and researchers • FFBS • AIP • Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions • Research to test, validate and release improved coconut varieties • A platform for interaction of coconut value chain stakeholders • Multiple usage, timeliness, efficiency and low cost • KALRO, Universities (for information) • MGO supporting farmers for dissemination ature scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already promoted if any Counties where TIMP will be up scaled Challenges in	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination Ature scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi Kilifi Lack of coconut innovation platforms to facilitate interaction of farmers with
 B: Assessment of dissemination Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination 	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination atture scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi Kilifi Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and fe Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination Muture scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi Kilifi Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Lack of machines
 B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination 	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination atture scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi Kilifi Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Lack of machines Lack of facilitation to demonstration site
B: Assessment of dissemina Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and fu Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination	ation and scaling up/out approaches Coconut farmers and researchers • FFBS • AIP • Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions • Research to test, validate and release improved coconut varieties • A platform for interaction of coconut value chain stakeholders • Multiple usage, timeliness, efficiency and low cost • KALRO, Universities (for information) • Machinery fabricators • NGO supporting farmers for dissemination ature scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi Kilifi • Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders • Lack of machines • Lack of facilitation to demonstration site • High initial cost for small-scale machines
 B: Assessment of dissemination Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and for Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination Suggestions for addressing 	 ation and scaling up/out approaches Coconut farmers and researchers FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination ature scaling up Kwale, Kilifi, Lamu, Tana-River, Taita-Taveta, Tharaka Nithi Kilifi Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Lack of machines Lack of facilitation to demonstration site High initial cost for small-scale machines Establish Coconut innovation platforms

2.10.4. Harrow				
	Lack of facilitation to demonstration site			
	• Build capacity through efficient agricultural production to afford the cost			
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders			
scaling if any	collaborate in an innovation platform			
	• Partnership is important in technology dissemination and adoption and this can be			
	facilitated through innovation platforms			
	Mechanization in agriculture increases production			
	Mechanization releases labour to alternative requirement areas			
	Provides low cost farm operations			
Social, environmental,	• Creation of awareness on mechanization importance in agricultural production			
policy and market	• Include all gender groups in research, and validation.			
conditions necessary for	Appropriate policy formulation of agricultural mechanization			
development and up				
scaling				
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations			
Basic costs	KES 280,000			
Estimated returns	KES 180,000 per month gross income			
Gender issues and concerns	Gender Unfriendly and expensive machines			
in development,	• Mango machines should be designed for easy start and operation.			
dissemination, adoption	• Up-scaling should target all the gender			
and scaling up	• Affordability to all gender			
Gender related	Creates employment especially for youth			
opportunities	Reduces drudgery for women farmers as well as men			
VMG issues and concerns	Facilitation to access information			
in development,	Affordability and easy to maintain machines			
dissemination, adoption				
and scaling up				
VMG related opportunities	Can create employment for VMG at local level			
E: Case studies/profiles of s	success stories			
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat,			
previous similar projects	finger millet and rice			
Application guidelines for	Demonstrations and training			
users	• User manuals			
F: Status of TIMP reading	ess (1-ready for upscaling;, 2-requires Ready for up scaling			
validation; 3-requires further	research)			
G: Contacts				
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos			
	Email: cd.katumani@kalro.org , Phone: 0711369535			
Lead organization and	KALRO, Egerton University			
scientists	Nasirembe W,			
Partner organizations	Local Fabricators			

2.10.5. Seed drill	
Category (technology, innovation or management practice)	Trator mounter augur
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	High and increasing cost of manual labour. Manual hole digging increases the cost of making planting holes. It is slow and tedious processes. It is also difficult to prepare a uniformly spaced contour ridges. Delayed operation lead to late planting. Manual hole digging increases the cost of hole making.
What is it? (TIMP description)	Hole digger is a PTO driven machine that digs holes in rows on equal distances mechanically and economically. It also can be used for hole making for electric poles and farm hedges. It is best suited for tree plantation. It can dig about 90cm deep hole even diameter in just 30 seconds. By detaching augers, it can be used as a small crane.
Justification	The auger digs a definite hole diameters and depths as desired. Users spend a short time to make the holes. The machine spends low amounts of fuel. It is easy to use, and can be used to a much greater depth, as the hole can be dug as deep as the entire length of the shaft. It mechanically removes soil from holes. The machine form a much neater hole, with a well-defined circumference. Holes can be made at pre-defined places by driving the compact tractor. Size of the hole is determined by the size of the auger used.
B: Assessment of dissemina	tion and scaling up/out approaches
Users of TIMP	Mango farmers and researchers
Approaches used in dissemination	 FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions
Critical/essential factors for successful promotion	 Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders Multiple usage, timeliness, efficiency and low cost
Partners/stakeholders for scaling up and their roles	 KALRO, Universities (for information) Machinery fabricators NGO supporting farmers for dissemination
C: Current situation and fu	iture scaling up
Counties where already promoted if any	Kilifi, Kwale, Lamu
Counties where TIMP will be up scaled	Machakos
Challenges in dissemination	 Lack of mango innovation platforms to facilitate interaction of farmers with relevant stakeholders Lack of machines Lack of facilitation to demonstration site High initial cost for small-scale machines

2.10.5. Seed drill					
Suggestions for addressing	Establish Coconut innovation platforms				
the challenges	Acquisition of the machines				
	Lack of facilitation to demonstration site				
	• Build capacity through efficient agricultural production to afford the cost				
Lessons learned in up scaling 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				
	Mechanization in agriculture increases production				
	• Mechanization releases labour to alternative requirement areas				
	• Provides low cost farm operations				
Social, environmental,	• Creation of awareness on mechanization importance in agricultural production				
policy and market	• Include all gender groups in research, and validation.				
conditions necessary for development and up scaling	 Appropriate policy formulation of agricultural mechanization 				
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations				
Basic costs	KES 40,000 (power auger digger), KES 450,000 (Tractor mounted hole digger)				
Estimated returns	KES 20,000/ month gross income				
Gender issues and concerns	Gender Unfriendly and expensive machines				
in development,	• Mango machines should be designed for easy start and operation.				
dissemination, adoption	• Up-scaling should target all the gender				
and scaling up	Affordability to all gender				
Gender related	Creates employment especially for youth				
opportunities	• Reduces drudgery for women farmers as well as men				
VMG issues and concerns	Facilitation to access information				
in development,	• Affordability and easy to maintain machines				
dissemination, adoption					
and scaling up					
VMG related opportunities	Can create employment for VMG at local level				
E: Case studies/profiles of s	success stories				
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat,				
previous similar projects	Tinger millet and rice				
Application guidelines for users	User manuals and leaflets				
F: Status of TIMP readine	ess (1-ready for upscaling;, 2-requires Ready for upscaling				
validation; 3-requires further	research)				
G: Contacts					
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos				
Trademontant' 1	Email: <u>cd.katumani@kairo.org</u> , Phone: 0/11369535				
Lead organization and	Naciromba W				
Partner organizations and contacts	Local Fabricators				

2.10 C Motorized Survey	_								
2.10.6. Willorised Spraye	r		Nozzle	Guide for Band a	nd Directed Spra	wing			
Category (technology,			-	-			•		
ninovation of management									
practice)			Even Flat Fan	Twin Even Flat Fan	Hollow Core	Full Core	Disc and Core Cone		
		Herbicides	Linitation						
		Pre-emerge Post-emerge Contact	Good	Good Very Good	Very Good	Good			
		Fungicides	very 6000	6000					
		Contact Systemic	Good Very Good		Good		Very Good Good		
		Insecticides		Very Good	Very Good		Very Good		
	Real A	Systemic	Very Good	Very abou	tery acou		Good		
		Growth Regulators	Good			Very Good			
	Technology								
A: Description of the techn	ology, innovation or management pra	octice							
Problem to be addressed	Slow and tedious processes of manu	ual spra	ying	of c	ocon	ut pl	ants e	specially th	he
	young plants; The height of the tree	requires	s a lo	ong pi	roject	ile s	pray; 1	Mango has	sa
	high number of pests that invade leaf,	flowers	and 1	nut.					
What is it? (TIMP	A motorized sprayer is a device us	sed to	spra	y a lic	quid,	wh	ere s	prayers a	are
description)	commonly used for projection of wa	ter, wee	ed ki	llers,	crop	perf	orman	ce materia	ıls,
	pest maintenance chemicals, as w	vell as	mar	nufact	uring	and	d pro	duction lin	ne
	ingredients. In agriculture, a spraye	er is a	pie	ce of	f equi	pmei	nt that	is used	to
	apply herbicides, pesticides, and fertili	izers on	agri	cultu	ral cr	ops.	Spray	ers are ma	ın-
	portable units typically backpacks with	th spray	gun	s The	y are	used	d to co	ontrol; wee	eds
	that can harbour insects by use of her	bicides,	inse	ct pes	sts tha	at car	n cause	e diseases l	by
	the use of insecticides as well as pesti	icides. (Contr	ol of	funga	ıl dis	eases	by the use	of
	fungicides. Application of micronutrie	ents on	the j	plants	s, bor	on ir	ncludir	ig as well	as
	toliar fertilizers.								
Justification	Pest reduce yields up to 70% and an	re a ma	jor n	nenac	e in	agric	ultura	l productio	on.
	Before coconuts form a canopy, broad	d leafed	wee	ds co	mpet	e wit	h coco	onut seedlii	ng
	for nutrients and light greatly reduc	cing the	eir yi	eld.	Manu	ial s	prayer	s are labo	our
	intensive and spraying labour is too	expense	ive. I	t has	lowe	er pr	essure	reducing i	its
	efficiency. Motorized sprayers therefore	re come	in h	andy.					
B: Assessment of dissemina	ation and scaling up/out approaches								
Users of TIMP	Mango Farmers and agribusiness entre	epreneui	S						
Approaches used in	• FFBS								
dissemination	• AIP								
	• Field Demonstrations and train	ing A	oricu	ltural	sho	ws	(ASK)) and oth	ıer
	exhibitions	iiig, 71	grieu	iturai	5110		(11513)	, and oth	
Critical/essential factors	• Research to test, validate and re	elease in	mpro	ved co	oconi	ıt var	rieties		
for successful promotion	 A platform for interaction of coconut value chain stakeholders 								
-	Use by Farmers	Jeonae (urue	enum	Bunk	011010			
Partners/stakeholders for	Machinemy fabrications								
scaling up and their roles	 Machinery fabricators NGO supporting formers (AGPA) 								
C: Current situation and f	• NGO supporting farmers(AGKA)								
Counties where already		- T . ·		1	NT' 1				
promoted if any	Kwale, Klim, Lamu, Tana-Kiver, Tana	a-Tavet	a, Th	araka	Nith	İ			

2.10.6. Motorised Sprayer				
be up scaled				
Challenges in	• Lack of coconut innovation platforms to facilitate interaction of farmers with			
dissemination	relevant stakeholders			
	• Relatively high cost for individual small-scale farmer.			
	• Limited awareness of the existence of machine among some farmers.			
Suggestions for addressing	Establish coconut innovation platforms			
the challenges	• Encourage group/cooperative ownership			
	• Launch and awareness campaign through demonstrations and trainings			
Lessons learned in up scaling 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			
	• Products from local/indigenous crops attract huge market, yet very little is being done to promote growth			
Social, environmental, policy and market	• Creation of awareness on mechanization importance in the community. Include all gender groups in research, and validation.			
conditions necessary for development and up	Good Policy on cost of agricultural mechanization			
Scalling	arable and marginalized groups (VMCs) considerations			
D: Economic, gender, vuni	Motorized encourt 55,000 KES per unit			
Estimated naturna	KES 180,000,00 per voor			
Conden issues and concerns	Kes 180,000.00 per year			
in development	spraying by the machine. This task was predominantly for women before the			
, dissemination, adoption	introduction of the machine.			
and scaling up				
dissemination				
Gender related opportunities	Creates employment at production, transportation, processing and distribution			
Gender related	Creates employment especially for youth			
opportunities	Reduces drudgery for women farmers as well as men			
VMG issues and concerns	Facilitation to access information			
in development,	Affordability and easy to maintain machines			
and scaling up				
VMG related opportunities				
E: Case studies/profiles of				
success stories				
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat,			
previous similar projects	finger millet and rice			
Application guidelines for users	User manuals and leaflets			
F: Status of TIMP reading	ess (1-ready for upscaling;, 2-requires			
validation; 3-requires further	research)			
G: Contacts				
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos			

2.10.6. Motorised Sprayer				
	Email: cd.katumani@kalro.org, Phone: 0711369535			
Lead organization and	KALRO, Egerton University			
scientists	Nasirembe W,			
Partner organizations and	Local Fabricators			
contacts				
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations			
Basic costs				
Estimated returns	KES 180,000.00/year			
Gender issues and concerns	Motorized sprayer designed for easy start and operation. Men have been drawn to			
in development	spraying by the machine. This task was predominantly for women before the			
,dissemination, adoption	introduction of the machine.			
and scaling up				
dissemination				
Gender related	Creates employment at production, transportation, processing and distribution			
opportunities				
Gender related opportunities				
VMG issues and concerns	Facilitation to access information			
in development,	Affordability and easy to maintain machines			
and scaling up				
VMC related opportunities	Can aroute amployment for VMC at least level			
E: Case studies/pportunities				
E: Case studies/promes of s				
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat,			
previous similar projects	finger millet and rice			
Application guidelines for us	ers			
F: Status of TIMP readine	ess (1-ready for upscaling;, 2-requires Ready for upscaling			
validation; 3-requires further	research)			
G: Contacts				
Contacts	The Institute Director, KALRO AMRI -Katumani; P.O. Box 340. Machakos			
	Email: <u>cd.katumani@kalro.org</u> , Phone: 0711369535			
Lead organization and	KALRO, Egerton University			
scientists	Nasirembe W,			
Partner organizations and	Local Fabricators			
contacts				

2.10.7. Coconut harvesting tool				
Category (technology, innov	ation or management practice)			
A: Description of the technology, innovation or management practice				
Problem to be addressed	Manual coconut harvesting is slower, untimely and risky, high cost of labour and manual labour in terms of coconut harvesters is diminishing			

2.10.7. Coconut harvesting tool		
What is it? (TIMP description)	Power harvesters are used to harvest coconut bunches by making some cuts onto the bunch. It can also be used to prune old coconut leaves/fronds. Less powerful than chainsaws, the cutting diameter of power coconut harvesting tool will be smaller as the chain guide is shorter. A power coconut harvester is basically a motorised version of a manual pole coconut harvester	
Justification	The machine works faster, telescopic and can reach far end bunches, uses gasoline as fuel, discourages child labour and cost effective	
B: Assessment of dissen	nination and scaling up/out approaches	
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs	
Approaches used in dissemination	 FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions 	
Critical/essential factors for successful promotion	 Research to test, validate and release improved coconut varieties A platform for interaction of mango value chain stakeholders 	
Partners/stakeholders for scaling up and their roles	Machinery fabricatorsNGO supporting farmers	
C: Current situation and fu	iture scaling up	
Counties where already promoted if any	N/A	
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu and Taita-Taveta	
Challenges in dissemination	 Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Relatively high cost for individual small-scale farmer. 	
Suggestions for addressing the challenges	 Limited awareness of the existence of machine by the farming community. Establish coconut innovation platforms Encourage group/cooperative ownership Launch and awareness campaign through demonstrations and trainings 	
Lessons learned in up scaling 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 Products from local/indigenous crops attract huge market, yet very little is being done to promote growth 	
Social, environmental, policy and market conditions necessary for development and up scaling	 Creation of awareness on mechanization importance in the community. Include all gender groups in research, and validation. Good Policy on cost of agricultural mechanization 	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	To be determined	
Estimated returns	Not yet	
Gender issues and concerns in development ,dissemination, adoption and scaling up	 Gender Unfriendly and expensive machines Coconut machines should be designed for easy start and operation. Up-scaling should target all the gender Affordability to all gender 	

2.10.7. Coconut harvesting tool	
Gender related	Creates employment especially for youth
opportunities	• Reduces drudgery for women farmers as well as men
VMG issues and concerns in development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level
E: Case studies/profiles of success stories	
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat
previous similar projects	and rice
Application guidelines for	User manuals and leaflets
users	
F: Status of TIMP readiness (2-requires validation)	
G: Contacts	
Contacts	The Institute Director, KALRO ICRI -Mtwapa; P.O. Box 16. 80109; Mtwapa
	Email: director.icri@kalro.org, Phone: 0712557178
Lead organization and	KALRO, Egerton University,
scientists	Nasirembe W, Pole F.N.
Partner organizations and	Local Fabricators
contacts	
VMG issues and concerns	• Training on local use and transportation will make it more usable.
in development,	• Power coconut harvester is affordable and could help VMGs exploit
dissemination, adoption	
and scaling up	Concernents and for VMC of local local
VMG related opportunities	Can create employment for VMG at local level
G: Contacts	
Contacts	The Institute Director, KALRO ICRI -Mtwapa; P.O. Box 16. 80109; Mtwapa
	Email: <u>director.icri@kalro.org</u> , Phone: 0712557178
Lead organization and	KALRO, Egerton University,
scientists	Nasirembe W, Pole F.N.
Partner organizations and	Tecsols Ltd – Nakuru
contacts	
210.9 Coconut harvestin	ag stielz
--	--
Category (technology,	Technology
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Manual coconut harvesting by climbing the tree is slower, untimely and risky, high
What is it? (TIMD	The account hervesting sticks are used to hervest account hunches by making some
description)	cuts onto the bunch by means of a metallic sickle that is attached at the end of the
description)	adjustable stick. It can also be used to prune old coconut leaves/fronds. The
	harvesting stick can harvest nuts from trees that are as high as 30m tall
Justification	It works faster, it can reach far end bunches, does not use fuel and hence is cheaper,
	discourages child labour, easier to operate and cost effective
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs
Approaches used in	• FFBS
dissemination	• AIP
	Field Demonstrations and training,
	Agricultural shows (ASK) and other exhibitions
Critical/essential factors	Research to test, validate and release improved coconut varieties
for successful promotion	A platform for interaction of mango value chain stakeholders
Partners/stakeholders for	Machinery fabricators
scaling up and their roles	NGO supporting farmers
C: Current situation and future scaling up	
Counties where already	
promoted if any	
Counties where TIMP will	Kilifi, Kwale, Lamu and Taita-Taveta
be up scaled	
Challenges in	• Lack of coconut innovation platforms to facilitate interaction of farmers with
ussemination	relevant stakenoiders
	• Limited awareness of the existence of machine by the farming community.

2.10.8. Coconut harvesting stick		
Suggestions for addressing	Establish coconut innovation platforms	
the challenges	• Launch and awareness campaign through demonstrations and trainings	
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders	
scaling if any	collaborate in an innovation platform	
	• Partnership is important in technology dissemination and adoption and this can be	
	facilitated through innovation platforms	
	• Products from local/indigenous crops attract huge market, yet very little is being	
	done to promote growth	
Social, environmental,	• Creation of awareness on mechanization importance in the community. Include	
policy and market	all gender groups in research, and validation.	
conditions necessary for	Good Policy on cost of agricultural mechanization	
development and up		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns	Gender Unfriendly and expensive machines	
in development	• Coconut machines should be designed for easy start and operation.	
,dissemination, adoption	• Up-scaling should target all the gender	
and scaling up	Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	Reduces drudgery for women farmers as well as men	
VMG issues and concerns i	n development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of s	success stories	
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat	
previous similar projects	and rice	
Application guidelines for	User manuals and leaflets	
users		
F: Status of TIMP readines	ss (2-requires validation)	
G: Contacts		
Contacts	The Institute Director, KALRO ICRI -Mtwapa; P.O. Box 16. 80109; Mtwapa	
	Email: director.icri@kalro.org, Phone: 0712557178	
Lead organization and	KALRO, Egerton University.	
scientists	Nasirembe W Pole F N	
Partner organizations and	Local Fabricators	
contacts		
VMG issues and concerns	• Training on local use and transportation will make it more usable	
in development	Training on local use and transportation will make it more usable.	
dissemination adoption	• Power coconut narvester is affordable and could help VMGs exploit	
and scaling up		
VMG related opportunities	Can create employment for VMG at local level	
G: Contacts	r sy set set set set	
Contacts	The Institute Director, KALRO-Mtwapa: P.O. Box 16-80109, Mtwapa	
Contacto	E-mail: director icri@kalro.org 0202024751	
Lood ongonization and	KALDO Egenton University	
Lead organization and	KALKO, Egerion University,	

2.10.8. Coconut harvesting stick		
scientists	Nasirembe W, Pole F.N.	
Partner organizations and contacts	Tecsols Ltd – Nakuru	

2.10.9. Coconut harvestin	g climbing gear	
Category (technology,	Technology	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem to be addressed	Manual coconut harvesting by climbing the tree is slower, untimely and risky, high cost of labour, and manual labour in terms of coconut harvesters is diminishing	
What is it? (TIMP	The coconut harvesting climbing gear are used to help climbers harvest coconut	
description)	bunches in tall coconut trees faster and safer than when manual climbing is done.	
	This saves time and more trees can be harvested in a day as compared to manual	
T	narvesting.	
Justification	It works faster, it is safer, does not use fuel and hence is cheaper, discourages child	
	labour, easier to operate and cost effective	
B: Assessment of dissemination and scaling up/out approaches		
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs	
Approaches used in	• FFBS	
dissemination	• AIP	
	• Field Demonstrations and training,	
	Agricultural shows (ASK) and other exhibitions	
Critical/essential factors	• Research to test, validate and release improved coconut varieties	
for successful promotion	A platform for interaction of coconut value chain stakeholders	
Partners/stakeholders for	Machinery fabricators	
	NGO supporting farmers	
C: Current situation and		
Counting where already		
promoted if any		
Counties where TIMD will	Kilifi Kwala Lamu and Taita Tavata	
be up scaled	Kinni, Kwaie, Laniu anu Tana-Taveta	
Challenges in	• Look of account innovation platforms to facilitate interaction of formany with	
dissemination	• Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders	
dissemination	 Relatively high cost for individual small-scale farmer 	
	 Limited awareness of the existence of machine by the farming community 	

2.10.9. Coconut harvesting climbing gear			
Suggestions for addressing	Establish coconut innovation platforms		
the challenges	Encourage group/cooperative ownership		
	• Launch and awareness campaign through demonstrations and trainings		
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders		
scaling if any	collaborate in an innovation platform		
	• Partnership is important in technology dissemination and adoption and this can be		
	Tacinitated infougn innovation platforms		
	 Products from local/indigenous crops attract nuge market, yet very fittle is being done to promote growth 		
Social, environmental,	• Creation of awareness on mechanization importance in the community. Include		
policy and market	all gender groups in research, and validation.		
conditions necessary for	Good Policy on cost of agricultural mechanization		
development and up			
scaling			
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations		
Basic costs			
Estimated returns			
Gender issues and concerns	Gender Unfriendly and expensive machines		
in development	• Coconut machines should be designed for easy start and operation.		
,dissemination, adoption	• Up-scaling should target all the gender		
and scaling up	Affordability to all gender		
Gender related	Creates employment especially for youth		
opportunities	Reduces drudgery for women farmers as well as men		
VMG issues and concerns i	VMG issues and concerns in development, dissemination, adoption and scaling up		
VMG related opportunities	Can create employment for VMG at local level		
E: Case studies/profiles of success stories			
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat		
previous similar projects	and rice		
Application guidelines for	User manuals and leaflets		
users			
F: Status of TIMP readines	ss (2-requires validation) 2-requires validation		
G: Contacts			
Contacts	The Institute Director, KALRO ICRI -Mtwapa; P.O. Box 16. 80109; Mtwapa		
	Email: director.icri@kalro.org, Phone: 0712557178		
Lead organization and	KALRO, Egerton University,		
scientists	Nasirembe W, Pole F.N.		
Partner organizations and	Local Fabricators		
contacts			
VMG issues and concerns	• Training on local use and transportation will make it more usable.		
in development,	 Mechanical coconut climber is affordable and could help VMGs exploit 		
dissemination, adoption			
and scaling up			
VMG related opportunities	Can create employment for VMG at local level		
G: Contacts			
Contacts	The Institute Director, KALRO ICRI -Mtwapa; P.O. Box 16. 80109; Mtwapa		
	Email: director.icri@kalro.org, Phone: 0712557178		

2.10.9. Coconut harvesting climbing gear	
Lead organization and	KALRO, Egerton University,
scientists	Nasirembe W, Pole F.N.
Partner organizations and	Tecsols Ltd – Nakuru
contacts	

2.10.10.Coconut harvesting Robot	
Category (technology,	Technology
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Manual coconut harvesting by climbing the tree is slower, untimely and risky, high cost of labour and manual labour in terms of coconut harvesters is diminishing
What is it? (TIMP	The coconut harvesting robots are used to help harvest coconut bunches in tall
description)	coconut trees faster and safer without having a climber physically climbing the tree.
	This saves time and more trees can be harvested in a day as compared to manual
	harvesting.
Justification	It works faster, safer, discourages child labour, easier to operate and cost effective
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs
Approaches used in	• FFBS
dissemination	• AIP
	• Field Demonstrations and training,
	• Agricultural shows (ASK) and other exhibitions
Critical/essential factors	Research to test, validate and release improved coconut varieties
for successful promotion	• A platform for interaction of coconut value chain stakeholders
Partners/stakeholders for	Machinery fabricators
scaling up and their roles	NGO supporting farmers
C: Current situation and future scaling up	
Counties where already	
promoted if any	
Counties where TIMP will	Kilifi, Kwale, Lamu and Taita-Taveta
be up scaled	
Challenges in	• Lack of coconut innovation platforms to facilitate interaction of farmers with
dissemination	relevant stakeholders
	• Limited awareness of the existence of machine by the farming community.
Suggestions for addressing	Establish coconut innovation platforms

2.10.10.Coconut harvesting Robot		
the challenges	• Launch and awareness campaign through demonstrations and trainings	
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders	
scaling if any	collaborate in an innovation platform	
	• Partnership is important in technology dissemination and adoption and this can be	
	facilitated through innovation platforms	
	• Products from local/indigenous crops attract huge market, yet very little is being done to promote growth	
Social environmental	• Creation of awaraness on machanization importance in the community. Include	
policy and market	all gender groups in research and validation	
conditions necessary for	 Good Policy on cost of agricultural mechanization 	
development and up		
scaling		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns	Gender Unfriendly and expensive machines	
in development	• Coconut machines should be designed for easy start and operation.	
,dissemination, adoption	• Up-scaling should target all the gender	
and scaling up	Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	Reduces drudgery for women farmers as well as men	
VMG issues and concerns i	n development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of s	success stories	
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat	
previous similar projects	and rice	
Application guidelines for	User manuals and leaflets	
users		
F: Status of TIMP readines	ss (2-requires validation) 2-requires validation	
G: Contacts		
Contacts	The Institute Director, KALRO ICRI -Mtwapa; P.O. Box 16. 80109; Mtwapa	
	Email: director.icri@kalro.org, Phone: 0712557178	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	
Partner organizations and	Local Fabricators	
contacts		
VMG issues and concerns	• Training on local use and transportation will make it more usable.	
in development,	• Mechanical coconut climber is affordable and could help VMGs exploit	
dissemination, adoption		
and scaling up	Concernent concernent for VMC of the orthogoal	
VMG related opportunities	Can create employment for VING at local level	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	

2.10.10.Coconut harvesting Robot		
Partner organizations and	Tecsols Ltd – Nakuru	
contacts		

2.10.11.Tractor mounted telescopic hoist	
Category (technology, innovation or management practice)	Technology
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Manual coconut harvesting by climbing the tree is slower, untimely and risky, high cost of labour and manual labour in terms of coconut harvesters is diminishing
What is it? (TIMP	The coconut harvesting by use of tractor mounted telescopic hoist help harvest
description)	coconut bunches in tall coconut trees faster and safer without having a climber
	physically climbing the tree. This saves time and more trees can be harvested in a day
	as compared to manual harvesting.
Justification	It works faster, safer, discourages child labour, easier to operate and cost effective
B: Assessment of dissemina	tion and scaling up/out approaches
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs
Approaches used in	• FFBS
dissemination	• AIP
	• Field Demonstrations and training,
	Agricultural shows (ASK) and other exhibitions
Critical/essential factors	• Research to test, validate and release improved coconut varieties
for successful promotion	A platform for interaction of coconut value chain stakeholders
Partners/stakeholders for	Machinery fabricators
scaling up and their roles	NGO supporting farmers
C: Current situation and fu	iture scaling up
Counties where already	
Counting and any TIMP will	Z'l'C' Zanala Langua d'Ta'ta Tanata
be up scaled	Kinn, Kwale, Lamu and Tana-Taveta
Challenges in	
dissemination	• Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders
dissemination	 Relatively high cost for individual small-scale farmer
	 I imited awareness of the existence of machine by the farming community
Suggestions for addressing	 Establish coconut innovation platforms
the challenges	Encourage group/cooperative ownership
Users of TIMP Approaches used in dissemination Critical/essential factors for successful promotion Partners/stakeholders for scaling up and their roles C: Current situation and fu Counties where already promoted if any Counties where TIMP will be up scaled Challenges in dissemination Suggestions for addressing the challenges	Coconut Farmers and agribusiness entrepreneurs • FFBS • AIP • Field Demonstrations and training, • Agricultural shows (ASK) and other exhibitions • Research to test, validate and release improved coconut varieties • A platform for interaction of coconut value chain stakeholders • Machinery fabricators • NGO supporting farmers iture scaling up Kilifi, Kwale, Lamu and Taita-Taveta • Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders • Relatively high cost for individual small-scale farmer. • Limited awareness of the existence of machine by the farming community. • Establish coconut innovation platforms

2.10.11.Tractor mounted telescopic hoist		
	Launch and awareness campaign through demonstrations and trainings	
Lessons learned in up	• Chances of successful scaling are higher when diverse value chain stakeholders	
scaling if any	collaborate in an innovation platform	
	• Partnership is important in technology dissemination and adoption and this can be	
	Tacilitated through innovation platforms	
	• Products from local/indigenous crops attract nuge market, yet very little is being done to promote growth	
Social environmental	 Creation of awareness on mechanization importance in the community. Include 	
policy and market	all gender groups in research and validation	
conditions necessary for	 Good Policy on cost of agricultural mechanization 	
development and up		
scaling		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns	Gender Unfriendly and expensive machines	
in development	• Coconut machines should be designed for easy start and operation.	
,dissemination, adoption	• Up-scaling should target all the gender	
and scaling up	Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	Reduces drudgery for women farmers as well as men	
VMG issues and concerns	in development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of	success stories	
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat	
previous similar projects	and rice	
Application guidelines for	User manuals and leaflets	
E. Status of TIMD reading	gg (2 requires validation) 2 requires validation	
C: Contacts		
Contacts	The Institute Director KALRO ICRI Mtwapa: P.O. Boy 16, 80109; Mtwapa	
Contacts	Email: <u>director.icri@kalro.org</u> , Phone: 0712557178	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	
Partner organizations and	Local Fabricators	
contacts		
VMG issues and concerns	• Training on local use and transportation will make it more usable.	
in development,	• Mechanical coconut climber is affordable and could help VMGs exploit	
dissemination, adoption		
and scaling up		
VMG related opportunities	Can create employment for VMG at local level	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Egerton University,	

2.10.11.Tractor mounted telescopic hoist	
scientists	Nasirembe W, Pole F.N.
Partner organizations and	Tecsols Ltd – Nakuru
contacts	

2.10.12.Coconut de-husking tool	
	E
Category (technology, innovation or management practice)	Technology
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	 Manual coconut de-husking by use of panga is slower, untimely and risky High cost of labour Food and water is used as fuel Manual labour in terms of coconut harvesters is diminishing
What is it? (TIMP description)	The coconut de-husking by use of the de-husking tool helps in de-husking many coconuts faster and safer thereby making more nuts available for further processing. This makes more nuts to be processed in a day as compared to manual de-husking.
Justification	It works faster, safer, discourages child labour, easier to operate and cost effective
B: Assessment of dissemina	ntion and scaling up/out approaches
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs
Approaches used in dissemination	 FFBS AIP Field Demonstrations and training, Agricultural shows and other exhibitions
Critical/essential factors	Research to test, validate and release improved coconut varieties
for successful promotion	• A platform for interaction of coconut value chain stakeholders
Partners/stakeholders for	Machinery fabricators
scaling up and their roles	NGO supporting farmers
C: Current situation and fu	iture scaling up
Counties where already promoted if any	
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu and Taita-Taveta
Challenges in dissemination	 Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Relatively high cost for individual small-scale farmer. Limited awareness of the existence of machine by the farming community.
Suggestions for addressing the challenges	 Establish coconut innovation platforms Encourage group/cooperative ownership Launch and awareness campaign through demonstrations and trainings
Lessons learned in up scaling if any	• Chances of successful scaling are higher when diverse value chain stakeholders collaborate in an innovation platform

2.10.12.Coconut de-husking tool		
	 Partnership is important in technology dissemination and adoption and this can be facilitated through innovation platforms Products from local/indigenous crops attract huge market, yet very little is being done to promote growth 	
Social, environmental, policy and market conditions necessary for development and up scaling	 Creation of awareness on mechanization importance in the community. Include all gender groups in research, and validation. Good Policy on cost of agricultural mechanization 	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns in development ,dissemination, adoption and scaling up	Gender Unfriendly and expensive machines Coconut machines should be designed for easy start and operation. Up-scaling should target all the gender Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	Reduces drudgery for women farmers as well as men	
VMG issues and concerns i	n development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of s	success stories	
Success stories from previous similar projects	Mechanization has enabled increased production in other crops such as maize, wheat and rice	
Application guidelines for users	User manuals and leaflets	
F: Status of TIMP readines	ss (2-requires validation) 2-requires validation	
G: Contacts		
Contacts	The Institute Director, KALRO ICRI -Mtwapa; P.O. Box 16. 80109; Mtwapa, Email: director.icri@kalro.org, Phone: 0712557178	
Lead organization and scientists	KALRO, Egerton University, Nasirembe W, Pole F.N.	
Partner organizations and contacts	Local Fabricators	
VMG issues and concerns in development, dissemination, adoption and scaling up	 Training on local use and transportation will make it more usable. Mechanical coconut climber is affordable and could help VMGs exploit 	
VMG related opportunities	Can create employment for VMG at local level	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	
Partner organizations and contacts	Tecsols Ltd – Nakuru	

2 10 13 Coconut de-husking machine		
Category (technology, innovation or management practice)	Technology	
A: Description of the techn	ology, innovation or management practice	
Problem to be addressed	Manual coconut de-husking by use of panga is slower, untimely and risky, high cost of labour and manual labour in terms of coconut harvesters is diminishing	
What is it? (TIMP description)	The coconut de-husking by use of the electric de-husking machine helps in de- husking many coconuts faster and safer thereby making more nuts available for further processing. This makes more nuts to be processed in a day as compared to manual de-husking (250-2500 per hour).	
Justification	It works faster, safer, discourages child labour, easier to operate and cost effective	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs	
Approaches used in dissemination	 FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions 	
Critical/essential factors for successful promotion	 Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders 	
Partners/stakeholders for scaling up and their roles	 Machinery fabricators NGO supporting farmers 	
C : Current situation and fu	ture scaling un	
Counties where already promoted if any		
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu and Taita-Taveta	
Challenges in dissemination	 Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Relatively high cost for individual small-scale farmer. Limited awareness of the existence of machine by the farming community. 	
Suggestions for addressing the challenges	 Establish coconut innovation platforms Encourage group/cooperative ownership Launch and awareness campaign through demonstrations and trainings 	
Lessons learned in up scaling 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 	

2.10.13.Coconut de-husking machine		
	facilitated through innovation platforms	
	• Products from local/indigenous crops attract huge market, yet very little is being	
	done to promote growth	
Social, environmental,	• Creation of awareness on mechanization importance in the community. Include	
policy and market	all gender groups in research, and validation.	
conditions necessary for	Good Policy on cost of agricultural mechanization	
development and up		
scaling		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns	Gender Unfriendly and expensive machines	
in development	• Coconut machines should be designed for easy start and operation.	
, dissemination, adoption	• Up-scaling should target all the gender	
and scaling up	Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	• Reduces drudgery for women farmers as well as men	
VMG issues and concerns i	n development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of s	success stories	
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat	
previous similar projects	and rice	
Application guidelines for users	User manuals and leaflets	
F: Status of TIMP readines	s (2-requires validation) 2-requires validation	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa: P.O. Box 16-80109, Mtwapa	
Contacts	E-mail: director icri@kalro.org_0202024751	
Land organization and	KALPO Egerton University	
scientists	Nacimmha W. Dolo E N	
	Nasirembe w, Pole F.N.	
Partner organizations and	Local Fabricators	
VMC		
v MG issues and concerns	• Training on local use and transportation will make it more usable.	
discomination adoption	• Mechanical coconut climber is affordable and could help VMGs exploit	
and scaling up		
VMG related opportunities	Can aroute amployment for VMC at level	
C: Contacts		
G: Contacts	The Institute Director KALDO Manager D.O. Day 16 90100 Manage	
Contacts	E meile directori cheles en 0202024751	
T 1	E-mail: <u>director.icri@kairo.org</u> , 0202024751	
Lead organization and	KALKO, Egerton University,	
scientists	Nasırembe W, Pole F.N.	
Partner organizations and	Tecsols Ltd – Nakuru	
contacts		

2.10.14.Coconut grating to	ool
Category (technology, innovation or management practice)	Technology
A: Description of the techn	ology, innovation or management practice
Problem to be addressed	Manual coconut de-husking by use of panga is slower, untimely and risky, high cost of labour and manual labour in terms of coconut harvesters is diminishing
What is it? (TIMP description)	The coconut grating by use of the grating tool helps in grating many coconuts faster and safer thereby making more grated coconut available for further processing. This makes more nuts to be processed in a day as compared to the local method of grating coconuts.
Justification	It works faster, safer, discourages child labour, less tiresome, easier to operate and cost effective
B: Assessment of dissemina	ition and scaling up/out approaches
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs
Approaches used in dissemination	 FFBS AIP Field Demonstrations and training,
	• Agricultural shows (ASK) and other exhibitions
Critical/essential factors	Research to test, validate and release improved coconut varieties
for successful promotion	• A platform for interaction of coconut value chain stakeholders
Partners/stakeholders for scaling up and their roles	 Machinery fabricators NCO supporting formers
C: Current situation and f	• NGO supporting farmers
C: Current situation and it	Kilife Kuula Lamu Tana Divan and Taita Tavata
promoted if any	Kinni, Kwale, Lamu, Tana-Kiver and Tana-Taveta
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu and Taita-Taveta
Challenges in	• Lack of coconut innovation platforms to facilitate interaction of farmers with
dissemination	relevant stakeholders
	• Relatively high cost for individual small-scale farmer.
	• Limited awareness of the existence of machine by the farming community.
Suggestions for addressing	Establish coconut innovation platforms
the challenges	Encourage group/cooperative ownership
T	Launch and awareness campaign through demonstrations and trainings
Lessons learned in up scaling 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
	• Products from local/indigenous crops attract huge market, yet very little is being

2.10.14.Coconut grating tool		
	done to promote growth	
Social, environmental,	• Creation of awareness on mechanization importance in the community. Include	
conditions necessary for	Cood Policy on cost of agricultural machanization	
development and up	• Good Foncy on cost of agricultural mechanization	
scaling		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns	Gender Unfriendly and expensive machines	
in development	• Coconut machines should be designed for easy start and operation.	
,dissemination, adoption	• Up-scaling should target all the gender	
and scaling up	Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	Reduces drudgery for women farmers as well as men	
VMG issues and concerns i	n development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of s	success stories	
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat	
previous similar projects	and rice	
Application guidelines for	User manuals and leaflets	
F. Status of TIMP readines	s (2-requires validation) 2-requires validation	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	
Partner organizations and	Local Fabricators	
contacts		
VMG issues and concerns	• Training on local use and transportation will make it more usable.	
in development,	Mechanical coconut climber is affordable and could help VMGs exploit	
dissemination, adoption		
and scaling up		
VMG related opportunities	Can create employment for VMG at local level	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	
Partner organizations and	Tecsols Ltd – Nakuru	
contacts		

2.10.15. Electric coconut grating equipment		
Category (technology, innovation or management practice)	Technology	
A: Description of the techn	ology, innovation or management practice	
Problem to be addressed	The normal method used for coconut grating is slower, untimely and tiresome, grated nut produced is prone to contamination and increase in drudgery by the operator	
What is it? (TIMP description)	The coconut grating by use of the electric grating equipment helps in grating many coconuts faster and safer thereby making more grated coconut available for further processing. This makes more nuts to be processed in a day as compared to the local method of grating coconuts.	
Justification	It works faster, safere, discourages child labour, less tiresome, easier to operate and cost effective	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Coconut Farmers and agribusiness entrepreneurs	
Approaches used in dissemination	 FFBS AIP Field Demonstrations and training, Agricultural shows (ASK) and other exhibitions 	
Critical/essential factors for successful promotion	 Research to test, validate and release improved coconut varieties A platform for interaction of coconut value chain stakeholders 	
Partners/stakeholders for scaling up and their roles	 Machinery fabricators NGO supporting farmers 	
C: Current situation and fu	iture scaling up	
Counties where already promoted if any	Kilifi, Kwale, Lamu, Tana-River and Taita-Taveta	
Counties where TIMP will be up scaled	Kilifi, Kwale, Lamu and Taita-Taveta	
Challenges in dissemination	 Lack of coconut innovation platforms to facilitate interaction of farmers with relevant stakeholders Relatively high cost for individual small-scale farmer. Limited awareness of the existence of machine by the farming community. 	
Suggestions for addressing the challenges	 Establish coconut innovation platforms Encourage group/cooperative ownership Launch and awareness campaign through demonstrations and trainings 	
Lessons learned in up scaling 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 	

2.10.15. Electric coconut grating equipment		
	• Products from local/indigenous crops attract huge market, yet very little is being	
	done to promote growth	
Social, environmental,	• Creation of awareness on mechanization importance in the community. Include	
policy and market	all gender groups in research, and validation.	
conditions necessary for	Good Policy on cost of agricultural mechanization	
development and up		
scaling		
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations	
Basic costs		
Estimated returns		
Gender issues and concerns	Gender Unfriendly and expensive machines	
in development	• Coconut machines should be designed for easy start and operation.	
,dissemination, adoption	• Up-scaling should target all the gender	
and scaling up	Affordability to all gender	
Gender related	Creates employment especially for youth	
opportunities	Reduces drudgery for women farmers as well as men	
VMG issues and concerns	in development, dissemination, adoption and scaling up	
VMG related opportunities	Can create employment for VMG at local level	
E: Case studies/profiles of	success stories	
Success stories from	Mechanization has enabled increased production in other crops such as maize, wheat	
previous similar projects	and rice	
Application guidelines for	User manuals and leaflets	
users		
F: Status of TIMP readines	ss (2-requires validation) 2-requires validation	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	
Partner organizations and	Local Fabricators	
contacts		
VMG issues and concerns	• Training on local use and transportation will make it more usable.	
in development,	• Mechanical coconut climber is affordable and could help VMGs exploit	
dissemination, adoption		
and scaling up		
VMG related opportunities	Can create employment for VMG at local level	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Egerton University,	
scientists	Nasirembe W, Pole F.N.	
Partner organizations and	Tecsols Ltd – Nakuru	
contacts		

2.11 COCONUT VALUE CHAIN BUSINESS AND MARKETING

2.11.1. Models for market-oriented production of Coconut products and by-products		
Category (i.e. technology,	Management practice	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Coconut production is much exercised in the traditional way and often not demand or market driven. This lack of market focus renders the sub-sectr products and by- products irresponsive to the quantity and quality (Q&Q) market specifications. There is therefore a demnd for coconut products at different market levels which primary and secondary producers cannot meet. The bottom line is that due to the Q&Q requirements current production cannot satisfy the existing markets or rather the existing markets are inaccessible.	
What is it? (TIMP description)	An approach to organize coconut production based on market orientation. Producer- driven model is based on production organized by the producers themselves. Buyer- driven model is based on production organized by the end customer companies. Intermediary-driven model is based on the production organized by an intermediary such as extension, NGOs, Research institutions, etc.	
Justification	Understanding the market demand for various coconut products is crucial in helping farmers select the procedures and the products to engage in to meet the market demand on a quantity and quality (Q&Q) basis. This is also a driver for targeting good profit margins for the overall production process. Without an appropriate approach, access to market will remain a major limitation, leading to further decline in production and income generation.	
B: Assessment of dissemina	ition and scaling up/out approaches	
Users of TIMP	Farmers, traders, processing industries, Extension, NGOs, Research institutions	
Approaches to be used in dissemination	Meetings, radio, and digital platforms	
Critical/essential factors for successful promotion	 Availability of investors Transparent functional relationships among stakeholders leading to free access to information Better/guaranteed higher prices of coconut products 	
Partners/stakeholders for	• Farmers – investments in production of improved coconut and clean planting	
scaling up and their roles	 material; market surveys County extension staff – Organization of farmers and technical service delivery; capacity building NGOs – Organization of farmers and service delivery; capacity building Private sector (local traders and exporters) – Support in input services and providing markets for coconut products Research institutions – Availing improved planting material, backstopping 	
C: Current situation and fu	iture scaling up	
Counties where already promoted if any	Kwale, Mombasa, Kilifi, Tana-River and Lamu	
Counties where TIMPs will be up scaled	Tharaka-Nithi, Kisumu, Busia and Makueni	
Challenges in development and dissemination -	 Discontinuous and geographically fragmented supply Small-scale production 	
	• Life cycle challenges that scare researchers and research investment	
	Limited information on sustainable coconut markets	

2.11.1. Models for market-oriented production of Coconut products and by-products		
	• Limited link of farmers to markets – disorganized marketing system	
	Level of policy support for market development	
	Poor quality produce	
Suggestions for addressing the challenges	• Discontinuous and geographically fragmented supply: – Formation of marketing groups	
the entirenges	 Small-scale production: – Aggregation of producers to producer organizations 	
	• Life cycle challenges that scare researchers and research investment: -	
	Biotechnology and marker assisted research	
	• Limited information on sustainable coconut markets: – capacity building on access channels to market information	
	• Level of policy support: - value chain support platform (e.g. producers'	
	association); implementation of product standardization, financing/access to credit, subsidies, inputs support, standardization in price/weights aspect	
	• Poor quality produce: – interactive exposure of producer organizations to	
	buyers/the market for quantity and quality communication that will enhance demand driven market linkages	
Lessons learnt on upscaling	 High marketing transaction costs due to produce bulkiness 	
if any	 Bulky nature coupled by small scale and fragmented production patterns inhibit 	
	market development	
	• High incidences of individual marketing as opposed to collective marketing	
Social, environmental,	• Social conditions: – acceptability of improved practices by the farmers, group	
policy and market	dynamics, cultures	
conditions necessary for	• Environmental conditions: – Enhancing natural resource management	
development and upscaling	• Policy conditions: – Policy support in extension, inputs' subsidy, prices,	
	production organizations (cooperatives), infrastructure, investment environment	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	Total variable costs include technologies on; improved varieties, manure, pest- control, labour cost, harvesting and tapping. We assume a production duration of 15 years, spacing of 9 m by 9 m; costs were highest in year 1 of establishment and	
	progressively reduced and stabilized at KES 13880 per ha from year 10. Total	
	variable costs are KES 94,262 per ha. The distribution of average cost per ha by technologies is:	
	• Cost of ploughing KES. 12,150 (13.0%)	
	• Cost of preparing holes for planting KES 1,074 (1.9%)	
	• Cost of selected/improved seedlings KES. 12,300 (17.6%)	
	• Cost seedlings planting/ replacement KES 2,500 (6.5%)	
	• Cost of manure KES. 22,956 (24.4%)	
	• Cost of pest control KES. 21,523 (22.8%)	
	• Cost of harvesting KES. 24,333 (25.8%)	
Estimated returns	Coconut production has remunerative returns.	
	Assumptions : Interest rate of 12%; farm gate price of KES 12 per nut, KES per kuti and KES 100 per litre of toddy:	
	Vield : there was no production during the first four years. The first fruits in year 5	
	vield 40 nuts per tree or 4920 nuts per ha and progressively rose to 12300 nuts per ha	
	from vear 6-10 peaking at 17.220 nuts per ha in vear 15. Makuti vield assumed at	
	24/tree from year 3. Toddy yield was assumed at 1.5 litres/tree from 15 trees	
	producing 6750 litres/year.	

2.11.1. Models for market-oriented production of Coconut products and by-products		
	• Revenue : There was no revenue from year 1 to 4. Initial revenue inflow of KES. 29,500 is generated from makuti alone. From year 5 the revenue rose to KES 88,540 per ha and progressively increased to KES 911,140 per ha by year 15 The net present value (NPV) of Coconut was KES. 2,918,004 per ha for all the three products and KES 699,177 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, and 108% with toddy production.	
Gender issues and concerns in development and dissemination, adoption	 Women and youth are discriminated in the production, marketing and control of on the proceeds of certain coconut products such the whole nut and the toddy Women also have limited participation and influence in rural producer 	
and scaling	organizationsWomen's status, age, wealth level may influence participation	
	 Limited access to assets, resources and services, required to join producer groups In some cultures women may not be able to travel away from their homes to producer group meetings, without permission 	
	• Strict rules of entry and requirements of producers' organizations may limit women and youth participation	
Gender related opportunities	Men, women and youth stand to benefit with higher profit margins through collective bargaining during marketing at different segments of the value chain	
VMG issues and concerns in development and dissemination, adoption and scaling up	 VMGs are widely discriminated in rural producer organizations VMGs also have limited participation and influence in rural producer organizations Limited access to assets, resources and services, required to join producer groups VMGs require special arrangements to enjoy full acces to business information along the value chain 	
VMG related opportunities	 VMGs stand to benefit with higher profit margins through collective bargaining and marketing 	
F. Case studies/profiles of	• Opportunities for unemployed youth in production and marketing through ICT	
Success stories from previous similar projects	No elaborate case study for citation	
Application guidelines for users	Training factsheets, manuals and power point slides are available	
F: Status of TIMP Reading validation, 3. Requires further	ess (1. Ready for upscaling, 2, Requires Ready for upscaling er research)	
G: Contacts	!	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa E-mail: director.icri@kalro.org, 0202024751	
Lead organization/scientists	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K. and Clotilda Ondiko	
Partner organizations	MoALFC	

Research gaps

- Efficiency evaluation of the farmer-market linkage models
- Equity distribution among the producers
- Productivity levels among the smallholder farmers due to farmer-market linkage models
- Farmer accessibility to production inputs

2.11.2. Developing business plans for the coconut enterprise/business		
Category (i.e. technology, innovation or management practice)	Management practice	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Low management regimes and lack of sustainability and success in the coconut enterprise from a business focus can be attributed to lack of business planning. Business plans provide a roadmap for resource mobilization as well as anticipation of the outputs and outcomes in monetary terms. Business plans also provide a basis for decision making for the implementing teams	
What is it? (TIMP description)	A coconut enterprise business plan will serve as an internal management and organizational tool that informs decision making; a tool to communicate with internal and external stakehlders of the enterprise.	
Justification	With a business plan in hand, coconut farmers and rural entrepreneurs will be able to strategically channel resources and make decisions towards creation and/or growth of a successful and sustainable business. Business plans also help producers assess different production models based on available and/or potential markets and hence target their product to market needs	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, the business community and consumers	
Approaches to be used in dissemination	Trainings, factsheets, manuals	
Critical/essential factors for successful promotion	 Education levels of the farmers and investors in coconut production Levels of experience in cocnut production Availability of information on coconut production and marketing Availability of clean planting material Market segmentation for various coconut products and by-products products (including increased demand for improved suberior varieties, products and by-products including livestock feed) 	
Partners/stakeholders for scaling up and their roles	 Farmers – Users of business plans County extension staff - Capacity building NGOs – Capacity building Private sector (local traders, exporters) – Buyers of coconuts and coconuts products and by-products Research institutions – Capacity building Financial Institutions – Financial support 	
C: Current situation and future scaling up		
Counties where already promoted if any	Kwale, Mombasa, Kilifi, Tana-River and Lamu	
Counties where TIMPs will be up scaled	Tharaka-Nithi, Kisumu, Busia and Makueni	
Challenges in development and dissemination -	 Disorganization and fragmented farmer population Small-scale and un-economical farming units Inadequate information to stakeholders on coconut products and by-products' production and marketing Low implementation of available policy and product standards Enterpise nature with respect to time to productive age/maturity Low levels of education and skills 	

2.11.2. Developing business plans for the coconut enterprise/business		
Suggestions for addressing the challenges	 Disorganization and fragmented farmer population – Formation of production clusters Small-scale and un-economical farming units:– aggregation of production to assume large scale-farming 	
	 Inadequate information to stakeholders on production of cochut products and by-products: – Developing information hub Enterpise nature with respect to time to productive age/maturity: Take advantage of biotechnology and the introduction of superior hybrids Level of policy support: – Enhance support in extension services Levels of education – Capacity building and development of simple production manuals that are language friendly to end-users 	
Lessons learnt in upscaling if any		
Social, environmental, policy and market conditions necessary for development and upscaling	 Social conditions – Acceptable by different gender groups in Counties growing coconut Environmental conditions – Coconuts create micro-climatic conditions and have effects similar to those of natural forests Policy conditions – Policy support in opportunities selected is paramount to 	
D. Economic gender vuln	enhance dissemination and adoption where the crop is adaptable erable and marginalized groups (VMGs) considerations	
Basic costs	The estimated costs in the development of a business plan include a series of consultative meetings involving hiring of expertise. Key factors to be considered are the scale of production/operation and the market outlook/target markets. The inputs involved include stationary of about KES 5000	
Estimated returns	Coconut production has good returns. The business plan is basically supposed to serve as a road map towards increasing efficiency and profitability of the farm and the coconut enterprise. Its also serves as a monitoring tool for the coconut enterprise. Note: The coconut value chain is a special case where many enterprises can be targeted within the same value chain; for instance the same coconut tree is a source of the whole nut, toddy, makuti and source of raw material for the brooms and fibre for making door-mats concurrently. Revenue : there are usually no revenue streams from year 1 to 4. Revenue inflow begins at year 5; Initial revenue inflow of KES. 29,500 is generated from makuti alone. From year 5 the revenue rose to KES 88,540 per ha and progressively increased to KES 911,140 per ha by year 15; The net present value (NPV) of Coconut was KES. 2,918,004 per ha for all the three products and KES 699,177 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, and 108% with toddy production.	
Gender issues and concerns in development and dissemination, adoption and scaling Gender related opportunities VMG issues and concerns	Cultural structures within coconut growing communities' inhibt full participation of women and youth in the management of the coconut enterprise. This has an influence on who has to be targeted in the development of the TIMPs as well as their dissemination and efforts for upscaling With the range of more than 100 products and byproduts (in total), opportunities for youth and women to participate in business development and growth. Access to information and literacy levels are crucial in jump-starting these groups to	
in development and dissemination, adoption and scaling up	participate in business planning, business start-ups and growth.	

2.11.2 Developing husiness plans for the coconut enterprise/husiness		
VMG related opportunities	Youth recovering from drugs and HIVs have an opportunity to venture in this	
	enterprise with capacity building and mobilization to keep/embrace record keeping.	
E: Case studies/profiles of success stories		
Success stories from	None so far.	
previous similar projects		
Application guidelines for	Training factsheets, manuals and power point slides are available	
users		
F: Status of TIMP Readiness (1. Ready for upscaling, 2, Requires Ready for upscaling		
validation, 3. Requires furthe	er research)	
G: Contacts		
Contacts		
Lead	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K.	
organization/scientists	and Clotilda Ondiko	
Partner organizations	• MoALFC at the county level	
	• NGOs	
	• FBOs	
Deservel serve		

- Research gaps
- Impact of business plan on coconut production
- Adoption of business plan
- Flow of information along the coconut value chain

2.11.3. Collective marketing of coconut products and by-products: the case of Organized Marketing Groups

Category (i.e. technology,	Management practice
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	Individual products' and by-products' marketing approaches render value chain
	stakeholders and particularly those in business to incur high transaction costs
	alongside having low bargaining power. Farmers and other business actors therefore
	become price-takers thereby leading to minimum returns that render businesses
	along the coconut value chain unsustainable.
What is it? (TIMP	Marketing as a group is a collective marketing approach. It involves formation of a
description)	group of farmers with a common objective of reducing market costs, increasing their
	bargaining power, enhancing strategic market positiong, sustainable income
	generation and business growth.
Justification	Due to the current fragmented structure of coconut products and by-products
	marketing, collective marketing will enable farmers and other market actors along
	the coconut value chain to gain/enjoy economies of scale. The advantages of
	collective marketing are higher volumes, uniform quality, reliable sellers, reliable
	buyers, continuous supply, access to distant markets and hence higher price and
	organization
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers and other market chain actors
Approaches to be used in	Trainings, factsheets, manuals
dissemination	
Critical/essential factors	Production programme in place or outlined

2.11.3. Collective marketing of coconut products and by-products: the case of Organized Marketing	
Groups	
for successful promotion Partners/stakeholders for scaling up and their roles	 Limited sale of produce outside collective initiative Quantity and quality (Q&Q) issues need to be addressed to the specifications of the absorbing/target market No side-selling: Market segment members must ascribe to the statutes of collective selling Good/favourable infra-structure: established structures for product collectiossembly, all weather road network Product differentiation and branding for traceability and also to stimulate competition among marketing groups Farmers:- defining production programme County extension staff particularly the departments of cooperative development and trade:- to provide extensive capacity building and monitoring NGOs: - Capacity building and resource mobilization including the human
C: Current situation and fu	resource (value chain actors wh may be members or non-members)
Counties where already	Kilifi County
promoted if any	
Counties where TIMPs will be up scaled	All coconut producing counties including Kwale, Makueni, Tana-River, Lamu, Tharaka-Nithi, Busia and Makueni
and dissemination -	 Producer farmers' fragmentation Small-scale and uneconomical production units Inadequate information on coonut production and marketing to stakeholders Undefined production programmes for coconut Limited market segmentation for different coconut products Weak policy support instruments Fluctuating prices due to inefficient market organization
Suggestions for addressing the challenges Lessons learnt in upscaling if any	 Producer farmers' fragmentation:- Formation of formal production clusters or producer groups Small-scale and uneconomical production units: – aggregation of producers to assume large scale-farming Inadequate information on coconut production and marketing to stakeholders: – Developing information hubs and learning platforms Undefined production programmes for coconut: -Engage stakeholders through a rigorous SWOT analysis to enhance strategic positioning along the value chain Level of policy support: – policy interpretation to br enhanced to al stakeholders along the value chain ugh support in extension services Fluctuating prices due to inefficient market organization:- Strengthen marketing committees and enhance product differentiation Commitment: limited number of stakeholders to support the coconut valu chain growth
Social, environmental, policy and market	 growin Subsistence production: this a result of limited investment to the sub-sector Volume target: low volume due to side-sales resulting from lack of sustainable market outlets Social conditions – Build trust among members; Sufficient volumes for both home consumption and commercialization
conditions necessary for	• Environmental conditions – Favourable condition for coconut production;

2.11.3. Collective marketing of coconut products and by-products: the case of Organized Marketing	
Groups	
development and upscaling	• Policy conditions – Infrastructural support (inputs, subsidies, marketing price guaranteed systems)
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs	The cost of forming producer organizations can be enormous depending on the level of understanding of the target individual farm-households. Farm-households who are victims of the consequences of individual selling efforts are relatively cheaper to sensitize towards forming producer organizations (POs). Formation of POs basically requires farmer mobilization efforts through common commodity interest groups (CCIGs) such as those with a focus on improving coconut marketing. An estimated average cost for farmer (CCIGs) sensitization of KES. 200,000/= is estimated. Once CCIGs are well sensitized, they can mobilize their membership to raise funds through share purchase to facilitate registration and management meetings. All costs can the
Estimated returns	• Under good management, a PO needs to target a minimum profit margin in the range of 30-35% of the total investment costs for every accounting period under review. This profit margin is within the range of normal profits for long-term investments as with the coconut enterprise which is perennial in nature.
Gender issues and concerns in development and dissemination, adoption and scaling	 Women are widely discriminated in rural producer organizations Women also have special niches along the coconut alue chain particularly for such products as making and selling brooms, virgin coconut oil and making confectionaries from coconut products and by-products Socio-cultural norms may limit women's participation in ownership and control of some selected products of the value chain; coconuts and the toddy inclusive Women's status, age, wealth level may influence participation Limited access and control to assets, resources and services, required to join producer groups Strict rules of entry conditions and requirements of producers' organizations such as the minimum number of coconut trees owned may limit women participation
Gender related opportunities	Men and youth stand to benefit with higher profit margins through their relative participation in the market along the value chain to their female counterparts
VMG issues and concerns in development and dissemination, adoption and scaling up VMG related opportunities	 VMGs are widely discriminated in producer organizations VMGs also have limited participation and influence in producer organizations VMGs have limited access to information, assets, resources and services, required to join producer groups VMGs stand to benefit with higher profit margins through collective bargaining and marketing Opportunities for unemployed youth in production and marketing
E: Case studies/profiles of s	success stories
Success stories from previous similar projects	
Application guidelines for users	Training factsheets, manuals and power point slides are available
F: Status of TIMP Reading validation, 3. Requires furthe	ess (1. Ready for upscaling, 2, Requires Ready for upscaling er research)
G: Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa

2.11.3. Collective marketing of coconut products and by-products: the case of Organized Marketing Groups

Oroups	
	E-mail: director.icri@kalro.org, 0202024751
Lead	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K.
organization/scientists	and Clotilda Ondiko
Partner organizations	Farmers – Defining production programme
	County extension staff - Capacity building
	NGOs – Capacity building

Research gaps

• Performance of marketing as a group for various coconut products, by-products and processes

2.11.4. Profitability analysis: Performance Evaluation/Measures for the Coconut products and by- products business	
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the techn	ology, innovation or management practice
Problem addressed	Lack of a strategy for profitability analysis by farmers and other stakeholders along the coconut value chain promotes a scenario where the effects of interventions/efforts such as investments can not be evaluated. This is the traditional approach which has rendered the enterprise to lack a basis for comparison for related costs and/or returns. The underlying consequences include growing knowledge gaps on cocnut based business performance.
What is it? (TIMP description)	Profitability analysis involves recording of costs and returns and a determination of profit/loss levels as an indicator of performance of the coconut enterprise.
Justification	Profitability analysis provides evidence of the business performance across time and investment regimes for coconut business. It is some form of a tool for identifying the business strength and areas for adjustment particularly where and when allocative profitability analysis is used. It also provides traceability of the business growth path.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	Farmers, Extension, the business actors/community along the value chain, NGOs, Researchers.
Approaches to be used in dissemination	 Trainings Factsheets Manuals FFBS AIP
Critical/essential factors for successful promotion	 Record keeping of all costs and revenues Ability of farmers to keep and interpret records Research to test, validate and release improved coconut varieties A platform for interaction of stakeholders along the coconut value chain
Partners/stakeholders for scaling up and their roles	 Farmers – production and record keeping County extension staff – Facilitators NGOs – Facilitators Private sector (local traders and exporters) – Buyers Research institutions – Facilitators

products business	sist remainder Dividuation measures for the coconat products and by
C: Current situation and fu	uture scaling up
Counties where already promoted if any	
Counties where TIMPs will be up scaled	All coconut producing counties including Kwale, Makueni, Tana-River, Lamu, Tharaka-Nithi, Busia and Makueni
Challenges in development and dissemination -	 Limited record keeping by farmers and other chain stakeholders Limited capacity by farmers and other stakeholders to interpret the records kept and translate to decision making Non-costing offamily labour in the coconut value chain
Suggestions for addressing the challenges	 Limited record keeping by farmers and other chain stakeholders:- capacity building Limited capacity by farmers and other stakeholders to interpret the records kept and translate to decision making; develop simple/friendly record keeping manuals Non-costing offamily labour in the coconut value chain:- capacity build stakeholders on how to cost family labour
Lessons learnt in upscaling if any	
Social, environmental, policy and market conditions necessary for development and upscaling	 Social conditions: - Awareness on record keeping and interpretation for decision making; Environmental conditions: - suitable for the increased diversification of coconut products Policy conditions: - Policy support particularly interpretation of the policy implementations related to inputs', cost, outputs, price and revenue profiling Market conditions: - Interpret cost related implications (direct and transaction costs in particular) to profit margins
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	 Total variable costs include technologies on; improved varieties, manure, pesticides, labour cost, harvesting and tapping. We assume a production duration of 15 years, spacing of 9 m by 9 m; costs were highest in year 1 of establishment and progressively reduced and stabilized at KES 13880 per ha from year 10. Total variable costs are KES 94,262 per ha. The distribution of average cost per ha by technologies is: Cost of ploughing KES. 12,150 (13.0%)
	• Cost of preparing holes for planting KES 1,074 (1.9%)
	• Cost of selected/improved seedlings KES. 12,300 (17.6%)
	• Cost seedlings planting/ replacement KES 2,500 (6.5%)
	• Cost of manure KES. 22,956 (24.4%)
	• Cost of pest control KES. 21,523 (22.8%)
	• Cost of harvesting KES. 24,333 (25.8%)
Estimated returns	Coconut production has remunerative returns.
	Assumptions: Interest rate of 12%; farm gate price of KES 12 per nut, KES per kuti and KES 100 per litre of toddy;
	Yield : there was no production during the first four years. The first fruits in year 5 yield 40 nuts per tree or 4920 nuts per ha and progressively rose to 12300 nuts per ha from year 6-10 peaking at 17,220 nuts per ha in year 15. Makuti yield assumed at

2.11.4. Profitability analysis: Performance Evaluation/Measures for the Coconut products and by-

2.11.4. Profitability analysis: Performance Evaluation/Measures for the Coconut products and by-		
products business		
	24/tree from year 3. Toddy yield was assumed at 1.5 litres/tree from 15 trees producing 6750 litres/year.	
	Revenue : There was no revenue from year 1 to 4. Initial revenue inflow of KES. 29,500 is generated from makuti alone. From year 5 the revenue rose to KES 88,540 per ha and progressively increased to KES 911,140 per ha by year 15; The net present value (NPV) of Coconut was KES. 2,918,004 per ha for all the three products and KES 699,177 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, and 108% with toddy production.	
Gender issues and concerns in development and dissemination, adoption and scaling	High illiteracy levels of women leading to lack of record keeping and poor record keeping.	
Gender related opportunities	Being a high value crop with a populous range of products and by-products, opportunities for women and youth. All functional segments along the value chain continuum provide free entry points for viable economic activities	
VMG issues and concerns in development and dissemination, adoption and scaling up	There are potential business niches that are suitable for VMGs especially with support on record keeping.	
VMG related opportunities	Those youths recovering from drugs and HIVs have an opportunity to venture in this enterprise since they can be able to keep good farm records.	
E: Case studies/profiles of s	success stories	
Success stories from previous similar projects		
Application guidelines for users	Training factsheets, manuals and power point slides are available	
F: Status of TIMP Reading validation, 3. Requires further	er research) Ready for upscaling, 2, Requires Ready for upscaling	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization/scientists	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K. and Clotilda Ondiko	
Partner organizations	MoALFC	

2.11.5. Participatory market research for coconut products and by-products		
Category (i.e. technology,	Management practice	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	Farmers and other actors along the value chain lack reliable market information on outlets for coconut products and by-products	
What is it? (TIMP	Pathways and sources through which farmers and other actors along the coconut	
description)	value chain will be enabled to access market information	
Justification	The low resource base that currently characterizes coconut farmers and other actors	

2.11.5. Participatory mar	ket research for coconut products and by-products
	is largely due to lack of information about markets, lack of business and negotiating experience, and lack of a collective organization which can give them the power they require to interact on equal terms with others, generally larger and stronger, market intermediaries. Cultural and social distance, and discrimination, may also be factors that at least partly exclude the poor from markets. Therefore participatory market research will assist farmer to gain knowledge on the structure and performance of markets leading to higher profit.
B: Assessment of dissemina	ation and scaling up/out approaches
Approaches to be used in dissemination	Barazas, trainings, factsheets, manuals, media, ICT, Field days,
Critical/essential factors for successful promotion	 Availability of County policies Willingness of farmers Availability of targeted markets Access to markets
Partners/stakeholders for scaling up and their roles	 Farmers – participants in market research Processors- capacity built Traders-capacity built County extension staff - Capacity building NGOs – Capacity building Private sector (local traders and exporters) – Targeted markets Research institutions – Capacity building
C: Current situation and fu	uture scaling up
Counties where already promoted if any	None
Counties where TIMPs will be up scaled	All coconut producing counties
Challenges in development and dissemination -	 Insufficient stakeholder collaboration: communication and dialogue among coconut stakeholders is lacking. Often, conflicting interests among actors lead to attitudes of rivalry. Poor EU market access: although some processors have links to European markets, the notion prevails among EU buyers that Kenyan Coconut products are of inferior quality Traceability: upstream traceability of Kenyan coconut products and by-products is severely challenged by the large number of smallholder farmers and independent buying agents. Low productivity: factors affecting low productivity in Kenya's coconut sector include the effects of climate change, the impact of pests and diseases, limited Good Agricultural Practices (GAP), lack of access to inputs, use of unsuitable or old coconut orchards and immature harvesting Inadequate information on the coconut products and by-products' market outlets. Lack of skills in the use of communication technologies Group dynamics Policy support
the challenges	over-riding principle of this code of conduct.

2.11.5. Participatory market research for coconut products and by-products	
	 Poor European market (EU) market access:- creation and marketing of a Kenyan coconut products' and by-products' brand should be explored and actualized Low-quality nuts:- solution is to support processors who wish to obtain loans to buy crops in advance, thereby addressing farmer' need for quick cash. In addition there is need to implement relevant harvesting plans in advance. Give grace period of non-harvesting Disorganization and fragmented producer population/farmers:- Organization of producer groups for collective marketing. Small-scale farming:- Increase acreage under coconut production, improving productivity and aggregation of produce to achieve large volume for the market Inadequate information to stakeholders on the coconut production and marketing:- Capacity building Policy support:- Support in extension services
Lessons learned in upscaling if any	Improved marketing strategies
Social, environmental, policy and market conditions necessary for development and up- scaling	 Social conditions – Level of education of the community Environmental conditions – Farmers are in different geographical localities Policy conditions – Policies supporting formation and functioning of producer organizations Market conditions – Existing demand
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	The inputs required may include costs of facilitating consultation among stakehoders especially through the POs approach which should not exceed KES. 30,000/= on quarterly basis. Othe inputs include stationery, smart phone, note books and airtime and probably annual subscription to some websites to gent market information on coconut costed at market price. In general the cost of participatory market research is estimated at KES 120,000/= annually.
Estimated returns	Revenue streams are expected to follow the generic standard business model with the following economic reward; Revenue : No revenue from year 1 to 4. Initial revenue inflow of KES. 29,500 is generated from makuti alone. From year 5 the revenue rose to KES 88,540 per ha and progressively increased to KES 911,140 per ha by year 15; The net present value (NPV) of Coconut was KES. 2,918,004 per ha for all the three products and KES 699,177 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, an
Gender issues and concerns in development and dissemination, adoption and scaling	There is inadequate representation of women and youth in participatory market research
Gender related opportunities	Women and youth have an opportunity to participate in participatory market research especially in any areas where they have competitive advantage in
VMG issues and concerns in development and dissemination, adoption and scaling up	VMGs also have limited participation in participatory market research
VMG related opportunities	Opportunities for those recovering from drugs and HIV to participate in participatory market research

2.11.5. Participatory market research for coconut products and by-products

E: Case studies/profiles of success stories		
Success stories from	None	
previous similar projects		
Application guidelines for	Barazas, training factsheets, manuals and power point slides	
users		
F: Status of TIMP Readi	iness (1. Ready for upscaling, 2,	The guidelines for the participatory market
Requires validation, 3. Requi	uires further research) research are ready for up-scaling	
G: Contacts		
Contacts	The Institute Director, KALRO-Mt	wapa; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org, 02	02024751
Lead organization and	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K.	
scientists	and Clotilda Ondiko	
Partner organizations	MoALFC	

Gaps for further research

- Performance of participatory market research process
- Production and marketing efficiency for the coconut value chain due to the participatory market research process
- Equity distribution in income and change in livelihood for the value chain stakeholders

2.11.6. An approach for developing and scaling up of a sustainable coconut enterprise	
Category (i.e. technology,	Management practice
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	The coconut sub-sector is and has been a source of livelihood to over 80% of the
	households growing/owning the coconut tree. Coconut products are a source of food
	and income which support many families including those not directly owning the
	coconut tree but otherwise derive benefits through the existing business
	been nitiated but hardly over 20% are sustainable. Ontions that exist to enable the
	farmer(s)/farmer groups to scale up their production of coconut products and by-
	products require new approaches that give priority to understanding the socio-
	economic landscape of business oriented groups.
What is it? (MP	A new plan to organize farmers to supply target markets. This is a plan to increase
description)	production through increasing the number of new groups involved in the coconut
	value chain. The plan involves a priori engagement of new groups along the coconut
	value/market chain to understand the social and economic dynmics of a business
	backwards to identify the readman to attaining these KSIs. This management
	practice follows the features of the My-Coop modulated concept by IEAD (2016)
Instification	The new plan that adopts to the My Coop modules provides a basic constitution.
Justification	structure with an opportunity for incorporating an in-built monitoring and evaluation
	(M&E) framework with participatorily home-made success indicators.
B: Assessment of dissemination and scaling up/out approaches	
Users of TIMP	Farmers, market actors/traders, processors and extension service providers
Approaches to be used in	Trainings
dissemination	• FFBS

2.11.6. An approach for developing and scaling up of a sustainable coconut enterprise		
	• AIP	
Critical/essential factors	• Farmers and other stakeholders embrace the My-Coop modules	
for successful promotion	• Ability of farmers to increase production within existing group under a new	
	management dispensation	
	• Ability to mobilize other members, land and adopt technology in order to	
	increase their production and sales	
	Foramation of new groups/producer organizations	
	Identification of new market opportunities	
	• Research to test, validate and release coconut products and by-products	
-	• An innovation platform for interaction among coconut value chain stakeholders	
Partners/stakeholders for	• Farmers – Members of producer organization	
scaling up and their roles	County extension staff – Capacity building	
	• Research Institutions: KALRO, Universities and the CGIAR –research into	
	new/differentiated products and capacity building	
	• NGOs – Capacity building	
	Private sector (local traders and exporters) – Targeted markets	
C: Current situation and f	uture scaling up	
Counties where already	On-going in Kilifi County	
promoted if any		
Counties where TIMPs will	All coconut producing counties including Kwale, Makueni, Tana-River, Lamu,	
be up scaled	Tharaka-Nithi, Busia and Makueni	
Challenges in development	Inactive membership in groups and/or producer organizations	
and dissemination -	Dynamics of increasing production from existing group	
	• Issues related to increasing production from expanding size of existing groups	
Suggestions for addressing	• Inactive membership in groups and/or producer organiztions:- Engage the	
the challenges	existing groups/POs using the My-Coop modulated capacity building tool	
	• Dynamics of increasing production from existing group: –Introduce an incentive	
	(monetary or otherwise) with respect to Q&Q to members within POs	
	• Issues related to increasing production from expanding size of existing groups: –	
	Assign the groups with increasing production with designated and functional	
	collectiossembly centres/points.	
Lessons learnt in upscaling	Using the My-Coop modulated tool improves understanding of the POs operational	
if any	principles and members' participation	
Social, environmental,	• Social conditions: – availability of other farmers with existing land who want to	
policy and market	join the group	
conditions necessary for	• Environmental conditions: – will follow understanding of the socio-economic	
development and upscaling	landscape of POs, improved technology and increasing number of members	
	• Policy conditions: – Policies supporting formation and functioning of producer	
	organizations internalized, ambraced and demonstrated	
	• Market conditions – new markets segmented based on coconut variety(ies) of	
D. Foonamie, conden surla	interest	
D: Economic, gender, vuin	erable and marginalized groups (VMGS) considerations	
Basic costs	Scaling up a business involves creating awareness of its products and services to its	
	nothways such as print media, social media, online marketing, information leaflets	
	and consultative stakeholder meetings. Use of road shows field demonstrations and	
	trade-fairs are also significant in reaching out to the corporate world	
	The costs for the above nathways vary with time and intensity of use but estimates	

2.11.6. An approach for developing and scaling up of a sustainable coconut enterprise		
	are provided as below (estimates done per individual/unit event);	
	• -Open days (KES 10),	
	• -Field days (KES 281),	
	• -Print media (KES 462),	
	• -Field demonstrations (KES 772),	
	• -Agricultural shows (KES 834),	
	• -Community resource persons (KES 988),	
	• -Extension visits KES 1,084), and	
	• -Farm exchange visit (KES 13,172).	
Estimated returns	• Estimated returns are projected on the assumption of the currect enterprises and	
	Assumptions: Interest rate of 12%: farm gate price of KES 12 per put KES per kuti	
	and KES 100 per litre of toddy;	
	Yield : there was no production during the first four years. The first fruits in year 5 yield 40 nuts per tree or 4920 nuts per ha and progressively rose to 12300 nuts per ha from year 6-10 peaking at 17,220 nuts per ha in year 15. Makuti yield assumed at	
	24/tree from year 3. Toddy yield was assumed at 1.5 litres/tree from 15 trees producing 6750 litres/year.	
	• Revenue : There was no revenue from year 1 to 3. Initial revenue inflow of KES.	
	29,500 is generated from makuti alone. From year 4 the revenue rose to KES 88,540 per ha and progressively increased to KES 911,140 per ha by year 15; The net present value (NPV) of Coconut was KES 2,918,004 per ha for all the	
	three products and KES 699,177 for nuts and makuti. Benefit cost ratio (BCR)	
	was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti	
	alone, and 108% with toddy production.	
Gender issues and concerns in development and	• Women participate in special commodity-based busness niches (brooms, Virgin Coconut Oil (VCO) and confectionaries, retail selling of the toddy)	
dissemination, adoption and scaling	• Women also have limited participation and influence in some of the commodity market concerns; whole-nut, copra, toddy whole-selling	
	• Limited access and control to assets, resources and services, required to join	
	Strict rules of the same (involving anotic) movement between points of supply to	
	• Strict rules of the game (involving spatial movement between points of supply to markets) for the sub-sector may limit women participation	
Gender related	• All gender groups stand to benefit with higher profit margins through collective	
opportunities	hargaining during marketing	
VMG issues and concerns	 VMCs can identify business opportunities along the value chain such as making. 	
in development and	• VMOS can identify business opportunities along the value chain such as making confectionaries making tooth-nicks door mats and carpets which have	
dissemination adoption	enormous chances for profitability and growth	
and scaling up	 VMGs also have limited participation and influence in agro-enterprise groups 	
and beaming up	• Limited access and control to assets resources and services required to join	
	agro-enterprise groups	
VMG related opportunities	 VMGs stand to benefit with higher profit margins through collective bargaining. 	
	and marketing for the special business/commodity niches	
	 Opportunities for unemployed youth in production and marketing through ICT 	
E: Case studies/profiles of	success stories	
Success stories from	None	
previous similar projects		
Application guidelines for	Training factsheets, manuals and power point slides are available	

2.11.6. An approach for developing and scaling up of a sustainable coconut enterprise		
users		
F: Status of TIMP Readine	ess (1. Ready for upscaling, 2, Requires	Requires validation
validation, 3. Requires furthe	er research)	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa	a; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org, 020202	24751
Lead	KALRO, Kengo Danda, Muniu, F. K.,	Pole, N. F., Mwalimu Menza, Stella, M. K.
organization/scientists	and Clotilda Ondiko	
Partner organizations	MoALFC	

2.11.7. Developing an online/E-Marketing platform for Coconut products and by-products		
Category (i.e. technology, innovation or management practice)	Management practice	
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Poor coconut products and by-products market performance (low market off-take) characterized by low sales volumes and low revenue collections are a result of limited information of selling outlets and their Q&Q specifications. Besides, there is also little knowledge about the available products and by-products and where to access them.	
What is it? (TIMP description)	Internet marketing refers to an online advertisement and selling approach through various digital means. These can include a variety of online platforms, tools, and content delivery systems	
Justification	Internet marketing is increasingly becoming crucial tool for agribusinesses due to its adaptability to diverse conditions and can be used for a wide range of products. Increased use of internet by consumers to purchase agricultural and non-agricultural products make it an easy channel to share information and create demand for the products at reduced marketing costs.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	Farmers, extension service providers, traders, processors, input suppliers and enablers	
Approaches to be used in dissemination	 Trainings FFBS AIP 	
Critical/essential factors for successful promotion	 A well developed, dynamic eye-catching and accessible website Good and reliable internet connection and mobile network coverage A good level of internet literacy for all the stakeholders in the coconut value chain Availability of aunthentic market related information (products and the Q&Q regimes) to be posted to the website 	
Partners/stakeholders for scaling up and their roles	 Farmers: - Coconut products' and by-products' producers; to deliver Q&Q County extension staff: - Capacity building NGOs:- Capacity building Private sector (local traders and exporters):- Buyers of coonut products and by-products Research institutions: - Research on cheap marketing options and Capacity building of stakeholders 	

2.11.7. Developing on online/E. Marketing alettern for Commutant and between the to		
2.11.7. Developing an online/E-Marketing platform for Coconut products and by-products		
C: Current situation and future scaling up		
Counties where already promoted if any	None	
Counties where TIMPs will be up scaled	All coconut producing counties including Kwale, Makueni, Tana-River, Lamu, Tharaka-Nithi, Busia and Makueni	
Challenges in development and dissemination -	 Poor internet connectivity and/or mobile phone network coverage Low digital skills of farmers Unconsolidated produce for the market Distribution of produce/products to distant or scattered consumer markets Inadequate information to stakeholders on the coconut production and marketing 	
	 and profitability Levels of policy support on internet infrastructure 	
Suggestions for addressing the challenges	• Internet connectivity – Information hubs to bridge gap in internet connection, network coverage and digital illiteracy	
	• Low digital skills of farmers – capacity building and involvement of youth in online marketing	
	• Unconsolidated produce for the market – Delivery of produce to the designated collection/distribution centers	
	 Distant consumer markets – Contracts with suppliers/transporters Inadequate information to stakeholders on the coconut production and marketing and profitability - Developing information hubs 	
	• Level of policy support – Policy support in internet infrastructure and utilization	
Lessons learnt in upscaling if any	 Requires stakeholders' involvement Remains the best cost effective option for marketing in terms of searching for market information (buyers in particular) 	
Social, environmental, policy and market conditions necessary for development and upscaling	 Social conditions: - low levels of adoption of information technology Environmental conditions: - improved internet connectivity Policy conditions: - Policy supporting information hubs 	
	Market conditions:- nign costs of information technologies	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	E-marketing requires investments in ICT tools and equipment. These may include smart phones, computer and printer including annual subscription to access some market information or strategies in selling coconut products and also buying inputs. Initial investments costs of up to KES. 150,000/= can be sufficient to set-up a platform/website for this purpose followed by an annual operational cost of averagely KES. 100,000/= for costs of accessing the internet.	
Estimated returns	It is assumed that the sales of coonut products and by-products will increase by about 20% and the inputs may decrease by 10%	
Gender issues and concerns in development and dissemination, adoption and scaling	 Women have relatively limited access to the required tools such as phones and computer than men Women are relatively illiterate to their male counterparts and therefore have limited opportunity for using ICT 	
Gender related opportunities	• Opportunities for youth to use the ICT tools since most of them are highly literate, have compatible phones and/or computers	
VMG issues and concerns in development and dissemination, adoption and scaling up	 VMGs have limited access to the required tools such as phones and computer than men VMGs are likely to be relatively more illiterate and therefore may not use the ICT 	

2.11.7. Developing an online/E-Marketing platform for Coconut products and by-products		
VMG related opportunities	• Opportunities for the VMGs since use of ICT is never labour intensive and is	
	therefore of health-friendly to them.	
E: Case studies/profiles of success stories		
Success stories from	None	
previous similar projects		
Application guidelines for	Training factsheets, manuals and power point slides are available	
users		
F: Status of TIMP Readine	ess (1. Ready for upscaling, 2, Requires Requires validation	
validation, 3. Requires furthe	er research)	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K.	
organization/scientists	and Clotilda Ondiko	
Partner organizations	MoALFC	

2.11.8. An Entrepreneurial model for Coconut products and by-products marketing	
Category (i.e. technology,	Management practice
innovation or management	
practice)	
A: Description of the techn	ology, innovation or management practice
Problem addressed	Markets and marketing are/is dynamic acros space and time. Coconut products and by-products customers range from direct consumers to industrial consumes who demand coconut products and by-products for use as inputs to their industrial operations. In which form that products and by-products are demande, quality and quantity (Q&Q) remain as the domain requirements by the the customers or markets. To respond to the Q&Q concept, farmers' and other stakeholders along the coconut value chain need to apply entrepreneurial skills as a strategy to enable them remain relevant.
What is it? (TIMP description)	An entrepreneural farmer undertakes innovations and finances it to a business venture in an effort to transform innovations into economic goods that meet targeted need in society and ultimately profit and sustainability. The background of an entrepreneurial spirit is risk taking with a positive excitation of success towards sustainability.
Justification	Farmers become entrepreneurs when business principles are applied in farming practices to make businesses successful. Production should be based on meeting a need in the market-place for demand, profitability and sustainability to be guaranteed. Developing an entrepreneurial model for coconut products and by-products marketing requires an understanding of the production and marketing landscape (the environment and the actors/stakeholders). This can be attained through consultative stakeholder meetings that link the demand and supply sides. The target in this exercise is to engage the supply side to effectively respond to the demand side.
B: Assessment of dissemination and scaling up/out approaches	
Users of MP	• Farmers,
	Market chain stakeholders
	• Extension

2.11.8. An Entrepreneurial model for Coconut products and by-products marketing		
	• NGOs	
	Researchers	
Approaches to be used in	• Trainings	
dissemination	Market visits	
	• FFBS	
	• AIP	
Critical/essential factors	Organization of farmers into formal and accessible groups	
for successful promotion	Availability of innovations	
	Access to finance	
	Availability of facilitators	
	Availability of many market actors	
	• Ability of farmers to meet Q&Q consistently	
	• Economies of scale and comparative advantage in production and marketing of	
	coconut	
	• Research to test, validate and release improved coconut varieties	
	A platform for interaction for the coconut value chain stakeholders	
Partners/stakeholders for	• Farmers – Acceptability of innovations	
scaling up and their roles	County extension staff - Facilitators	
	• NGOs – Facilitators	
	• Private sector (local traders and exporters) – Buyers	
	Research institutions – Facilitators	
C: Current situation and f	uture scaling up	
Counties where already	None	
promoted if any		
Counties where TIMPs will	All coconut producing counties including Kwale, Mombasa, Kilifi, Tana-River,	
be up scaled	Lamu, Tharaka-Nithi, Busia and Makueni	
Challenges in development	• Small and fragmented production of cocnut products and by-products	
and dissemination -	Limited entrepreneurial information	
	Limited/weak levels of policy support	
Suggestions for addressing	• Small and fragmented production of cocnut products and by-products: -	
the challenges	promotion of the POs initiative	
	• Limited entrepreneurial information:- Capacity building through exchange visits	
	• Limited/weak levels of policy support:- Interpret policy implications to the	
· · · · ·	farmer groups and POs	
Lessons learnt in upscaling	Reduced cost of production, increased profit	
Social, environmental,	• Social conditions: – Conflicts with traditional production methods and	
policy and market	perceptions	
development and upscaling	• Environmental conditions: – Controlled use of pesticides and their disposal	
development and upscamig	• Market conditions: – Respond to the Q&Q specifications for effective and	
Di Feenemie genden vuln	sustainable markets	
D: Economic, gender, vuin	erable and marginalized groups (VMGS) considerations	
Basic costs	Sensitization meetings should target cost minimization to as low as 20-25% of the	
	cost of production per acre per year.	
Estimated returns	• Under good management, returns should be within the calculated profit margins	
	per acre as shown below;	
	• Year Ito 4, revenues remain o (zero).	
2.11.8. An Entrepreneurial model for Coconut products and by-products marketing		
--	---	--
Gender issues and concerns	 Initial revenue inflow of KES. 29,500 is generated from makuti alone. From year 5 the revenue rose to KES 88,540 per ha and progressively increased to KES 911,140 per ha by year 15; The net present value (NPV) of Coconut was KES. 2,918,004 per ha for all the three products and KES 699,177 for nuts and makuti. Benefit cost ratio (BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti alone, and 108% with toddy production. Women have relatively limited entrepreneurial skills and capacity to engage in 	
in development and dissemination, adoption	 significant coconut-based businesses compared to men Women have relatively low basic business numerical skills to compete in certain 	
and scaling	coconut-based business opportunities compared to men	
	• Women are relatively low in applying for formal do not usually apply for loans that can be used to manage their businesses and increase their profits due to lack of collateral compared with men	
Gender related opportunities	Opportunities for women to venture in entrepreneurship following business basics that include financial management and records' keeping.	
VMG issues and concerns in development and dissemination, adoption and scaling up	 VMGs can identify business opportunities along the value chain such as making tooth-picks, door mats and carpets which have enormous chances for profitability and growth VMGs also have limited participation and influence in agro-enterprise groups Limited access and control to assets, resources and services, required to join agro-enterprise groups 	
VMG related opportunities	Opportunities for VMGs to venture in entrepreneurship through affirmative action funds that are given to them e.g. Uwezo fund etc.	
E: Case studies/profiles of s	success stories	
Success stories from previous similar projects	Increased income and diversification in investments	
Application guidelines for users	Training factsheets, manuals and power point slides are available	
F: Status of TIMP Reading	ess (1. Ready for upscaling, 2, Requires Available innovations are ready for	
Validation, 3. Requires furthe	upscaling	
Contacts	The Institute Director, KAI RO-Mtwana: P.O. Box 16-80109 Mtwana	
Contacts	E-mail: <u>director.icri@kalro.org</u> , 0202024751	
Lead organization/scientists	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K. and Clotilda Ondiko	
Partner organizations	MoALFC	

Researh Gaps

- Sustainability based on market prices
- Innovations for increased productivity

2.1 Agricultural Policy options and Instruments

Policy issues provide a direction towards good management practices that ensure sustainability of the value chain functions and those benefiting (individuas or the economy) from the value chain. The policy framework for the sub-sector in Kenya is vested in the Nuts and Oil crops Directorate (NOCD) which bears the regulatory mandate for the sub-sector ranging from aspects of good agricultural practice through to markets and marketing locally and internationally. In practice, there are two broad policy instruments that the NOCD has put

in place to govern the the coconut sub-sector. These are listed and their narratives provided below;

2.12 AGRICULTURAL POLICY OPTIONS INFLUENCING COCONUT ENTERPRISE

2.12.1. Regional and National Agricultural policy framework and strategies supporting the Coconut		
Category (i.e. technology	Management practice	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	The coconut sub-sector is dominated by smallholder farmers. The other actors are	
	fragmented and therefore survive at the mercy of middlemen, brokers and	
	processors including foreign wholesalers and retailers. Primary producers are	
	therefore price-takers. There is little feel and impact of the policy framework at the	
	primary stakeholder level.	
What is it? (TIMP	Regional, National Agricultural policy framework includes policies, regulations and	
description)	laws that control and regulate the coconut value chain business that is dominated by	
Instification	Agricultural policy instruments, and regulations affect the account value chain	
Justification	actors differently There is thus need to formulate/review friendly policies, educate	
	farmers and other stakeholders on the same with reference to the coconut products	
	and by-products business. Agricultural policy making in Kenya is long and tideious.	
	Some of the policies are conflicting and do not meet the indented policy objectives	
	and goals. Therefore the need to review and propose adjustments of the same for	
	value chain actors	
B. Assessment of disseming	value chain actors.	
Lisers of TIMP		
	Farmers Delicy makers	
	 Traders-wholesalers retailers importers exporters 	
	 Processing industries 	
	• Extension	
	NGOs	
	Research institutions	
	Regulatory institutions	
Approaches to be used in	Meetings including policy advocators	
dissemination	• Radio	
	• Television	
	Digital platforms	
	Earmers' groups	
	• FFBS	
	• AIP	
Critical/essential factors	Positive response of the coconut products and by-products stakeholders	
for successful promotion	Research to test, validate and release improved coconut varieties	
	A platform for interaction in coconut value chain stakeholders	
Partners/stakeholders for	• Farmers:- Demanding coconut value chain policies to support production and	
	marketing	

2.12.1. Regional and National Agricultural policy framework and strategies supporting the Coconut		
sub-sector		
scaling up and their roles	Processors- demand favorable policies	
	 Iraders (Exporters, wholesalers and retailers):- demand favorable policies National and County extension staffy. Someitization and intermetation of policies 	
	• National and County extension starr Sensitization and interpretation of policies to farmers	
	 NGOs:- Sensitization and interpretation to farmers 	
	 Private sector (wholesalers, retailers and exporters) – Demanding coconut value 	
	chain policies to support production and marketing	
	• Research institutions:- Recommend, sensitize and interpret policies to	
	stakeholders	
	Policy makers – Assist in policy making and interpretation	
C: Current situation and f	ature scaling up	
Counties where already		
promoted if any		
Counties where TIMPs will	All coconut growing counties	
Challen and in development		
and dissemination -	• Value Chain : The Coconut products and by-products yields remain low and total domestic production is unable to satisfy demand by manufacturers leading	
	to growing imports of raw materials	
	 Consumption- Low domestic consumption 	
	• Standards: International quality standards are high. No certification in most	
	segments of the coconut value chain.	
	• Aggregation: Aggregation of coonut products and by-products centres are not	
	well regulated due to lack of or weak POs.	
	• Financial Incentives: Financial support is concentrated to to upstream value	
	chain actors like exporters but primary producers are not fully covered and if	
Suggestions for addressing	• Value Chain: Increase yields and production through training on GAP (ag better	
the challenges	seeds, irrigation, and CSA management practices including post-harvest).	
	Develop targeted incentives to encourage stronger engagement of producers by	
	both upstream and downstream actors.	
	• Standards: Existing coonut products and by-products standards could be	
	harmonized with regional and international ones. Train farmers on quality	
	standards	
	• Aggregation: Partnerships between farmer cooperatives and coconut products and by products producers and other upstream value chain actors can strengthen	
	market linkages set guaranteed prices for farmers and enable access to resilient	
	high-vielding seeds and other climate-smart inputs.	
	• Financial Incentives : Financial incentives can be given to coconut products	
	primary producers and other actors who are constrained with investment funds.	
Lessons learned in		
upscaling if any		
Social, environmental,	• Social conditions – The number and acreage under coconut is increasing and	
policy and market	also the number of actors is on the rise Environmental conditions. The the error is found with pasts and discourse of	
development and up-	• Environmental conditions – The the crop is faced with pests and diseases use of pesticides should be properly done. Organically produced puts can have a	
scaling	special market niche and fetch higher prices	
	 Policy conditions – Lacking specific coconut policy 	

2.12.1. Regional and National Agricultural policy framework and strategies supporting the Coconut sub-sector

	Market conditions - Poor market infrastructure	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	These review may require a series of consultative meeting and reporting of stakeholders in coconut value chain. Estimated costs of policy review costs are about KES. 50,000/=	
Estimated returns	The returns may include favourable production and marketing of coconut products and by-products which may increase by over 20%	
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 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 youth and women in policy development forums at all levels Inadequate representation of youth and women in the policy of validation process 	
vivio related opportunities	products and by-products for increased incomes and employment creation	
E: Case studies/profiles of success stories		
Success stories from previous similar projects		
Application guidelines for users	Training factsheets, manuals and power point slides	
F: Status of TIMP Reading	ness (1. Ready for upscaling, 2, Some Requires validation and upscaling	
Requires validation, 3. Requires further research)		
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa E-mail: <u>director.icri@kalro.org</u> , 0202024751	
Lead organization and scientists	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K. and Clotilda Ondiko	
Partner organizations	MoALDF	

Gaps for further research

- Adoption of policies
- Equity distribution among the stakeholders
- Productivity levels among the smallholder farmers of the coconut vlue chain
- Farmer accessibility to production inputs
- Impact on coconut products and by-products' prices

2.12.2. Policy options influencing coconut products and by-products producers and other actors		
Category (i.e. technology,	Management practice	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	There are diverse policy options influencing production, processing and marketing	

2.12.2. Policy options influencing coconut products and by-products producers and other actors		
	of coconut products and by-products. Some of the existing policies are conflicting and therefore need proper interpretation to stakeholders. Poor understanding/uptake of the policy framework has led to limited competitiveness of the coconut value chain products and by-products.	
What is it? (TIMP description)	The policies being highlighted for recommendation herein are for the purpose of regulating the value chain from a market focus so as to respond to issues of $\Omega \& \Omega$	
Justification	There is so far no elaborate understanding and/or significant existence of friendly promotional policies for the coconut value chain products, by-products and processes. Production, processessing and trade policies with catchy incentives that enhance stakeholder participation and business growth need to be put in place and promoted.	
B: Assessment of dissemina	ation and scaling up/out approaches	
Users of TIMP	 Farmers Traders (exporters, wholesalers and retailers) Processing industries Extension NGOs Research institutions Policy makers 	
Approaches to be used in dissemination	 Meetings Radio Television Digital platforms Farmers' groups FFBS AIP 	
Critical/essential factors for successful promotion	 Availability of stakeholders Availability of agricultural policies and specific coconut-based policies Issues in the coconut products and by-products business along value chain Specific policy objective statement Research to test, validate and release improved/emerging coconut products and by-products A platform for interaction in the coconut value chain stakeholders 	
Partners/stakeholders for scaling up and their roles	 Farmers:- Demanding the coonut value chain policies to support production and marketing County extension staff:- Sensitization and interpretation of policies to farmers NGOs:- Sensitization and interpretation of policies to farmers Private sector (local traders and exporters):-Demanding the coonut value chain policies to support production and marketing Research institutions - recommend, interpret ans sensitize stakeholders 	
C: Current situation and fu	uture scaling up	
Counties where already promoted if any	None	
Counties where TIMPs will be up scaled	All coconut growing counties	
Challenges in development and dissemination -	 Limited aggregation models for products and by-products Disorganized and fragmented farmer population 	

2.12.2. Policy options influencing coconut products and by-products producers and other actors		
	 Small-scale and uneconomical farming units Inadequate information to stakeholders on the agricultural policies whether National or County Poorly established coconut value chain 	
	Coconut production is specific to agro-ecological zones in Kenya	
Suggestions for addressing the challenges	 Poor aggregation models-favorable polies for aggregators Disorganized and fragmented farmer population:- Formation of producer organizations as focal institutions for learning and technology transfer Small-scale farming:- Policies for increasing productivity Inadequate information to stakeholders on the agricultural policies whether National or County:- Interpretation and sensitization of stakeholders on existing policies Poorly established coconut value chain:- strengthening the coconut value chain through establishment of POs Coconut production is specific to agro-ecological zones and not all the Counties in Kenya: Further research on adaptable varieties for other agro-ecological zones 	
Lessons learned in upscaling if any	None	
Social, environmental, policy and market conditions necessary for development and up- scaling	 Social conditions - Acceptability of the policies Environmental conditions - lack of a comprehensive land use policy Policy conditions - Lack of specific policies for coconut products and by-products Market conditions - Poor market infrastructure 	
D: Economic, gender, vuin	erable and marginalized groups (VMGs) considerations	
Basic costs	 These review may require a series of consultative meeting and reporting of stakeholders in coconut value chain. Estimated costs of taking a policy recommendation through to interpretation/validation is proposed to be KES. 150,000/= Policy options aim at having high coconut production with good returns. The yield 	
	levels should increase from the current level by about 10-20%	
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 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 youth and women in policy development forums at all levels Inadequate representation of youth and women in the policy of validation process 	
VMG related opportunities	Opportunities for VMGs participation in all levels of policy formulation since there is a policy framework to support their participation	
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	

2.12.2. Policy options influencing coconut products and by-products producers and other actors		
F: Status of TIMP Readiness (1. Ready for upscaling, 2, Requires validation		
Requires validation, 3. Requires further research)		
G: Contacts		
Contacts	The Institute Director, KALRO-Mtw	wapa; P.O. Box 16-80109, Mtwapa
	E-mail: director.icri@kalro.org, 020	02024751
Lead organization and	KALRO, Kengo Danda, Muniu, F.	. K., Pole, N. F., Mwalimu Menza, Stella, M. K.
scientists	and Clotilda Ondiko	

Partner organizations GAPS

1

Unfavorable policy options •

Further research

- Adoption of policy options •
- Equity distribution among the stakeholders •

MoALDF

- Productivity levels among the smallholder farmers •
- Farmer accessibility to production inputs •

2.12.3. Policy Instruments	s influencing the Coconut value chain	
Category (i.e. technology,	Management practice	
innovation or management		
practice)		
A: Description of the techn	ology, innovation or management practice	
Problem addressed	Failure to achieve policy objectives due to unfavorable instruments and regulations.	
	Poor administration or lack of implementation of policy instruments affects coconut	
	producers and other actors along the value chain unfavourably	
What is it? (TIMP	Policy instruments are the means to achieve policy objectives.	
description)		
Justification	There are strategies, techniques and methods used by the government to achieve	
	policy objectives and goals. Policy instruments may result in desired or unfavorable	
	results. This may require adjustments or reviewing of the policies.	
B: Assessment of dissemina	ntion and scaling up/out approaches	
Users of TIMP	• Farmers	
	Community advocacy groups	
	• Traders	
	Processing industries	
	• Extension	
	• NGOs	
	Research institutions	
	Policy makers	
Approaches to be used in	• Meetings	
dissemination and	Radio	
administration	• Television	
	Digital platforms	
	• Farmers' groups	
	• FFBS	
	• AIP	
Critical/essential factors	Availability of policy objectives	

2.12.3. Policy Instruments influencing the Coconut value chain		
for successful promotion	Availability of policy instruments	
	• Research to test, validate and release/recommend workable instruments for the	
	coconut value chain	
	A platform for interaction for the coconut value chain stakeholders	
Partners/stakeholders for	• Farmers:- beneficiaries of policy instruments	
scaling up and their roles	• County extension staff:- policy interpretation and sensitization of farmers	
	NGOs:- Sensitization of farmers	
	• Private sector (local traders and exporters):- beneficiaries	
	• Research institutions: – evaluation of the policies and sensitization of	
	stakeholders on what works well	
C: Current situation and f	uture scaling up	
Counties where already	None	
promoted if any		
Counties where TIMPs will	All coconut growing counties	
be up scaled		
Challenges in development	Disorganized and fragmented farmer population	
and dissemination -	Small-scale and uneconomical farming units	
	• Inadequate information to stakeholders on the agricultural policies whether	
	National or County	
	Poorly established coconut value chain	
	• Coconut production is specific to agro-ecological zones in Kenya	
Suggestions for addressing	• Disorganized and fragmented farmer population:- Formation of producer	
the challenges	organizations as focal institutions for learning and technology transfer	
	Small-scale farming:- Policies for increasing productivity	
	• Inadequate information to stakeholders on the agricultural policies whether	
	National or County:- Interpretation and sensitization of stakeholders on existing	
	policies	
	• Poorly established coconut value chain:- strengthening the coconut value chain	
	through establishment of POs	
	• Coconut production is specific to agro-ecological zones and not all the Counties	
	in Kenya: Further research on adaptable varieties for other agro-ecological zones	
Lessons learned in	None	
upscaling if any		
Social, environmental,	• Social conditions – Low understanding of policy instruments	
policy and market	• Environmental conditions – lack of a comprehensive land use policy and an	
conditions necessary for	inclusive adaptation research for coconut	
development and up-	• Policy conditions – Limited policy instruments which the target recipients are	
scamg	not aware of	
	Market conditions - Poor market infrastructure	
D: Economic, gender, vulnerable and marginalized groups (VMGs) considerations		
Basic costs	The cost elements include Literature review, stationary, among others. Review	
	costs is estimated at KES 50,000 per policy instrument	
Estimated returns	Coconut production has good returns.	
	• Under good management, returns should be within the calculated profit margins	
	per acre as shown below;	
	• Year 1to 4, revenues remain o (zero).	
	Initial revenue inflow of KES. 29,500 is generated from makuti alone. From year 5	
	the revenue rose to KES 88,540 per ha and progressively increased to KES 911,140	

2.12.3. Policy Instruments influencing the Coconut value chain		
	per ha by year 15; The net present value (NPV) of Coconut was KES. 2,918,004 per ha for all the three products and KES 699,177 for nuts and makuti. Benefit cost ratio	
	(BCR) was 6.2; the internal rate of return (IRR) was about 54% for nuts and makuti	
	alone, and 108% with toddy production.	
Gender issues and concerns	• Inadequate representation of youth and women in policy development forums at	
dissemination adoption	all levels	
and scaling	• Inadequate representation of youth and women in the policy of validation process	
Gender related	Opportunities for adequate youth representation in the policy formulation and	
opportunities	validation process if they focus and strategize well	
VMG issues and concerns	• Inadequate representation of youth and women in policy development forums at	
in development and	all levels	
dissemination, adoption	• Inadequate representation of youth and women in the policy of validation	
and scaling up	process	
VMG related opportunities	Opportunities for VMGs participation in all levels of policy formulation since there	
	are policy frameworks to support their participation	
E: Case studies/profiles of success stories		
Success stories from	None	
previous similar projects		
Application guidelines for	Training factsheets, manuals and power point slides are available	
users		
F: Status of TIMP Readiness (1. Ready for upscaling, 2, Requires validation		
Requires validation, 3. Requires further research)		
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16-80109, Mtwapa	
	E-mail: director.icri@kalro.org, 0202024751	
Lead organization and	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K.	
scientists	and Clotilda Ondiko	
Partner organizations	MoALFC	

GAPS

- There are conflicting policy instruments
- There are no efforts to interpret policies at farm level
- Non-implementation of some policy instruments
- Validation of policy instruments
- Equity distribution among the stakeholders
- Farmer accessibility to production inputs markets
- Farmers accessibility to output markets

2.12.4. Policy cycle process and implementation at county level for the Coconut value chain		
Category (i.e. technology,	Management practice	
innovation or management		
practice)		
A: Description of the technology, innovation or management practice		
Problem addressed	The coconut value chain todate operates or is managed under traditional systems with	
	a local market focus. There are so far no standards regulated by statutes. Some	
	policies may exist but are little know along the value chanin actors. There is so far no	
	common agenda understanding for the coconut value chain business and marketing	

2.12.4. Policy cycle process and implementation at county level for the Coconut value chain	
	and this state of the art influences market access and overall comtetiveness of the value chain
What is it? (TIMP description)	The policy cycle creates the need for a policy based on the agricultural problem emergence/issues. The policy cycle is an idealized process that explains how policy should be drafted, implemented and assessed. It serves more as an instructive guide for those new to policy than as a practical strictly-defined process, but many organizations aim to complete policies using the policy cycle as an optimal model. The policy cycle is usually divided into five stages: agenda setting, formulation, implementation, and evaluation
Justification	Policy cycle is a valuable device for new policy development. It is a tool which divides complex procedures into convenient and manageable steps. These individual steps provide a frame work and antedates any forthcoming issues related to policy development.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	 Farmers Traders Processing industries Extension NGOs Research institutions
Approaches to be used in dissemination	 Meetings Radio Television Digital platforms Internet Farmers' groups FFBS AIP
Critical/essential factors for successful promotion	 Availability of stakeholders Step by step approach for understanding the problem by stakeholders, policy formulation, implementation and evaluation Research to test, validate and release improved the impct of the policy on the coconut value chain A platform for interaction the coconut value chain stakeholders
Partners/stakeholders for scaling up and their roles	 Farmers – generate issues County extension staff - capacity building NGOs – capacity building Private sector (local traders and exporters) – generate issues Research institutions – capacity building Policy makers
C: Current situation and fu	ature scaling up
Counties where already promoted if any	
Counties where TIMPs will be up scaled	All coconut growing counties
Challenges in development and dissemination -	 Disorganization and fragmented farmer population Small-scale and uneconomic farming units

2.12.4. Policy cycle process and implementation at county level for the Coconut value chain	
	Inadequate information to stakeholders on issues
	Poorly established coconut value chain
Suggestions for addressing	• Disorganization and scattered farmers:- issues on formation of producer
the challenges	organizations as an institution
	Small-scale farming:- promote/enhance aggregation efforts
	• Inadequate information to stakeholders:- Sensitization on the roles of each
	policy cycle stages
	• Poorly established coconut value chain:- strengthening te coconu value chain
Tanana la sur a l'u	through formation of POs
Lessons learned in	
Social, environmental,	• Social conditions:- Diversity of issues among the coonut value chain actors
policy and market	• Environmental conditions:- environmental issues
development and up	• Policy conditions – Lack of elaborate efforts to share policy concers and issues
scaling	with coconut value chin stakeholders
	• Market conditions – Market issues
D: Economic, gender, vuln	erable and marginalized groups (VMGs) considerations
Basic costs	Total variable costs include; consultative meetings, and KII., stationery, stationery
	The estimated costs for policy implementation (sensitization, interpretation and
	advocacy) 18 KES 100,000/=.
Estimated returns	The returns may include favourable production and marketing of coconut products
	and by-products which may increase by over 20%
Gender issues and concerns	• Inadequate representation of youth and women in policy development forums at
in development and	all levels
dissemination, adoption	• Inadequate representation of youth and women in the policy of validation
and scaling	process
Gender related	Opportunities for adequate youth representation in the policy formulation and
opportunities	validation process if they focus and strategize well
VMG issues and concerns	• Inadequate representation of youth and women in policy development forums at
in development and	all levels
dissemination, adoption	• Inadequate representation of youth and women in the policy of validation
and scaling up	process
VMG related opportunities	Opportunities for VMGs participation in all levels of policy formulation since there
	are policy frameworks to support their participation
E: Case studies/profiles of	success stories
Success stories from	None
previous similar projects	
Application guidelines for	Training factsheets, manuals and power point slides are available
users	
F: Status of TIMP Readi	ness (1. Ready for upscaling, 2, Requires validation
Requires validation, 3. Requires further research)	
G: Contacts	1
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email:
	director.icri@kalro.org, Phone: 0712557178
Lead organization and	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K.
scientists	and Clotilda Ondiko
Partner organizations	MoALFC

GAPS

• Low integration of policy ate county level

Further research

- Integration coconut policy at county levels
- Impact on the new policy on coconut products and by-products production and marketing

2.12.5. Policy validation customization for the coconut value chain	
Category (i.e. technology, innovation or management practice)	Management practice
A: Description of the techn	ology, innovation or management practice
Problem addressed	Limited policy framework and low understanding of the policy implications among coconut products and by-products stakeholders. There are also conflicting policy instruments in the coconut value chain which need ellabotae interpretation.
What is it? (TIMP description)	A policy validation cycle involves an existing agricultural policy, database and stakeholders.
Justification	To reduce costs in developing a new policy, policy validation cycle is useful.
B: Assessment of dissemina	ntion and scaling up/out approaches
Users of TIMP	 Farmers, traders Importers and exporters Processing industries Extension NGOs Research institutions
Approaches to be used in dissemination	 Meetings Radio Television Digital platforms Internet Farmers' groups FFBS AIP
Critical/essential factors for successful promotion	 Availability of stakeholders Availability and knowledge of agricultural policies Certification of products along the value chain A platform for interaction in the coconut value chain stakeholders
Partners/stakeholders for scaling up and their roles	 Farmers – provide database and target areas/stakeholders County extension staff - data collection NGOs – provide data Private sector (local traders and exporters) – provide data Research institutions – analysis and recommendations
C: Current situation and fu	iture scaling up
Counties where already promoted if any	None
Counties where TIMPs will be up scaled	All coconut growing counties
Challenges in development	Disorganization and fragmented farmer populaion

2.12.5. Policy validation customization for the coconut value chain	
and dissemination -	Small-scale and uneconomica farming units
	Poorly established coconut value chain
Suggestions for addressing	• Disorganization and scattered farmers – information on application of the policy
the challenges	• Small-scale farming – information on economic production levels
	• Poorly established coonut value chain – strengthening the coconut value chain
Lessons learned in	None
upscaling if any	
Social, environmental,	• Social conditions – lack of information on policy validation procedures
policy and market	• Environmental conditions – lack of a comprehensive land use policy
conditions necessary for	• Policy conditions – Lacking specific coconut products and by-products
development and up-	production and business
scaling	Market conditions – lack of information
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations
Basic costs	• The inputs required for validation include consultative meetings, Key informant
	interviews, stationery and documentation costs
	 Policy validation cost can range between KES 50,000 to 100,000/=
Estimated returns	Revenue : Favourable policies that will increase productivity and price by at least 10-20%
Gender issues and concerns	• Inadequate representation of youth and women in policy development forums at
in development and	all levels
dissemination, adoption	• Inadequate representation of youth and women in the policy of validation
and scaling	process
Gender related	• Opportunities for adequate youth representation in the policy formulation and
opportunities	validation process if they focus and strategize well
VMG issues and concerns	• Inadequate representation of youth and women in policy development forums at
in development and	all levels
and scaling up	• Inadequate representation of youth and women in the policy of validation
VMC related are arturities	
v MG related opportunities	• Opportunities for VMGs participation in all levels of policy formulation since there is a policy framework to support their participation
E: Case studies/profiles of s	success stories
Success stories from	None
previous similar projects	
Application guidelines for	Training factsheets, manuals and power point slides are available
users	
F: Status of TIMP Reading	ness (1. Ready for upscaling, 2, Requires validation
Requires validation, 3. Requires further research)	
G: Contacts	
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email: director.icri@kalro.org, Phone: 0712557178
Lead organization and	KALRO, Kengo Danda, Muniu, F. K., Pole, N. F., Mwalimu Menza, Stella, M. K.
scientists	and Clotilda Ondiko
Partner organizations	MoALFC
~ ~	

GAPS

Low implementation of developed policesNegative impacts of policies on the farming communities

Reference

• Impact of validated policies (Nyongesa D., 2021)

2.12.6. Registration and l	icensing of functional stakeholsers and stakeholders' operations
Category (i.e. technology, innovation or management	Management practice
practice)	
A: Description of the mana	gement practice
Problem addressed	Seed sources and overall functions of the coconut value chain have followed a traditional system with no scientific backstopping. This has led to lack of or limited standards in production patterns for the value chain products and by-products. The emerging consequences include limited competitive market advantage of coconut products and by-products in the local and international markets.
What is it? (MP description)	Registration of all coconut growers and/or post-harvest functions provides an opportunity for an official recognition of the growers and/or actors by the Nuts and Oil Crops Directorate herein being the Authority for support in areas of technical backstopping, market linkage and/or financial facilitation by means of linkage with financial institutions or agencies. The policy focuses on regulating establishment of cocnut seedling nurseries, issuance of commercial nursery licenses, mother plants/ mother block registration, registration and licensing of traders, retailers, transporters, marketing agents, warehousemen and distributors and registration and licensing of importers and ex-porters. It further guides on applications for approval to establish a manufacturing facility, issuince of manufacturing licenses as well as renewal of licenses.
Justification	Existence of a traditional approach to seed sources and overall management practices of the coconut value chain has led to led to a concsequential existence of inferior products that do not meet global standards. The emerging consequences include a limited competitive advantage of coconut products and by-products in the local and international markets. Registration and licensing of functional stakeholsers and stakeholders' operations therefore provides a strategic means for traceability of all products that penetrate the different market levels and consumption niches.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of the MP	
	 Painters Policy makers Traders Processing industries Extension NGOs Research institutions
Approaches to be used in dissemination	 Meetings with stakeholders Radio Television Digital platforms Internet Farmers' groups FFBS AIP
Critical/essential factors for successful promotion	 Availability of stakeholders Team spirit among stakeholders Producer awareness and interest in the policy making process

2.12.6. Registration and licensing of functional stakeholsers and stakeholders' operations	
Partners/stakeholders for scaling up and their roles	 Availability of specific coconut-based policies Research to test, validate and release improved coconut varieties A platform for stakeholder interaction along the coconut value chain Farmers – Aware and demanding coconut policies to support production and marketing County extension staff – Sensitization of farmers NGOs – Sensitization of farmers Private sector (local traders and exporters) – Demanding coconut policies to support production and marketing Research institutions – Sensitization of stakeholders Policy makers – Assist in policy making
C: Current situation and fu	uture scaling up
Counties where already promoted if any	Kwale, Mombasa and Kilifi (to some extent)
Counties where TIMPs will be up scaled	All coconut growing counties (Kwale, Mombasa, Kilifi, Lamu, Tana-River, Taita- Taveta, Tharaka-Nithi and Busia among other emerging ones)
Challenges in development and dissemination	 Value Chain: Coconut is produced in small scale systems often of mixed cropping in the early growing years (before the 5th to 6th). It is prone to poor soils (with inherently low depth), termites and prolonged drought. The enterprise is also managed under traditional low input regimes and therefore does not realize its full potential in terms of production and productivity. Standards: Existing standards at the production level may not be known by most of the coonut producers and hence not widely adopted. This is further complicated by the low volumes produced and lack of aggregation Aggregation: Aggregation models exist in coonut value chain where farmers have ascribed to or are members of producer organizations such as cooperatives particularly for the whole nut. Even with on-going renewed efforts on products' (whole nut and copra) aggregation, farmers are often not receptive due to previous bad experiences particularly on organizational issues and marketing. Financial Incentives: Coconut production has for long followed traditional production systems with barely no financial support/incentives to farmhouseholds growing and/or managing coconut orchards. In summary there are no elaborate subsidies that translate to financial incentives to the sub-sector so far that can stimulate business growth at grass-root level.
Suggestions for addressing the challenges	 Value Chain: Mobilize farmers to form commodity-based producer organizations that respond to the markets on a Q&Q basis. Standards: The concept of standards needs to be addressed from the seed selection stage through adoption of GAP that respond to aspects of Q&Q as well as food and environmental safety through the coordination of the relevant institutions across the sub-sector. Aggregation: Establishment of producer organizations (POs) and/or farmer associations/cooperatives targeting coconuts production and warehousing can strengthen market linkages, set guaranteed prices for farmers. Financial Incentives: A conditional subsidy facility needs to put in place to producer organizations and licensed business operators. Underlying conditions for the facility need to based on minimum entry requirements such as size of the orchard and acceptance to ascribe to all the required production standards for quality assurance for coconut products and by-products
Lessons learnt in upscaling	None

if any	
 Social, environmental, policy and market conditions necessary for development and upscaling Environmental conditions – Plant se establishment Policy conditions – Implementation of coconut production and marketing Market conditions – Improved market 	eed to be of high productivity for the toddy eedlings/nuts in marshy areas for good E existing policies and standards relating to tet infrastructure and linkages to distant
markets and product aggregation to h economies of scale	high volumes to enable benefiting from
D: Economic, gender, vulnerable and marginalized groups (VMGs) c	considerations
Basic costsThe cost sensitization of stakeholders to ful at KES. 250,000/= in order to reach out to a	a good representation of the policy is estimated
Estimated returns Good advocacy and full domestication of coconut value chain by 15-20%.	of the policy can increase returns of the
 Gender issues and concerns in development and dissemination, adoption and scaling Inadequate representation of youth and all levels Inadequate representation of youth a process 	d women in policy development forums at and women in the policy of validation
Gender related Opportunities for adequate youth represe opportunities validation process if they focus and strategi	sentation in the policy formulation and gize well
VMG issues and concerns in development and dissemination, adoption and scaling upInadequate representation of the VMGs in p	policy development forums at all levels
VMG related opportunities A policy framework to support VMGs' par Efforts to replicate the same to the coconut	rticipation exists for all sectors and levels. t sub-sector need to be actualized
E: Case studies/profiles of success stories	
Success stories from previous similar projectsNone	
Application guidelines for Training factsheets, manuals and power point users	pint slides
F: Status of TIMP Readiness (1. Ready for upscaling, 2, Requires Requires validation and upscaling validation, 3. Requires further research)	
G: Contacts	
Contacts The Institute Director, KALRO-Mtwapa; director.icri@kalro.org, Phone: 071255717	; P.O. Box 16. 80109; Mtwapa, Email: 78
LeadKALRO, Kengo Danda, Muniu, F. K., Poorganization/scientistsand Clotilda Ondiko	ole, N. F., Mwalimu Menza, Stella, M. K.
Partner organizations MoALFC	

- Researh Gaps
- Adoption of policies
- Equity distribution among the stakeholders
- Productivity levels among the smallholder farmers of coconut
- Farmer accessibility to production inputs
- Impact on coconut prices

2.12.7. Regulation of Coconut production, processing and market provisions for coconut products,	
by-products and processes	
Category (i.e. technology,	Management practice
innovation or management	
A: Description of the mana	egement practice
Problem addressed	Extensive use of traditional practices in production, processing and marketing which
	international markets. This has consequently led the sub-sector to contribute
	insignificantly to the gross domestic product from agriculture
What is it? (MP	This policy instrument provides a roadman for promotion of products' standards
description)	through certification of seed sources and the seed, certification of nurseries and
	mother blocks, regulating contracts between producers and dealers/processors.
	regulating processing functions and setting a background for products' traceability.
	It basically covers aspects of good agricultural practices (GAP) including pesticides'
	and soil fertility ammendments' use so as to conform to high-end markets
	specifications and/or standards. Other issues of concern that the policy instrument/s
	facilitates are food and environmental safety.
Justification	The policy instrument provides a framework for product promotion for its
	competitive advantage on issues of quantity and quality alongside a need for
	direction for issues related to field inspection, buying and selling arrangements, the
	heter line for this policy instrument is to enhance product competitive advantage
	as well as expansion of business/market opportunities which are currently low
	Marginal returns from the marginal efforts (with related costs) need to be positive
	and growing.
B: Assessment of dissemina	ation and scaling up/out approaches
Users of TIMP	• Farmers
	Policy makers
	• Traders
	Processing industries
	• Extension
	• NGOs
	Research institutions
Approaches to be used in	• Meetings
dissemination	Radio
	Television
	Digital platforms
	• Internet
	• Farmers' groups
	• FFBS
	• AIP
Critical/essential factors	• Availability of stakeholders
for successful promotion	I eam spirit among stakeholders
	Producer awareness and interest in the policy making process
	Availability of specific coconut-based policies A platform for stakeholder interaction along the approximation along the approximation of the second technic specific second technic second tech
Dorthora/ataliahaldara for	A platform for stakenoider interaction along the coconut value chain
ranners/stakenolders lor scaling up and their roles	• Farmers – Aware and demanding coconut policies to support production and
scanng up and men 10108	паксинд

2.12.7. Regulation of Coconut production, processing and market provisions for coconut products,	
by-products and pro	
	• County extension staff – Sensitization of farmers
	• NGOs – Sensitization of farmers
	• Private sector (local traders and exporters) – Demanding coconut policies to
	support production and marketing
	Research institutions – Sensitization of stakeholders
	Policy makers – Assist in policy making
C: Current situation and f	iture scaling up
Counties where already	Kwale, Mombasa and Kilifi (to some extent)
promoted if any	
Counties where TIMPs will	All coconut growing counties (Kwale, Mombasa, Kilifi, Lamu, Tana-River, Taita-
be up scaled	Taveta, Tharaka-Nithi and Busia among other emerging ones)
Challenges in development	• Value Chain: Coconut is produced in small scale systems often of mixed
and dissemination	cropping in the early growing years (before the 5th to 6th). It is prone to poor soils (with inherently low depth), termites and prolonged drought. The enterprise
	is also managed under traditional low input regimes and therefore does not realize its full potential in terms of production and productivity.
	• Standards: Existing standards at the production level may not be known by
	most of the coonut producers and hence not widely adopted. This is further
	complicated by the low volumes produced and lack of aggregation
	• Aggregation: Aggregation models exist in coonut value chain where farmers
	have ascribed to or are members of producer organizations such as cooperatives
	particularly for the whole nut. Even with on-going renewed efforts on products'
	(whole nut and copra) aggregation farmers are often not receptive due to
	previous had experiences particularly on organizational issues and marketing
	• Financial Incentives: Coconst production has for long followed traditional
	• Financial incentives. Coconut production has for long followed traditional
	production systems with barery no inflancial support/incentives to farm-
	nousenoids growing and/or managing coconut orchards. In summary there are no
	elaborate subsidies that translate to financial incentives to the sub-sector so far
	that can stimulate business growth at grass-root level.
Suggestions for addressing the challenges	• Value Chain: Mobilize farmers to form commodity-based producer organizations that respond to the markets on a Q&Q basis.
	• Standards: The concept of standards needs to be addressed from the seed
	selection stage through adoption of GAP that respond to aspects of Q&Q as well
	as food and environmental safety through the coordination of the relevant
	institutions across the sub-sector.
	• Aggregation: Establishment of producer organizations (POs) and/or farmer
	associations/cooperatives targeting cocoputs production and warehousing can
	strengthen market linkages, set guaranteed prices for farmers
	Financial Incentives: A conditional subsidy facility needs to put in place to
	• Financial incentives. A conditional subsidy facility needs to put in place to producer organizations and licensed business operators. Underlying conditions
	for the facility need to based on minimum entry requirements such as size of the
	orchard and accentones to accribe to all the required production stordards for
	orchard and acceptance to ascribe to an the required production standards for
Lessons la surt in 1'	quanty assurance for coconut products and by-products
Lessons learnt in upscaling	INONE
11 any	
Social, environmental,	• Social conditions – Traditional farming of coconut including use of varieties of
policy and market	low productivity and nutritional value
conditions necessary for	• Environmental conditions – Plant in areas not prone to weevil infestation. As a

2.12.7. Regulation of Coconut production, processing and market provisions for coconut products,		
by-products and pro	by-products and processes	
development and upscaling	 good cover crop, coconut is well adapted to both high and low rainfall areas Policy conditions – Implementation of existing policies and standards relating to coconut production and marketing Market conditions – Improved market infrastructure and linkages to distant markets; high volumes to benefit from economies of scale 	
D: Economic, gender, vulne	erable and marginalized groups (VMGs) considerations	
Basic costs	The cost validating this policy arise from consultative meetings with stakeholders across the products and by-products range. A sensitization and interpretation meeting to the stakeholders. A basic cost of KES 250,000/= is estimated to jump-start domestication of the policy ramework.	
Estimated returns	Good advocacy and full domestication of the policy can increase returns of the coconut value chain by 25-30%.	
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 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	There is inadequate representation of the VMGs in policy development forums at all levels	
VMG related opportunities	A policy framework to support VMGs' participation exists for all sectors and levels. Efforts to replicate the same to the coconut sub-sector need to be actualized	
E: Case studies/profiles of s	success stories	
Success stories from previous similar projects	None	
Application guidelines for users	Training factsheets, manuals and power point slides	
F: Status of TIMP Readin Requires validation, 3. Requi	ness (1. Ready for upscaling, 2, Requires validation and upscaling irres further research)	
G: Contacts		
Contacts	The Institute Director, KALRO-Mtwapa; P.O. Box 16. 80109; Mtwapa, Email: director.icri@kalro.org, Phone: 0712557178	
Lead organization/scientists	KALRO, Kengo Danda, Muniu, F.K., Pole, N.F., Mwalimu Menza, Stella, M.K. and Clotilda Ondiko	
Partner organizations	MoALFC	

Research Gaps

- Adoption of policies
- Equity distribution among the stakeholders
- Productivity levels among the smallholder farmers of coconut
- Farmer accessibility to production inputs
- Impact on coconut products, by-products prices





National Agricultural and Rural Inclusive Growth Project (NARIGP), P.O. Box 8073-00200 Nairobi, Kenya Capitol Hill Towers, 5th Floor, Cathedral Road Website: www.narigp.go.ke