Fruits of our toil
Increasing agricultural productivity and incomes of smallholder farmers in Kenya

Kenya Agricultural Productivity Programme
THE WORLD BANK
REPUBLIC OF KENYA
Fruits of our toil

Increasing agricultural productivity and incomes of smallholder farmers in Kenya
# Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABDC</td>
<td>Agribusiness Development Centre</td>
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<tr>
<td>AI</td>
<td>Artificial Insemination</td>
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<td>AIRC</td>
<td>Agricultural Information Resource Centre</td>
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<td>AIV</td>
<td>African Indigenous Vegetable(s)</td>
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<td>AKIT</td>
<td>Agricultural Knowledge Information and Technology</td>
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<td>APL</td>
<td>Adaptable Programme Loan</td>
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<td>APVC</td>
<td>Agricultural Product Value Chain</td>
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<td>ASAl</td>
<td>Arid and Semi Arid Lands</td>
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<td>ASCU</td>
<td>Agriculture Sector Coordination Unit</td>
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<td>ASDS</td>
<td>Agricultural Sector Development Strategy</td>
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<td>ASDSP</td>
<td>Agricultural Sector Development Support Programme</td>
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<td>ASPSC</td>
<td>Agricultural Sector Programmes Steering Committee</td>
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<td>ATCs</td>
<td>Agricultural Training Centers</td>
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<td>BBS</td>
<td>Broad Based Survey</td>
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<td>CASC</td>
<td>County Agricultural Steering Committee</td>
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<td>CASPSC</td>
<td>County Agriculture Sector Programmes Steering Committee</td>
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<td>CBO</td>
<td>Community Based Organization</td>
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<td>CDD</td>
<td>Community Driven Development</td>
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<td>CDF</td>
<td>Constituency Development Fund</td>
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<td>CIAP/CIP</td>
<td>Community Integrated Action Plan</td>
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<td>CIG</td>
<td>Common Interest Group</td>
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<td>CRA</td>
<td>Community Resource Assessment</td>
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<td>CRM</td>
<td>Collaborative Research Model</td>
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<td>CSU</td>
<td>County Service Unit</td>
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<td>CTT</td>
<td>County Technical Team</td>
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<td>CWG</td>
<td>Common Working Group</td>
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<td>EAAPP</td>
<td>East Africa Agricultural Productivity Project</td>
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<td>EDP</td>
<td>Enterprise Development Plan</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EPC</td>
<td>Export Promotion Council</td>
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<td>ERP</td>
<td>Enterprise Resource Planning</td>
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<td>ESMF</td>
<td>Environmental and Social Management Framework</td>
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<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<td>FGDs</td>
<td>Focused Group Discussions</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GIS</td>
<td>Geographic Information Systems</td>
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<td>GMS</td>
<td>Grant Management Structures</td>
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<td>GRP</td>
<td>Grass Root Partner</td>
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<td>IAA</td>
<td>Integrated Agriculture Aquaculture</td>
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<td>IC</td>
<td>Indigenous Chicken</td>
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<tr>
<td>ICIP</td>
<td>International Centre for Insect Physiology and Ecology</td>
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<td>ICPI</td>
<td>Integrated Crop and Pest Management</td>
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<tr>
<td>ICRISAT</td>
<td>International Crops Research Institute in Arid and Semi-arid Tropics</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<td>ICVC</td>
<td>Indigenous Chicken Value Chain</td>
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<td>IEC</td>
<td>Information Education and Communication</td>
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<td>ILRI</td>
<td>International Livestock Research Institute</td>
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<td>IP</td>
<td>Intellectual Property</td>
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<td>IPPM</td>
<td>Integrated Pest Management</td>
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<td>IPP</td>
<td>Indigenous Peoples Plan</td>
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<td>Acronym</td>
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<tr>
<td>IPMF</td>
<td>Integrated Pest Management Framework</td>
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<td>IPPF</td>
<td>Indigenous Peoples’ Planning Framework</td>
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<td>IPO</td>
<td>Implementing Partner Organization</td>
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<td>IPVMP</td>
<td>Integrated Pest and Vector Management Plan</td>
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<td>ISFM</td>
<td>Integrated Soil Fertility Management</td>
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<td>IWSNM</td>
<td>Integrated Water and Soil Nutrient Management</td>
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<td>KALRO</td>
<td>Kenya Agricultural and Livestock Research Organization</td>
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<td>KAPAP</td>
<td>Kenya Agricultural Productivity and Agribusiness Programme</td>
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<td>KAPP</td>
<td>Kenya Agricultural Productivity Programme</td>
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<td>KAPSFLMP</td>
<td>Kenya Agricultural Productivity-Sustainable Land Management Project</td>
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<td>KARI</td>
<td>Kenya Agricultural Research Institute</td>
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<td>KDFF</td>
<td>Kenya Dairy Farmers Federation</td>
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<td>KEBS</td>
<td>Kenya Bureau of Standards</td>
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<td>KENAFF</td>
<td>Kenya National Farmers Federation</td>
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<td>KENFAP</td>
<td>Kenya National Federation of Agricultural Producers</td>
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<td>KEPHIS</td>
<td>Kenya Plant Health Inspectorate Service</td>
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<td>KIPPPRA</td>
<td>Kenya Institute of Policy Research and Analysis</td>
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<td>KIRDIC</td>
<td>Kenya Industrial Research and Development Institute</td>
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<tr>
<td>KUSCO</td>
<td>Kenya Union of Saving and Credit Co-operatives</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
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<tr>
<td>MIS</td>
<td>Management Information System</td>
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<td>MOALF</td>
<td>Ministry of Agriculture Livestock and Fisheries</td>
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<td>MoLED</td>
<td>Ministry of Industrialization and Enterprise Development</td>
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<td>NAEP</td>
<td>National Agricultural Extension Policy</td>
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<td>NALEP</td>
<td>National Agricultural and Livestock Extension Program</td>
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<td>NARDTC</td>
<td>National Aquaculture Research Development and Training Centre</td>
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<td>NARL</td>
<td>National Agricultural Research Laboratories</td>
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<td>NARS</td>
<td>National Agricultural Research System</td>
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<td>NASEP</td>
<td>National Agricultural Sector Extension Policy</td>
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<td>NECOFA</td>
<td>Network for Eco-farming in Africa</td>
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<td>NEMA</td>
<td>National Environment Management Authority</td>
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<td>NGO</td>
<td>Non-Governmental Organization</td>
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<td>NRM</td>
<td>Natural Resource Management</td>
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<td>PCW</td>
<td>Planning and Contracting Workshop</td>
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<td>PMG</td>
<td>Producer and Marketing Group</td>
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<td>PMO</td>
<td>Produce Market Organization</td>
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<td>PPP</td>
<td>Public Private Partnership</td>
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<td>PRA</td>
<td>Participatory Rural Appraisal</td>
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<td>RFID</td>
<td>Radio Frequency Identification Device</td>
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<td>RI</td>
<td>Return to Investment</td>
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<td>RTT</td>
<td>Regional Technical Team</td>
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<td>SDCCP</td>
<td>Smallholder Dairy Commercialization Project</td>
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<td>SIDA</td>
<td>Swedish International Development Cooperation</td>
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<td>SMAED</td>
<td>Small &amp; Medium Agribusiness Enterprise Development</td>
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<td>SMS</td>
<td>Short Message Services</td>
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<td>SP</td>
<td>Service Provider</td>
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<td>SRA</td>
<td>Strategy for Revitalizing Agriculture</td>
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<td>TAECONS</td>
<td>Tech-Forum Agricultural and Economic Consultants Federation</td>
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<tr>
<td>UNHCR</td>
<td>United Nations High Commissioner for Refugees</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>USDA</td>
<td>United States Department of Agriculture</td>
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<td>VC</td>
<td>Value Chain</td>
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<td>VCDP</td>
<td>Value Chain Development Plan</td>
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Acknowledgements

To the partner organisations, individual smallholder farmers, farmer groups, farmer co-operatives and government agencies whose work collectively led to the production of this book, we acknowledge your effort and contributions.

We sincerely thank the project leaders, the 44 case authors, the 5 resource persons from KAPP Secretariat and the IIRR team who sacrificed their time and sleep at the writeshop in Nakuru to produce this book. We feel greatly indebted to the many individual members of the communities in which these projects took place, the private extension service providers featured in this book, supporting partners, staff of collaborating institutions including national research stations, and national and county governments.

Also, it would have been a very different book if it was not for the commitment and guidance of the KAPP leadership, led by the National Co-ordinator, Francis K. Muthami, Andrew Dibo, Edwin Ikitoo, Jane Ngugi, Francis Baiya, Florence Odweso, Priscilla Muiruri, Kinuthia Kariuki, and Stella Nyagah from KENAFF.

For the IIRR team, we sincerely thank Chrispin Mwatate for successfully facilitating the writeshop; Tervil Okoko (the chief editor) for coordinating and editing this book; Eric Mwaura for technical editing and guidance and Jacqueline Ochanda and Bernice Wambui, both who provided efficient secretarial and logistical support during the writeshop.

Finally, we would like to acknowledge and thank the World Bank for providing the much needed financial and technical support to the KAPP programme. We also thank the Government of Kenya for supporting the programme.
Foreword

Agriculture, the mainstay of Kenya’s economy, currently contributes 26 per cent of the GDP directly and another 25 per cent indirectly. The sector also accounts for 65 per cent of Kenya’s total exports and provides more than 18 per cent of formal employment. More than 70 per cent of informal employment is in the rural areas. Smallholder farmers who form 75 per cent of the farming community are among the top contributors to the GDP although they cultivate no more than two hectares each using limited technology.

The sector experienced a notable decline in performance between 1980 and the first quarter of 2000. This decline was caused by both internal and external factors. These factors included declining global agricultural commodity prices; vulnerability to climatic shocks; domestic policy shortcomings which created distortions in input and output markets thus exacerbating market failures and; inadequacies in the legal and regulatory framework that raised costs of conducting business. Poor infrastructure increased costs of marketing while ineffective public support services led to low adoption of new agricultural technologies. The high incidence of HIV/AIDS in the country contributed to reduced labour productivity. The smallholder farmers were hardest hit by these challenges. The Government’s development strategies to address these issues are articulated in the Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC) (2003-2007), The Strategy for Revitalising Agriculture (SRA) (2004-2014) and the Agriculture Sector Development Strategy (ASDS) (2010-2020).

The Kenya Agricultural Productivity Programme (KAPP) largely supported key reforms in the agricultural sector. This was in order to address domestic policy shortcomings as well as inadequacies in legal and regulatory frameworks during its first phase. The second phase of the programme worked with smallholder farmers and implemented the reforms undertaken during phase I of the programme. Service delivery was anchored on the agricultural product value chain platform for both technology generation and extension service delivery, with the objective of addressing challenges associated with market linkages and access to credit. These two factors are critical in the adoption of technologies in agriculture, particularly by smallholder farmers.

I am pleased to note that as a reform programme, implementation of the KAPP has been largely successful. As a result, a number of sector policy documents were formulated/reviewed and operationalized. An enabling environment for the generation, dissemination and adoption of agricultural technology has been firmly laid by these policies. Institutional framework required to increase agricultural productivity in the country has also been established and operationalized. Also, beneficiary communities and their organizations in the project areas have been sufficiently empowered to have a voice in decision-making, to demand for extension, research and other productivity-enhancing products, and to even influence policy direction.

The purpose of this publication is to share with stakeholders the achievements, lessons learnt and recommendations for possible replication, as well as challenges encountered during the implementation of the programme.

I would like to thank the World Bank for providing the much needed financial and technical support during the implementation of the programme. I would also like to thank the Government of Kenya for supporting the programme.

Francis K. Muthami
National Coordinator,
Kenya Agricultural Productivity Programme
# Contents

Acronyms and Abbreviations ........................................................................ iii  
Acknowledgements ...................................................................................... v  
Foreword .................................................................................................... vi  
Kenya Agricultural Productivity Programme (KAPP) ................................... 1  
Reforming policy and empowering institutions ............................................ 7  
Developing agricultural value chains with a gender lens .............................. 10  
Improving KAPP’s ICT infrastructure ......................................................... 14  
Integrating and mainstreaming environmental and social safeguards .......... 17  
Empowering farmer organisations and other stakeholders .......................... 19  
Empowering beneficiaries with business skills .......................................... 22  
Developing KALRO’s human resource capacities ........................................ 25  
Linking fish production with markets in Kenya ........................................... 32  
Supporting research in African indigenous vegetables ................................. 39  
From livestock deaths to quality cuts and wealth among ASAL communities.. 45  
Moving the case for sorghum for food security, nutrition and industrial growth in Kenya .......................................................... 51  
Enhancing productivity of mango and passion fruit value chains ................. 57  
Conserving soil, land and water for the sake of livestock and crops in Kajiado’s Euwaso Kedong ............................................................ 64  
Finding new economic freedom in drylands of Kenya through sorghum and green grams .............................................................. 70  
Combating maize lethal necrosis disease in Kenya ........................................ 77  
Automating agricultural research processes in Kenya ................................. 83  
Irrigation for mangoes, rice and fish in Makueni and Busia counties .............. 88  
Enhancing production and marketing of indigenous chicken in Makueni and Kakamega .......................................................... 96  
Overcoming bottlenecks in dairy improvement in Meru and Nyeri counties ... 102  
Supporting KARI research programmes .................................................... 108  
Lessons from collaborative research cases ................................................ 113  
Making the magical birds of Homa Bay come home to roost ....................... 124  
Milking money from dairy farming in West Pokot ................................ ........ 129  
Making bubbling income from bulb onions of Batei ward, West Pokot ....... 133  
Promoting African indigenous vegetables as an agribusiness in Siaya .......... 137  
Improving the lives of smallholder goat keepers of Taita Taveta ................. 141  
Milk cementing marriages in West Pokot .................................................. 146  
Tapping from a cultural heritage: The story of bees and the liquid gold of the Ogieks .............................................................. 150  
Unleashing the potential of indigenous chicken in Nakuru .......................... 154  
Promoting local poultry value chain in Kakamega ...................................... 158
Making markets work for citrus farmers in Kwale ................................................. 163
Changing lives through local poultry in Kwale ..................................................... 167
Turning 'a boys’ hobby’ into a farmer’s fortune in Nyeri County ............................. 170
Siaya groundnuts lead the way ........................................................................... 174
Aloe vera: The hidden treasure of Taita Taveta ..................................................... 177
Capitalising on the golden grains of Butere-Mumias ............................................. 182
Rallying Nyandarua dairy farmers for improved livelihoods ............................. 186
Transforming lives through dairy enterprise in Taita Taveta ............................... 190
Changing lives through group marketing of bananas in Kisii ................................. 193
Farming for the magical nuts of Homa bay ........................................................... 196
Mango is Makueni’s cash cow ........................................................................... 200
It is more mangoes for Tana River farmers ........................................................... 204
Living off the bees in Tana River ......................................................................... 208
Kenyenya dairy farmers add value for change .................................................... 212
Improving livelihoods through potato farming in Meru County .............................. 215
Moving markets for livestock pastoralists in Garissa ............................................ 218
Lessons from improving extension services cases .................................................. 221
List of authors and contributors .......................................................................... 228

List of figures

Figure 1. The writeshop process ........................................................................... 5
Figure 2. Proportion of smallholder farmers satisfied with extension/empowerment/agribusiness ...................................................................................... 12
Figure 3. Proportion of beneficiaries perceiving their views have been taken into account in decision making processes ........................................... 12
Figure 4. Distribution of KAPP Collaborative Research projects .............................. 30
Figure 5. Number and category of KAPAP’s collaborative research consortium members .................................................................................. 31
Figure 6. Comparison of average weight gains for the semi-feedlot and grazed bulls ................................................................. 49
Figure 7. Industrial partners and their specific needs for sorghum ............................. 53
Figure 8. Roles of the research institutions in the consortium ................................ 53
Figure 9. Map of Ewaso Kedong ....................................................................... 65
Figure 10. Response of green gram grain yields to crop combination and soil fertility amendment in Mongorion, West Pokot County, during the 2014 season ....72
Figure 11. Response of sorghum grain yields to crop combination and soil fertility amendment and water harvesting technologies in Mongorion, West Pokot County, during the 2014 season ............................. 73
Figure 13. Influence of irrigation regime on mango fruit grade (8 and 9) and fruit per tree ........................................................................... 93
Figure 14. Culture Type Average Net Annual Income (KES/ Ha) ............................. 94
Figure 16. Milk Delivered by Men and Women .................................................... 147
Figure 17. Earnings from Milk for Men and Women ............................................. 149
Figure 18. Trend in earnings from rabbit sales from 2011/12 -2014/15 ................... 172
Chapter 1: Introduction

Kenya Agricultural Productivity Programme (KAPP)

Agriculture is a major contributor to the Kenyan economy. It accounts for 25 per cent of the Gross Domestic Product (GDP), 65 percent of total national exports. It provides 18 per cent of the formal employment and 70 per cent of informal employment; and supports the livelihood of 80 per cent of the population. The performance of the agricultural sector is, therefore vitally important to the economic growth and development in Kenya. The country’s agricultural growth fell from 3.5 per cent in the 1980s, to 1 per cent in the 1990s. These trends were reflected in the growth of the GDP that also fell from 7 per cent to just over 2 percent in the same period. This resulted in increased poverty, a decline in competitiveness, limited investment in the agricultural sector and low productivity and income among smallholder farmers. To trigger economic growth, the Government of Kenya launched a Strategy for Revitalizing Agriculture (SRA) which was aligned to the overarching development strategy, the Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC, 2003-2007). The objective of the Strategy was to provide a policy and institutional environment that is conducive to increasing agricultural productivity, promoting investments, and encouraging private sector involvement in agricultural enterprises and agribusiness.

To address the agricultural development constraints and the objectives of the SRA, the Government of Kenya sought technical assistance and financing support from the development partners.

To this end, the World Bank assisted the Government of Kenya to set up the Kenya Agricultural Productivity Programme (KAPP). Through this programme, the World Bank awarded a loan amount to the Government. The programme was designed as a 12-year, three-phase Adaptable Programme Loan (APL). The APL approach was found prudent given the need for long-term engagement to have tangible impact in agriculture and rural development sectors. The long-term objective of the programme was to contribute to sustainable increase in Kenya’s agricultural productivity and improvement of the livelihoods of its rural communities through improved performance of the agricultural technology supply and demand system.
KAPP’s two phases

The KAPP was implemented in two phases. The first phase focused on facilitating the development of appropriate agricultural policies and strategies essential for creating a conducive agribusiness development, improving technology generation, dissemination and uptake systems through transformation of research and extension systems and empowerment of farmers and their organizations so that they may participate effectively in setting the agricultural development agenda. Overall, the programme aimed at contributing to higher goals of national development enshrined in many government development strategy blue prints such as enhancing economic growth, equity, better governance and decentralization of services. The first phase started in 2004 and closed in December 2008. By 2007, the implementation period of the Economic Recovery Strategy had ended. The strategy had steered economic growth to a rapid growth trajectory and the Kenyan economy was estimated to have grown by about 7 per cent. To sustain the recovery and move into a higher growth and development path, the Government launched the Kenya Vision 2030. The objective of Vision 2030 is to transform Kenya into “a newly-industrializing, middle income country, providing a high quality of life to all its citizens in a clean and secure environment”. The Vision 2030 identifies the agricultural sector as one of the key sectors of the economic pillar with a projected annual growth rate of 5-7 per cent. To make the agricultural sector a key driver of the economy, and achieve annual growth rate of 10 per cent as expected in the Vision 2030, the Government developed the Agricultural Sector Development Strategy (ASDS). With the ASDS, the Government aimed at transforming the agricultural sector into a profitable economic activity capable of attracting private investment and providing gainful employment for the people. The two blue prints were taken into consideration during the design of KAPP Phase II. Phase II focused on deepening and up-scaling of technologies as supported by the policies and strategies issuing from phase I. It involved two main areas: Supporting agricultural research and; improving agricultural extension services. Some work was also done to strengthen the capacities of research institutions and apex farmer institutions. The KAPP Phase II, or KAPAP (Kenya Agricultural Productivity and Agribusiness Programme), was effected from March 4, 2010 until 30th September, 2015.

Working in the Counties

The KAPP programme is multi-sectoral and is being implemented by four agencies namely; the Ministry of Agriculture, Livestock and Fisheries, the Ministry of Industrialization and Enterprise Development, the Kenya Agricultural and Livestock Research Organization (KALRO), and the Kenya National Farmers Federation (KENAFF). The programme has the following specific thematic areas: Policy, Institutional and Implementation Support, National Agricultural Research Systems, Agricultural Extension; Farmer and other Stakeholders’ Empowerment; and Agribusiness and Market Development Components. The Extension, Farmer and other Stakeholders and Agribusiness and Market Development components of the Programme were implemented in 19 counties namely: Busia, Kakamega, Trans Nzoia, West Pokot, Nakuru, Siaya, Homabay, Kisii, Makueni, Embu, Meru, Wajir, Garissa, Taita-Taveta, Kwale, Kilifi, Tana River, Nyeri and Nyandarua. The National Agricultural Research System and Policy and Institutional Support
components covered the whole country.

To guide the implementation of the programme, separate manuals for collaborative research and farmer grant manuals were developed and adapted. The manuals set out details of activities to be financed; beneficiaries and eligibility criteria; arrangements and procedures for preparation; appraisal; approval; implementation; and supervision of activities financed by the grants; procurement; financial management and disbursement arrangements; performance indicators; standard formats for Farmer and Research Grant Agreements; and other administrative, financial and organization arrangements required for providing the grants. Other documents guiding implementation included triggered safeguard policies related to social and environmental issues, indigenous and marginalized peoples and pest management.

Investments in KAPP aimed at benefiting the smallholder farmers through enhanced access to appropriate technologies that would increase productivity, incomes and improve livelihoods of the farming community. It was envisaged that this would trigger the transformation of agriculture from subsistence to a profitable and sustainable business and give incentives to the private sector to invest in the agricultural sector and promote industrial growth. The research organizations were to benefit from the capacity building of scientists and development of appropriate research infrastructure. Consumers were to get value for money in agricultural products. It was also envisaged benefits could accrue to stakeholders from robust research and extension systems and through implementation of appropriate policies necessary for providing conducive agribusiness development environment. Overall, when the agricultural sector grows the whole national economy will also grow.

This book showcases the most successful approaches in the KAPP programme. It provides an opportunity for partners of KAPP and those of the Government of Kenya to learn about results; not only on a cursory level but to understand the underlying reasons why change is occurring or not occurring in the lives of the smallholder farmers who interacted with these projects. The partners will also use this information to replicate the successful approaches in their respective projects for wider adoption by communities.

**Areas of work:**

Consequently, KAPP’s projects reflected the following attributes:

a. KAPP’s main objective of increasing agricultural productivity and agribusiness; hence, incomes and living standards of participating smallholder farmers in the project area.

b. Multi-institutional and multi-disciplinary approach with emphasis on Public-Private Partnerships (PPP); thus generating technologies with agribusiness perspective.

c. Market orientation with potential for agribusiness development into bank-able business plans.

d. Cross-cutting issues including integrated pest and nutrient management, environment, social, gender and HIV/AIDS issues.
How this book was made

In December 2014, the KAPP Secretariat contracted the International Institute of Rural Reconstruction (IIRR) to document the experiences of Phase I and Phase II of the KAPP programme. The documentation aimed to cover projects on policy and institutional reforms, research, and extension services. Documenting the experiences of the KAPP resulted in this publication which has the following sections:

- Description of activities undertaken in KAPP Phase 1 and lessons learnt.
- Case descriptions of collaborative research projects as implemented through the collaboration of implementing partners.
- Lessons learnt from implementing the collaborative research projects
- Case descriptions of contracted extension services projects as implemented through the contracting service delivery model.
- Lessons learnt from implementing the extension services projects.

Selection of cases, writing of cases

IIRR, through KAPP Secretariat, invited leaders of selected projects to submit a draft manuscript about their projects, following prepared writing guidelines. For those project leaders who responded, IIRR staff members reviewed the manuscripts submitted by project leaders. Each case typically consisted of one or more human-interest stories about a group, an individual or a community who had used a model technique to try to solve a problem along with a description of the project and some supporting data.

The writeshop

Leaders of the projects who had good knowledge of the projects were invited to a 12-day writeshop at Jumuia Resort Centre in Nakuru, Kenya, from 13 to 25 April, 2015. The 52 writeshop participants included 44 case holders (or case writers), facilitators, editors, resource persons from IIRR and KAPP and logistic staff.

Day 1-6: Writing and re-writing cases and lessons on extension services

The case holders spent the first six days reading out and reviewing their drafts in group sessions, and re-writing the same individually.

Day 7-12: Writing and re-writing cases and lessons on collaborative research, and policy and Institutional reforms.

The case holders in projects dealing with these two areas of work spent the next 6 days reading out and re-writing their drafts in group sessions, and re-writing the same individually. Participants also suggested the book’s title on the last day.
How this book is organized

This book is divided into 4 chapters: Introduction, KAPP Phase I, Supporting Agricultural Research and Improving extension services. Lessons from each area of work have also been provided.
Chapter 2: Supporting policy and Institutional reforms
Reforming policy and empowering institutions
Florence A. Odweso, KAPP

KAPP’s work was guided by a series of policies. It also engaged in institutional strengthening by building the capacities, reforming and empowering the institutions it worked with. To facilitate this work, an enabling environment had to be created to support the projects and to spur economic growth and development. KAPP Phase 1 largely focused on policy reforms. In addition, support was given to KALRO to further develop its human resource capacity.

Getting the right policies for the work

Being a reform project under the national government, KAPP Phase I focused largely on influencing policy reforms in the agricultural sector. These reforms were mainly targeted at research and extension services delivery. The work began with reviewing the National Agricultural Extension Policy (NAEP) and its implementation framework, which were prepared in 2001, and this resulted in the formulation of the National Agricultural Sector Extension Policy (NASEP) to guide extension service delivery in the agricultural sector.

National Agricultural Sector Extension Policy (NASEP)

The National Agricultural Extension Policy (NAEP) provided a vision and mission of extension service in the country and elaborated the role of key stakeholders in an increasingly liberalised market economy. The policy spelt out, among others, the desirable characteristics of extension approaches and methods to be applied by extension service providers, and set the stage for what would be acceptable best practices in extension service delivery. The policy advocated demand-driven extension services as well as the participation of other players in the delivery of extension services. It also recognized the need to diversify, decentralize and strengthen the provision of extra services with a view to increase sustainability and relevance to farmers.

The policy, however, did not adequately address sustainable financing for service delivery, lack of co-ordination among institutions implementing extension programmes, minimal farmer participation in identification of their needs, gender equity, and weak linkage between extension staff and research. Furthermore, it did not address poor coordination among extension service providers including input suppliers, and access to markets. There was therefore need to review the NAEP so as to align it with the Strategy for Revitalizing Agriculture (SRA) and the Agricultural Sector Development Strategy (ASDS).

Under the banner of the Agricultural Sector Coordination Unit (ASCU) comprising of representatives of the key sector ministries, and in collaboration with other key sector stakeholders, KAPP supported and actively participated in the review of the NAEP. This work resulted in the National Agricultural Sector Extension Policy (NASEP) and its implementation framework.
NASEP serves as the instrument by which extension service delivery is provided in the country by both the Government and the private sector. The policy promotes pluralism in extension service delivery; privatization and commercialization of extension services; decentralization of services and empowering of extension clientele; stakeholder collaboration and networking; regulation of extension providers to ensure quality and accountability; institutional and human resource development; technology development; packaging and dissemination and financing of extension services. It advocates for demand-driven and farmer-led participatory approaches.

**National Agricultural Research System (NARS) policy**

Institutions that undertook agricultural research in Kenya operated without a common vision. This led to the duplication of efforts and wastage of resources. It was upon this realization that the Government developed two overarching documents; the Strategy for Revitalizing Agriculture (SRA) and the Agricultural Sector Development Strategy (ASDS) to guide development in the sector. In line with these two key sector documents, there was need to formulate the National Agricultural Research System (NARS) policy, to guide and co-ordinate all agricultural research activities in the country for efficiency and accountability.

KAPP in collaboration with other key stakeholders participated in and supported the formulation of the NARS policy. Lessons from other countries such as India and Malaysia were also incorporated in the policy document. The policy advocates for a coordinated approach in formulation of research agenda; research planning and priority setting systems; human resource development and the seamless utilization of existing research infrastructure and facilities among institutions. This includes the development and management of a sustainable funding system; establishment of integrated information, communication and knowledge management system; monitoring and evaluation; quality control and impact assessment; dissemination and technology deployment; as well as partnership and collaboration. By adopting the NARS Policy 2012, KAPP believes this will accelerate the reform agenda that is required to make the NARS well coordinated, dynamic, innovative and responsive to client needs and guided by a common vision, mission and goal.

Other policy reviews and formulation supported by KAPP include:

**The Co-operative Development Policy 2011**, which embraces the various strategies needed to make Kenya’s co-operatives efficient and globally competitive. Liberalisation of the economy in the 1990s culminated in the need to review the then co-operatives policy. The process was facilitated by KAPP resulting in the current policy. KAPP’s work, among others, was geared towards encouraging smallholder farmers to form co-operatives, market as a group and mobilize investments. This policy provides a framework for promoting public/private partnerships between co-operatives, the government, and private investors to mobilize investments, acquire new technologies, embracing value addition and engage in aggressive marketing of co-operatives’ products and services.
**Agricultural Sector Communication Strategy:** There was need to develop an effective and efficient agricultural knowledge, information and technology (AKIT) system to help in improving rural productivity and social equity. Such a system would link users and institutions to promote learning, sharing and utilization of agricultural knowledge, information and technology. To address this need, a team comprising of members from the Ministry of Agriculture, Ministry of Livestock Development, Ministry of Fisheries Development, and Ministry of Co-operatives Development and Marketing, private sector, university of Nairobi, Kenya Agricultural and Livestock Research Organization (KALRO) and the Kenya National Farmers Federation (KENAFF) collaboratively developed the agricultural sector communication strategy. The Strategy advocates for the active involvement of all stakeholders in the generation, storage, access and sharing of relevant knowledge, information and technology in simple and easy to apply forms that also address the end-users felt needs. KAPP facilitated and supported the process.

**National Livestock and Dairy Policy:** This policy document, whose review was facilitated by KAPP, is a result of various consultations among stakeholders convened by the Ministry of Livestock Development to review the livestock policy. It addresses the challenges and shortcomings arising from the liberalization policies implemented by the Government in the 1990s. It is consistent with current government strategies stipulated in the sector wide Strategy for Revitalizing Agriculture (SRA), the Agricultural Sector Development (ASDS) and Vision 2030. It also covers a wide range of issues within the livestock sub-sector including dairy, disease free zones and leather improvement. This policy guided KAPP’s projects on dairy value chains and research.

**National Aquaculture policy:** The development of fish farming in Kenya has largely been unregulated. Acknowledging the need for the development of aquaculture sub-sector in Kenya, the Government took a key decision to develop a comprehensive policy for the sub-sector. This policy aspires to create an environment for a vibrant aquaculture industry with strong and efficient marketing systems that allow for increased investment and economic gains. KAPP facilitated the development of this policy and also used it to guide its projects on extension services in aquaculture.

**Avian Influenza preparedness:** KAPP worked with smallholder indigenous poultry farmers along the meat value chain. Although no cases of the influenza have been reported in Kenya, a high level of preparedness is critical in order to mitigate any risks posed by infected migratory birds. KAPP supported the National Task Force on Avian Influenza preparedness to undertake animal surveillance; human surveillance; laboratory analyses; infection prevention and control; information, education, and communication; coordination and resource mobilization all in readiness for any eventuality. The Task Force operated under the Department of Veterinary Services, Ministry of Livestock Development.
Developing agricultural
value chains with a gender lens

Jane Njeri Ngugi, KAPP

The KAPP Phase 2 programme (also referred to as Kenya Agricultural Productivity and Agribusiness Project- KAPAP), recognized the importance of mainstreaming gender in planning, implementation, and monitoring and evaluation of all its activities. The need for mainstreaming was recognized from the evaluation of KAPP phase one. In the evaluation the need to strengthen women’s capacities to accumulate resources, retain incomes, and have a voice in decision-making bodies was identified as a key lesson. The implementation of KAPP was guided by the national and agricultural policies (Kenya Constitution, Vision 2030, ASDS, NASEP) which are emphatic on gender issues. The need for empowerment of rural women was identified by the World Bank as a focus area during the 56th Commission of the Status of Women in 2012, and agreed as a programmatic priority for all development partners.

Who was involved?

It is on this basis that KAPP undertook key efforts to mainstream gender and ensure that both men and women participated and benefited from the project interventions. All the stakeholders; World Bank, KAPP Secretariat, KAPP’s County Service Units, and KAPP implementing agencies and farmers were involved in the gender mainstreaming efforts.

Mainstreaming gender

The mainstreaming of gender in KAPP was done at two levels; 1) project formulation and, 2) project planning and implementation. The activities at each level were proposed and then implemented as follows:

Putting in place the framework

A gender perspective was integrated in the project formulation and the broad gender concerns and strategies were highlighted in the project appraisal document. The implementing teams then integrated a gender perspective in the key performance indicators in the projects’ results framework. This indicators stated;

- Number of participating men and women;
- Increase in productivity and incomes of men and women;
- Levels of technology adoption for men and women;
- Levels of satisfaction among men and women; and
• The percentage of men and women who felt that their voices had been taken into account during decision-making processes.

Project outputs

The expected outputs for gender mainstreaming were identified during project formulation to include: development of a gender policy for the agricultural sector; undertaking a gender disaggregated baseline survey to generate data to inform the policy development processes; generation of information that would strengthen the evidence-base regarding the connection between gender and development; and development of a model that allows for an analysis of women’s and men’s roles and resources in the development of selected value chains.

To achieve these outputs, the project ensured that gender mainstreaming remained a priority activity throughout the project and collection of sex disaggregated data was made mandatory. All the funds needed to undertake gender mainstreaming activities were set aside in the projects’ cost.

Working with the Framework

The project developed a gender mainstreaming strategy to guide the gender mainstreaming processes at the grassroots. These activities that were identified in the strategy included; 1) Capacity building for implementing agents at all levels; 2) Development of guidelines in the operational procedures towards ensuring gender sensitivity in all the project activities; 3) Gender sensitivity in monitoring, evaluation and impact assessment; 4) Nomination of gender focal persons among the implementing agents at the grassroots levels to take charge of gender integration in all the grassroots activities and; 5) Safeguards to enhance participation of women. This included: use of a gender perceptive during the development of posters used in the flagging of opportunities and adoption of the 30 per cent gender rule during establishment of farmer grant management structures to ensure participation of vulnerable groups in the Common Interest Groups leadership.

The aftermath

The project reports show that the gender mainstreaming activities as highlighted in the gender mainstreaming strategy were successfully implemented. These activities contributed towards integration of gender concerns at the grassroots resulting in both men and women participating and benefiting from the project interventions.

Enhanced capacity for women: The need for gender sensitivity in the planning of farmer forums by taking into account their gendered daily and seasonal calendars was emphasized both in the guidelines and during trainings. As a result of these trainings, the following was achieved:
Participation of men and women during community resource assessments. This resulted in the inclusion of value chains that are culturally and socio-economically appropriate for participation by both men and women. These included local poultry, rabbits, black beans, groundnuts, cassava, sorghum and local vegetables. The collaborative research projects also focused on local poultry, sorghums, and local vegetables.

Enhanced participation of women in decision-making through adoption of the 30 per cent gender rule during establishment of farmer grant management structures. The number of women seeking extensions services rose to 44 per cent, up from 13 per cent at baseline.

**Draft gender policy:** A gender disaggregated baseline survey was conducted at the start of the project. This survey identified the gender inequalities in agricultural production (KAPP, 2011). The data collected was summarized into a Gender Policy Note (World Bank, 2012) and presented to the Agricultural Sector Co-ordinating Unit (ASCU) to inform the development of the sector gender policy. A draft gender policy has been developed.

**Sex disaggregated data:** A gender perspective was integrated in the projects’ management information system (MIS). This has enabled the project to collect sex-disaggregated data in regard to the participation, production and earnings of men and women in the project’s contracted extension service delivery.

**Increased productivity and incomes for women and men:** KAPP’s data shows significant increase in production and incomes for both women and men in selected value chains cumulatively within the 4 years (2012-2015) of service delivery.

![Figure 2. Proportion of smallholder farmers satisfied with extension / empowerment / agribusiness](image1)

![Figure 3. Proportion of beneficiaries perceiving their views have been taken into account in decision making processes.](image2)
Analysis

The development of the sector gender policy is a key achievement since it will push the current agricultural sector gender mainstreaming efforts to a higher level upon its completion and dissemination.

Some counties recorded dismal changes in regard to women participation across value chains due to cultural practices. Disparities could also be attributed to women farming smaller plots and having limited access to the prerequisite farm inputs for value chain participation.

Recommendations

Tailor-made strategies towards fostering gender equity need to be developed for areas where cultural practices are a big impediment to gender equity.

In cases where women have limited access to inputs, flexible support should be included alongside the extension services. More encompassing gender mainstreaming efforts need to be planned and implemented in all future agricultural development initiatives to enable reaching out to the youth with incentives and extension services that will attract them back to agriculture as business. Gender should be mainstreamed in all such projects since they deal with smallholder farmers.
Improving information sharing in KAPP

Florence Odweso & Evelyn Wanjiuru, KAPP

Information sharing among stakeholders and the beneficiaries was a challenge at the inception of KAPP. This is partly because information booklets, leaflets, field demonstrations and exhibitions conducted under the conventional extension service deliver did not specifically address the felt needs of beneficiaries. Farmers were also rarely taken on learning/bench-marking tours. More so, ICT infrastructure was not well developed and the KAPP County Service Unit offices did not have Local Area Network (LAN).

To solve these problems, KAPP supported development of targeted booklets and leaflets, field demonstrations and exhibitions as well as learning tours in order to address farmers felt needs. Messages were also relayed through the radio, TV and the KAPP website. KAPP contracted a consultant to carry out an information and communication technology (ICT) needs assessment. The aim was to provide KAPP Secretariat management with the information necessary for informed, effective and efficient procurement and implementation of the required ICT systems and capacities. Specific objectives of the exercise included:

1. To provide information necessary for informed procurement decisions;
2. To assist in preparing and planning for the acquisition and implementation of the required ICT systems, and;
3. To provide support in the management of the process of acquisition and implementation.

The assessment looked at the following areas: Institutional databases; applications and information/web services; ICT infrastructure and facilities which include LANs, WANs, communication and collaboration; hardware and software which include servers, PCs/laptops, printers and security infrastructure and; facilities which include secure rooms, continuous power availability, and air conditioning.

Parties involved

The process of ICT gaps identification and acquisition of the ICT systems at KAPP Secretariat and County Service Units involved the KAPP Secretariat, staff at County Service Units who provided information on available systems, the implementing agencies, one consultant who carried out the needs assessment and provided the project with the final report, ICT Authority who were involved in the procurement process, and the World Bank which financed the consultancy and the required ICT systems.

Acquiring the right tools

A procurement process was then engaged which put in place the required ICT systems. The
project commenced by procuring ICT equipment for office use and for information hubs including; 63 desktops, 58 laptops, 5 printers, 2 photocopiers, 3 LCD Projectors, 64 UPS, 1 server, 1 server cabinet, 22 switches, 22 Digital Cameras, 5 Camcorders, 24 Smartphones, Local Area Networking (for 3rd floor and 7th floor of KAPP offices and 20 CSUs) and Management Information System (MIS) for the KAPP Secretariat and the CSUs. However, the project has continued to procure ICT systems as needs arise.

**Putting up a MIS system:** KAPAP engaged the services of a consultant to upgrade the programme’s Management Information System (MIS) which was developed during KAPP phase I. The MIS has been implemented to enable better data collection, input, storage, processing and retrieval of monitoring and evaluation data to provide information that helps the project track, control and re-plan its activities, outputs, outcomes, and budgets. This improves efficiency in resource utilization, determines effectiveness, and enables informed decision-making.

The project has also signed an agreement with a firm to service and maintain KAPP’s photocopiers in the counties and at the secretariat. Also, an Internet Service Provider (ISP) has been engaged to provide internet at the KAPP secretariat offices.

**Versatile website:** KAPP Secretariat engaged website developers who designed and upgraded the Project’s official website to ensure that relevant and important information about KAPP and research materials was posted in real time.

**Training:** CSU staffs (Coordinators, monitoring and evaluation officers and accountants) were trained on MIS to enable them use the system and implement it efficiently. A total of 20 monitoring and evaluation officers and Catchment Area Coordinators were also trained on data collection for monitoring and visibility through the use of android-based systems application called Open Data Kit.

**Benefiting from the work**

**Timely reports:** These interventions led to timely reports being received from the CSUs by the KAPP Secretariat. This has enhanced efficiency in programme management. Also, this has improved communication and information dissemination between the CSUs, the implementing agencies and the KAPP Secretariat. For example, data transfer from CSUs to KAPP Secretariat can promptly be transmitted through the MIS, which is a product of this intervention. Also, information, education and communication (IEC) materials such as brochures promoting the activities of various CSUs were produced using the colour photocopier procured as a result of this intervention. Service delivery improved because farmers accessed information that addressed their felt needs.

**Improved knowledge management systems:** Also, the use of the LCD projectors made meetings with the stakeholders (service providers and farmers) more informative and engaging,
as opposed to flip charts which were used before this intervention. Video clips of some of the successful ventures and best practices etc. have been developed and used to sensitise and educate farmers on best practices. The systems have also been used to create a comprehensive demand-driven knowledge-base at the KAPP Secretariat. This knowledge base is easily accessible to stakeholders. The system has allowed KAPP to evaluate the key performance indicators and capture milestones achieved.

**Recommendations**

There is need to keep on building the capacity of staff to keep them abreast with current ICT trends and technologies. There is also need to keep on upgrading the systems to keep up with the technology trends.

**Lessons**

ICT equipment needs regular servicing to keep them running effectively. If neglected, this can cause systems failure and repeated instances of break downs. This delays reporting and subsequent inefficient service delivery.

It becomes very hard for people to use systems they are not used to. Involvement of users of systems and applications through training is critical to ensure smooth adaptation to current technologies. Access to relevant agricultural information enhances productivity.
Integrating and mainstreaming environmental and social safeguards

Kithome Kilaka, KAPP

Agricultural practices by the smallholder farmer involves continuous land tillage on the small land parcels with less or no replenishment on soil fertility, use of agricultural chemicals, and sale of raw agricultural products. On the other front, resource use, sharing of proceeds accruing from agricultural production, and how communities relate and do development is controlled by the cultures and traditions practiced amongst most of the Kenyan farming folk. These agricultural production practices put pressure on land, soils, water resources and biodiversity. KAPP set out to encourage and to support new ways of doing agriculture – as long as they are sustainable.

Getting the frameworks

To help in the process of ensuring environmental safety and sustainability, the Government of Kenya and the World Bank developed three environmental and Social Frameworks that were used to guide the screening, scoping and eventual approval of the proposed community-based micro-projects. To ensure that the project farmer groups were within acceptable means of production, food safety, and demand needs of the intended market. The project administered a conventional environmental and social screening checklist adopted from a conventional package that again guided actions and interventions by target communities towards conformity to safeguards.

Capacity building:
Up to 120 stakeholders including service providers were trained on the entire process of conforming to the social and environmental safeguards. Those trained then served as trainer of trainers. A demonstration on how to actualise the environmental and social management screening checklist, a social assessment, an integrated pest and vector management plan, environmental monitoring plan, and the indigenous peoples plan was done for CSUs, service providers, researchers and farmer leadership.

Screening of CIGs:
A total of 93 CIGs were screened using the checklist. Out of these, 5 CIGs, especially those who are involved in processing and other value addition activities, have had their processes and products approved and certified by the Kenya Bureau of Standards. After screening 18 CIGs did environmental impact assessment because the activities they were involved in required specific environmental mitigation plans approved by NEMA. KAPP, using the indigenous peoples’ framework, screened two marginalized communities namely; the Sengwer in Trans Nzoia and West Pokot Counties and the Ogieks of Nakuru County. The indigenous peoples’ framework advocates for community micro-projects to be designed and implemented in a way that fosters full respect for indigenous peoples’ dignity, human rights, and cultural uniqueness.
The screening process of the proposed community micro-projects was rigorously undertaken at both individual and value chain level to ensure that they comply with the requirements set out both under World Bank safeguard policies, NEMA and KAPP frameworks.

Results of the interventions

Standards and approvals: As a result of the interventions, 18 CIGs went ahead and did Environmental Impact Assessment (EIA) which have been approved by NEMA; 5 CIGs have sought for training on certification, approval and certification of their processing process and products; 3 indigenous peoples plans were developed including one for the Ogiek of Nakuru who have since gotten the Kenya Bureau of Standards approval for their honey. Each of the 7 collaborative research projects prepared the integrated pest and vector management plans in order to guide minimisation on use of agrichemicals along the research value chains.

Analysis

These frameworks have guided the beneficiaries in identifying key agribusiness investments for value addition. They also facilitated the principle of public-private partnership.

It is, therefore, imperative to sustainably build the capacities of the beneficiaries of this major paradigm shift in agricultural research and extension programs.

Conclusion

The safeguards should be a practice not only for food safety and dignified human health but also for increased incomes at smallholder farmer level.

Service provider consortia and other stakeholders assist in the transformation of agribusiness along the specific value chains and so their inclusion in mainstreaming environmental and social safeguards is equally imperative.

Consumers should continuosly be assured that the food and food products produced by smallholder farmers is safe for consumption. This is a good way of promoting safe farm-to-fork practices.
Empowering farmer organisations and other stakeholders

Kinuthia M. Kariuki (KAPP) & Stellah Nyagah (KENAFF)

In Kenya 75 per cent of national food needs and raw materials are provided by smallholder farmers. Only about 30 per cent of these farmers have access to relevant agricultural services and means to enable them increase productivity. Most of these farmers are semi-commercial/semi-subsistence and are mainly financially poor, yet resource-rich. This implies that they need to economically benefit from their resources, like land and livestock, so that they can create wealth in the rural areas where they operate. This is, however, not easily achieved in areas where the institutional mechanisms to support wealth creation are not well informed or do not exist. Also, benefits and development resources for rural poor and small-scale farmers rarely get to them because of the lack of a clear institutional mechanism for research, knowledge management, knowledge sharing and learning network along the need-to-supply continuum for them to seize the opportunities.

Previously, farmers largely operated and functioned as individual farmers. These farmers usually have different farm sizes, and are at different stages of commercialization. The main disadvantage of this arrangement has been poor access to service delivery. They are furthermore not able to collectively demand for services, quality and reliable information, and they cannot enter into binding partnerships. Their operational scope is also very narrow and as such, they cannot bulk produce and meaningfully engage in value transformation.
Engaging farmer groups

KAPP sought to empower the smallholder farmers by empowering their groups. KAPP worked with the Kenya National Farmers Federation (KENAFF) to empower farmers to articulate their demands and help them access agricultural services. It also supported the demand side so that farmers could be informed on what the market requires. Service provider institutions were also supported to deliver their interventions at the farmer level.

Promoting formation of farmer groups: The identification of the right vehicle to achieve this feat was important at the onset. KAPP supported the farmers to form smallholder groups in order to maximize the power of numbers in input and output acquisition, in bulking and in marketing their produce. Common Interest Groups were formed along the specific agricultural product value chains and organized at the lowest level, the county and commodity associations at the national level. The groups were then supported to form co-operatives, in most cases at the county level. Co-operatives then became the solution to commercializing farmers’ distorted realities.

Group investments: This took various forms including group training on certain skills, business/marketing skills and information, group accessing technology, installation of produce processing equipment for value addition, purchase of labour saving equipment among others. The CIGs, producer group or co-operative members, through the guidance of the service provider, developed proposals (business plans), which were then funded either by KAPP, the county government, national government or other development agencies.

Under KAPP, farmer groups and co-operatives play a very important role as vehicles for the Administration of farmer “Grants”. Various targeted interventions for the empowerment of farmers and other stakeholders are supported using grants under the project. The grants target co-financing of CIGs, co-operatives qualified producer organizations investments to build their capacity to offer services that enhance their capacities for registration, meet national and international marketing and certification standards and requirements and offer market link networking services to client members. Farmer grants also specifically cater for contracting of demand-driven farm advisory and training services.

To this end, the project has exposed farmers to skills through capacity building so as to support the administration of grants which use accounting procedures that are simple to operate while maintaining financial control and accountability aspects of the KAPP/KAPAP operations. Targeted trainings enable the groups offer mechanisms for farmers to monitor their activities, resources, and accountability.

Results

Empowered farmers: In total, 7,080 local CIGs were formed and strategically positioned to address the priority needs of the farmers at the farmer level. These were consolidated to 480 ward
level forums. At each of the 20 implementing counties, a county consultation forum was formed from representatives of the sub-county level fora, which ultimately resulted into the national level consultative forum. As a result, 93 farmer co-operatives were formed. Farmers who are members of these groups are now better equipped with reliable market information and ability to analyze the same and can enjoy affordable pooled transport facilities and infrastructure that enhances their productivity and incomes. The co-operatives are also very attractive to financing and credit facilities service providers. Government intervention and regulation of farmers is today possible through the co-operative, courtesy of the new Co-operatives Act that assures farmers of security for their investments. Co-operators along with other producer organizations can lobby against uneven tariff protection and keep pushing for adequate government investment in agriculture.

Analysis

Co-operatives, by their nature, offer opportunities for providing basic protection securities to empower communities at their local levels. They operate under a concrete legal framework, i.e. Acts, rules and by-laws, and are corporate bodies with clear governance and management structures and perpetual succession that guarantees sustainability. This is critical for the smallholder farmer investments at the local level given the fact that a lot of resources have gone into these initiatives. When members have confidence in their co-operatives, they are motivated to enhance production and hence income, which was the focus of KAPP. This is also in line with the global Millennium Development Goals of alleviation of poverty and extreme hunger by half by the year 2015 and the economic development pillar of Kenya’s Vision 2030.

These organizations can better engage in structured growth and are able to define and programme their development. They are thus more committed to service delivery and are more accountable to their memberships.

Conclusion

• Commercialization under the smallholder-dominated agriculture can succeed if farmers are empowered to balance subsistence farming and commercial agriculture.
• Support to KENAFF as an umbrella organization was important under the programme because it provided requisite infrastructure and clout from the grassroots level to the national level. KENAFF enjoys enormous recognition by Government and international bodies.
• The co-operative society model is important for agribusiness development but more work of reorganizing them at the catchment or village level needs to be put in place.
Empowering beneficiaries with business skills

Priscilla Muiruri, KAPP

A characteristic feature of Kenya’s smallholder agriculture is the dominance of primary production. This normally involves production of low volume of produce at individual farm level for subsistence and subsequent marketing of surplus in raw or semi-processed form. Limited on-farm and off-farm processing of agricultural produce has translated to low prices, fewer job opportunities and eventually low income for farmers. This can be attributed to the challenge of inadequate adoption of new technologies and innovations, managerial and technical skills to effectively establish and manage viable agribusinesses. Developing a dynamic and competitive agribusiness requires not only enhanced technical and managerial skills but also greater marketing orientation and networking; better market information and better linkages with service providers.

The managerial skills that were found to be inadequate among the beneficiaries included entrepreneurship, business planning, financial management and innovations. Also, the beneficiaries needed technical skills in husbandry management, food processing, quality and standards control, and marketing.

The beneficiaries

The project aimed at empowering and building the capacity of agricultural extension service providers supporting farmer business entities and farmer leaders. To begin with, KAPP established collaborative partnerships with selected universities and training institutions which have comparative advantage in their respective value chains and fields of expertise. It then supported these institutions to develop training manuals and facilitated the trainings.
Collaborating with institutions

KAPP partnered with the following institutions: Technical University of Kenya (TUK) to develop training modules in entrepreneurship and business management; The Dairy Training Institute (DTI) to develop modules on dairy value chain and; Jomo Kenyatta University of Agriculture and Technology (JKUAT) for modules on fruits and vegetables value chain.

How was it implemented?

The following interventions were undertaken:

**Identifying constraints:** The project carried out a field survey to identify the constraints affecting performance of community-based agro-business initiatives. The survey identified food processing skills and technologies, entrepreneurship and business management skills as the key constraints.

**Business plan development:** To address the constraints, KAPP supported the development of business plans preparation guidelines. It also supported the farmer Common Interest Groups (CIGs) business leaders and their service providers to develop business plans.

**MoUs with training institutions:** As the business plans were being implemented, the selected training institutions were brought on board to address the specific needs of the business entities. This was done through Memorandum of Understanding (MOU) instruments in which KAPP entered into collaborative partnerships with these institutions. The training institutions worked closely with industry and key stakeholders in the respective value chains. The stakeholders included farmers, input suppliers, service providers, processors, agricultural programmes and projects, and development partners. The DTI developed six modules, TUK developed two training modules, while Jomo Kenyatta University of Agriculture and Technology developed 20 modules.

**Module piloting:** The institutions tested the developed training modules through regional workshops. This was done through training of trainers for both service providers and farmer leaders.

The benefits of this work

**Wider product range and more improved revenue:** The trained persons supported the farmers’ group business entities as well as the individual farmer farm businesses to grow in terms of the products range and also in revenue generated. For example, the case of Mr. Ephantus Gichohi, the chairman of Gakindu Farmers’ Co-operative society Ltd, in Mukurweini, Nyeri County, who after being trained steered the co-operative to establish animal feeds processing plant, can attests to this.
“I was a beneficiary of the feeds formulation training at Dairy Training Institute in May 2014. My co-operative, made up of 1800 members, had tried to venture into dairy meal processing in April 2014. However, we had challenges in acquiring the technical expertise needed in operational and quality management processes. After the training I have provided expertise and leadership and the co-operative has since started formulating Pokea Dairy Meal as a new business line,” says Mr. Gichohi.

The dairy meal produced by the co-operative retails at Ksh. 1550 per 50 kg bag while the average price for the same product in the market is Ksh. 1650. It has become a popular brand within the county. The co-operative generates revenue through the sale of feeds to the co-operative members, neighbouring dairy co-operatives and farmer groups.

Gichohi is also formulating chicken feed for use in his farm and this has significantly reduced his cost of production. His home-made ration costs him Ksh. 2,300.00 per 70 kg bag while a similar product would cost him Ksh. 3,500.00 in the market.

A pool of ToTs: The capacity building on business planning produced a pool of trainer of trainers (ToTs) based at the KAPP County Service Units. The ToTs support the farmer common interest groups and individual farmers to prepare business plans on demand basis.

Adoption of modules: The developed modules by DTI were recognized and certified by the Technical Industrial Vocational Entrepreneurship Training Authority (TVETA), an authority within the Ministry of Education. The modules can thus be used in technical and vocational training in the dairy industry. Also, the modules led to the development of occupational standards for various actors in the dairy sector such as dairy processing technician, dairy production assistant, and artificial inseminators.

As a result of linkages, Egerton University has adopted the training modules by DTI and is currently using them to deliver certificate level courses. Smallholder Dairy Commercialization Programme (SDCP) and Equity Group Foundation have also adopted the dairy value chain modules for Training of Trainers courses. Further, the modules have been adopted for use in the Practical Training Centres under the Netherlands Development Agency (SNV).

Analysis

This initiative contributed to knowledge and practical skills both at the farm level and at the level of institutions of higher learning to link with industry.

Conclusion

The partnerships between the project and institutions of higher learning in the development of training modules, presented an opportunity to link new research trends, experimental techniques and innovation to industry. These tools are highly recommended for adoption as they present a unique platform to link the academia and community with the industry in order to bridge the gaps and address issues that will trigger increased production for the market and improved incomes.
Developing KALRO’s human resource capacities

Elizabeth Munyori, KALRO

For the Kenya Agricultural Research Institute (currently Kenya Agricultural and Livestock Research Organization-KALRO), a premier research organization, the enhancement of the capacity of staff was of paramount importance. A training needs assessment conducted in 2009 identified inadequate capacity in regard to work related skills. This created the need for short and long-term trainings across all staff cadres. Such trainings were to contribute to motivation of staff through competence, career development and promotion. Lack of an attractive scheme of service as well as conducive terms and conditions for staff also affected retention of highly qualified staff. The end result of all these was productivity that was lower than expected.

Interventions

For ten years, from 2004 to 2015, KAPP, working in partnership with other stakeholders, supported a project aimed at building the capacity of staff and human resource management at KALRO. The stakeholders included local and international institutions and consultancy firms. The following interventions were undertaken:

Assessing needs and constraints: KALRO carried out a training needs and organizational constraints assessment, in 2009, to guide in the planning, coordination, management and facilitation of its training programs. This was undertaken by a consultant who interviewed staff members in selected KALRO centres and during stakeholder meetings. Representation of staff and regions was ensured during the selection of respondents. A master training plan was developed highlighting the training program across the various cadres.

Upgrading skills, knowledge and attitudes for all KALRO staff: This focused on scientists, technical and administrative staff to enhance their capacity in regard to technical, leadership and managerial skills in line with the master training plan.

ISO certification process: Various activities were undertaken towards making KALRO an ISO-certified institution. Two consultancy firms facilitated the processes that involved pre-certification audits; training for ISO champions and internal auditors; sensitization of staff; collection of non-conformities; addressing of non-conformities and maintenance of ISO standards by undertaking internal surveillance audits twice a year. Bureau Veritas conducted certification audits to check on KALRO’s compliance and facilitated the ISO certification process.

Development of human resource strategy: The development of a comprehensive strategy was aimed at addressing issues in regard to ensuring that KALRO’s human resource is adequately skilled, competent, well cultured, motivated, and retainable. This strategy would be reviewed after every five years.

Development of a scheme, terms and conditions of service: A scheme of service was developed in 2006 and presented to the ministry for approval. This was aimed at motivating staff through: improved performance management systems; improved human resource management; career
development and better schemes and conditions of service. A task force was established to
develop tools for appraising all KALRO staff on the basis of their bi-annual achievements and
has been used to date and high achievers rewarded through appropriate promotions. However,
the long-awaited approval has been overtaken by the formation of KALRO rendering it un-
implementable.

Results
A report was developed as a result of the training needs and organizational constraints
assessment. The report highlighted the training needs for each job cadre, key among them being
inadequate skills in research management, computer, record-keeping, proposal writing, data
analysis, and customer handling among others. The key organizational constraints identified was
capacity that is un-matched with staff motivation resulting to staff stagnation in certain job groups.

Upgrading skills, knowledge and attitudes for all KALRO staff
In response to the training needs identified above, various trainings were planned and implemented
to upgrade staff on various skills. As a result, the scientists were able to develop good research
proposals that were successfully funded, enabling the institution to meet its objectives and
enhance its service delivery to farmers, its main clients. The increased number of publications in
refereed journals is an indicator to these achievements.

ISO certification: As a result of the interventions, KALRO was certified by International
Organization for Standardization (ISO); QMS 9001:2008 standard in February 2012. This
has improved the reputation of the organization both nationally and internationally. This has
also improved research outputs through holding the staff accountable to proper record keeping,
calibration of laboratory equipment’s and regular training of staff on the same.

Human resources strategy reviewed: A comprehensive human resources strategy was
developed in 2005. A review of this strategy was to be undertaken every five years. The review
actually happened as a result of the interventions.

Analysis
The skills acquired by KARI staff through the various trainings undertaken with KAPP funding
contributed highly towards enhancing the institutional outcomes. This has led to competent staff
making them marketable among other institutions.

References
1. Kenya Vision 2030
2. The ASDS
3. The NAEP
4. The KAPP PAD
5. The PIP
6. The Collaborative Research Grants
7. The Contracted Extension Service Delivery Model
Chapter 3 Supporting Agricultural Research
Supporting research: Overview

E.C. Ikitoo, Research Specialist, KAPAP

Introduction

Agricultural research in Kenya has undergone tremendous changes since its inception under the colonial government in the early 20th Century. The sub-sector has evolved from the status of a ‘purely advisory services function’ provided by the mainstream ministry of Agriculture, to research services offered by many semi-autonomous public institutions including universities and the private sector. The research sub-sector is led by KALRO, which is the central or main agricultural research organization in the National Agricultural Research System (NARS) with most qualified scientists and one of the best research capacities in sub-Saharan Africa. Despite these developments; in particular plurality, which confers many positive attributes to the research system; and the important role it plays in the country; hitherto, there has been no research policy to guide the NARS. The research has been guided by many acts including; Companies Act, Science and Technology Act Cap 250, Agriculture Act Cap 318 and university legislations. Under these diverse acts and legislations, many actors including civil society, NGOs and other non-state actors, have all claimed to do agricultural research.

Despite the huge human and physical capacity existing within the NARS, the research has largely been uncoordinated and subject to high risks of duplication of efforts and wastage of resources; and, in many instances the research agenda has been at variance with the national goal and people’s aspirations. Further, the research has been grossly under-funded on average at 0.7% of GDP, which is well below the 2.0% recommended by the New Partnership for Africa’s Development–Comprehensive Africa Agriculture Development Programme (NEPAD-CAADP, 2002; NEPAD, 2010) and over 5.0% in most industrialized countries. The research linkage to industry, which is the main consumer of agriculture raw materials and processor of agricultural products for value addition, has also been poor.

Justifying the intervention

This scenario called for interventions in terms of institutional reforms, improvement of coordination mechanisms and creation of synergies. In line with the operationalization of the NARS Policy 2012 and at its implementation framework the support by the World Bank needed to:

a. Orientate the agricultural research focus to make it responsive to national development goals, market demand, client needs, and cross-cutting and emerging issues.

b. Develop and manage an effective and efficient agricultural knowledge, information and communication system that links knowledge and information from a variety of providers and users.
c. Promote commercialization of agricultural research innovations in the process of technology development and transfer.
d. Develop an effective and efficient system-wide framework for planning, developing and managing the human resource capacity for research.
e. Establish innovative mechanisms aimed at achieving sustainable funding for agricultural research.

The Collaborative Research Model

The Collaborative Research Model (CRM) was developed under KAPAP for use by its Competitive Grants System (CGS), which established a scheme for research funding, i.e. Collaborative Research Grants (CRGs), as part of its support to reforms in the NARS. The KAPAP CRM is based on Agricultural Product Value Chain (APVC) approach, which is characterized by increased vertical coordination - resource management, production, post harvest handling, value addition/processing, marketing and interaction with consumers. The CRM applies holistic and collaborative approaches for research proposal development that involves multi-institutional and inter-disciplinary teams; and, emphasizes Public-Private-Partnership (PPP) with at least one or more industrial entrepreneur(s).

The CRM whose operational principles are based largely on the provisions of the Research Grants Manual (RGM) (Ikitoo, 2011) is guided by the following policy statement and objectives:

Policy Statement: KAPP’s grants administration system shall ensure that all collaborative research proposals are APVC compliant and address priority needs of value chain operators and supporters.

Granting mechanisms: The Collaborative Grants System (CGS) mechanism was used in this work. The CGS allows the research consortia to provide research services to value chain operators and to deliver innovations in product development, processing and marketing. The objectives of the CGS are: to promote broad stakeholder participation with focus on potential for agri-business development; to ensure research proposals demonstrate complementarities to past research findings and current or on-going research work and; to ensure research proposals take into account potential environmental and social safeguards in line with the National Environmental Management Authority’s requirements including a project screening report.

Who qualified for a CRG award?: All public and private agricultural research and development institutions, universities, producer organizations, agro-processors, consumers, NGOs and individuals were eligible for funding provided they were capable of conducting collaborative research with two or more partners in any of the identified agricultural product value chains. The identified agricultural product value chains were: cereals, fruits, vegetables, meats, dairy
and aquaculture. Research work was also done on Natural Resource Management (NRM). However, in all cases, the Principal Investigator (PI) and Lead Organization (LO) must be a member of the National Agricultural Research Systems (NARS).

**Using the model**

**Research:**

The Meats Value Chain research had two sub-components namely beef sub-component, with 5 consortium members working mainly with the Kenya Meats Commission (KMC) and Mugano Range in Taita-Taveta. The indigenous chicken sub-component had 10 consortium members drawn from two national universities, Kenyatta University and University of Nairobi, KALRO Kakamega and Government departments and agencies; and, which worked with 5 farmer groups in Makueni and Kakamega Counties. The dairy Value Chain research consortium had 7 members including the KEMRI medical team and three industrial members.

The Aquaculture Value Chain worked with KMFRI centres at Sagana and Sang’oro, Maseno University, Aquaculture Association of Kenya (AAK) and Kenya Fish Processors and Exporters Association (AFIPEK), and several farmer groups in the Mt. Kenya region, Taita-Taveta County and Western Kenya. NRM comprised of various research institutions including KALRO, Kenyatta University, University of Eldoret, KEMFRI, National Irrigation Board and various farmer groups.

![Distribution of KAPP Collaborative Research projects](image)
Capacity building of institutions

Training of researchers
KAPP used the Collaborative Research model to implement projects which supported PhD, MSc and BSc students. These students worked as research assistants in the projects to conduct studies in partial fulfillment of their theses and dissertations at various public and private universities. These included students from the University of Nairobi, Moi University, Kenyatta University, Jomo Kenyatta University of Agriculture and Technology, Mount Kenya University and Chuka University.

Training of farmers and other stakeholders
Besides research, the model was also used to train over 1,000 individuals including farmers, farmer groups and youth, comprising (47 per cent male, 41 per cent female and 12 per cent youth) on knowledge and skills required for the successful implementation of the projects activities.

Training of Undergraduate and Post Graduate Students
A number of the students, who were registered in various public and private universities were also funded by the project to undertake their PhD and MSc studies.
Linking fish production with markets in Kenya

Jonathan Munguti, KMFRI

For the past 10 years, William Kiama had to struggle to fend for his family. His earnings as a politician did not provide him with enough money to pay school fees for his children with ease. Being a former chairman of Sagana County Council, he also had county members to support. But life soon changed for the better when he started farming ornamental fish, tilapia and catfish. Kiama lives in Karima Sub-county of Kirinyaga County, Kenya, where he has constructed a big storey family house, courtesy of proceeds from his fish farm.

Good climate, dwindling fortunes

Kenya, being a tropical country, has many water bodies and conducive climate, making it highly favorable for aquaculture development. The area under aquaculture production has increased from 722Ha in 2009 to 14,076Ha in 2013, reflecting an increase in production from 4,220MT in 2009 to 42,000 MT in 2013 (FAO, 2014). This is largely due to increased government interest in the sub-sector and favorable policy and production environment. However, Kiama and other fish farmers in Kenya have for a long time grappled with problems of accessing quality and sufficient fish fingerlings, feeds and market access for their produce. Post-harvest losses and insufficient knowledge on husbandry and fish products, compounded their problems. Also, many
of these farmers were unable to maximize earnings from their produce due to limited or no value addition to their products. According to a KAPAP baseline study (2011), most of the fish farmers in Taita-Taveta, Meru and Kisii use traditional ways of drying and frying fish to add value. This limits their earnings, thereby demoralizing them and lowering their production. Insufficient supply of fish has kept per capita consumption of fish below 5kg (FAO, 2012); yet, fish is known to be a major source of superior protein for human health. This makes it necessary to mitigate the problems.

An Aquaculture Research Consortium was constituted, under the guidance of KAPP’s Collaborative Research grant approach, to create a vibrant and sustainable commercial aquaculture for food safety and security, wealth creation, and improved livelihood. The approach involved a group of partners and aimed at using appropriate and innovative fish farming technologies in the value chain among the rural poor communities. The consortium was led by the Kenya Marine and Fisheries Research Institute (KEMFRI).

### Partner institution and their respective roles

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<thead>
<tr>
<th>No</th>
<th>Institution</th>
<th>Role</th>
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<tbody>
<tr>
<td>1</td>
<td>Kenya Marine &amp; Fisheries Research Institute (KEMFRI)</td>
<td>Lead institution. Research coordination</td>
</tr>
<tr>
<td>2</td>
<td>State Department of Fisheries (SDF)</td>
<td>Training, extension, production and distribution of research findings</td>
</tr>
<tr>
<td>3</td>
<td>Aquaculture Association of Kenya (AAK)</td>
<td>Farmer mobilization</td>
</tr>
<tr>
<td>4</td>
<td>County Governments (Taita-Taveta, Kisii &amp; Meru)</td>
<td>Supervision and technical support</td>
</tr>
<tr>
<td>5</td>
<td>Maseno University (MU)</td>
<td>Training and capacity building</td>
</tr>
<tr>
<td>6</td>
<td>Private feed millers (Crop King feed millers)</td>
<td>Up-scaling and commercialization of tested feed production</td>
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<tr>
<td>7</td>
<td>Fish farmers/Traders</td>
<td>Beneficiaries</td>
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### The approach

KEMFRI and the other consortium members embarked on enhancing ongoing work on selective culture program for Nile tilapia (*Oreochromis niloticus*), catfish (*Clarias gariepinus*) and *ningu* (*Labeo victorianus*) - the commonly cultured fish in Kenya - and proximate analysis and feed formulations using non-conventional fish feed ingredients. This was done at the National Aquaculture Research Development and Training Centre (NARDTC), Sagana. At the same time, the team started working with farmers on key fish farming areas to address the challenges faced by farmers. Initially, the team concentrated in Taita-Taveta, Meru and Kisii Counties. However, this was scaled up to 20 counties which had been identified as having a high aquaculture potential.
in the national aquaculture suitability map (Aquaculture Development Working Group, 2012). The research team conducted a baseline study which indicated that capacity building along the aquaculture value chain was necessary in empowering stakeholders. The study confirmed that optimizing profits, improving productivity and reducing post-harvest losses while diversifying and value addition was necessary. The study involved all stakeholders such as grow-out fish farms, hatcheries, hoteliers, traders and feed millers in Meru, Taita-Taveta and Kisii Counties.

**Methodology**

Under the sponsorships of KAPP and its Research Advisory Committee, a full proposal on commercializing aquaculture production through sustainable technologies and market linkages was developed by a multi-institutional interdisciplinary team.

During the deepening and up-scaling phase (KAPP II) of this project, the consortium, jointly with respective county directors of fisheries in the four counties, reached out to 1200 fish farmers who were first sensitized and then encouraged to form farmer clusters for efficient service delivery. In some instances, the local chief barazas (meetings) served as venues of these meetings to sensitize farmers. This led to the formation of 38 farmer clusters. KMFRI jointly with the State Department of Fisheries and AAK in each county then conducted a training of trainers where 228 farmers participated.

**Selection of model farmers:** All the 48 farmers who had already taken up the fish culture as an enterprise were enlisted as model farmers to encourage their colleagues. This was aimed at improving fish production countrywide.
**Testing improved seed and feed:** By the time the KAPP support was coming in, KMFRI had been involved in a selective breeding programme for Nile tilapia, catfish and *ningu*. The organization was also doing feed formulation meant for different stages of fish development and different fish growing regions in the country. KAPP, being on board allowed more research into the non-conventional products that could be used in feed formulation. This came in handy because feed was expensive and many farmers could not afford the commercial feeds. Also, most of the commercial feeds were formulated for intensive fish production systems, as opposed to the semi-intensives. KAPP support enabled KMFRI to upscale trials both at the station and on farm using the improved formulated feed. Trials were also done in low and high altitudes (warm water fish in high altitude areas do not grow as fast as those in the high temperature lowlands). In total 18 on-farm trials were done countrywide. Samples of fish which did not perform well after the trials were taken for genetic analysis. The aim was to determine if there were other causes of their retardation.

**Forensic genetic mapping:** To understand underlying genetic factors of growth and to ascertain existence of any genetic differences due to geographical isolation among different populations, KMFRI collected samples from rivers Tana, Mara, Nyando and Kuja. The DNA of the samples of the three fish species were then extracted and analyzed at the International Livestock Research Institute (ILRI). On-farm experiments were conducted covering cost effective dietary and water quality management for genetically selected tilapia, catfish and *ningu* fish species in the focal areas of Taita Taveta, Meru and Kisii. This was done with a view to undertake similar investigations in different agro-climatic zones of Kenya.

**Setting up greenhouses:** To increase the water temperature in fish ponds in high altitude regions, the project team designed 4 green houses, for each of the 4 counties. Meru, Taita-Taveta, Makueni and Kisii tested fish growth performance and water quality parameters.

**Adding value to fish products:** To popularize the fish value added products from fish, the project partners, in liaison with the KAPP county representatives and county governments organized open-days in Makueni, Taita-Taveta and Kisii Counties where the value added products were exhibited. During the open days, fish-eating campaigns were also held among communities and regions which traditionally were not fish consumers.

**More fish, more gain**

**Increased fish production:** As a result, KMFRI has produced filial generation five (F5) of tilapia which increased production by 5%, compared to the previous generation (F4). More research on the F5 has resulted in the production of F6, which grows faster than all the previous generations. The F5 and F6 have superior production characteristics because they mature faster, have higher feed conversion ratios and higher survival rate. The research also improved the breeding of *ningu* and management of the *ningu* fry. Successful grow-out trials for the *ningu* in earthen ponds,
hapas and tanks were also recorded. However, poor growth response of the fish, in relation to the world trends, was recorded.

**Formulation of growth specific diets:** A total of 12 growth specific diets for three fish species under culture were formulated and categorized for different climatic zones. Locally available feed ingredients were also identified which when utilized in the feed formulations could bring down feed costs by 15%, compared to available commercial feeds.

**Value addition:** As a result of efforts to diversify the fish products, fish sausage, fingers, fish balls, skewers and fish pie, among others, were developed. These products have been taken up by hoteliers in Kirinyaga, Meru and Nairobi. The new products are aimed at increasing fish consumptions in the regions which were traditionally not fish consumers. The promotion of fish products has led to the entry of two fish restaurants in Meru, two fish sausage making operations and one new fish restaurant in Sagana.

**Greenhouses for fish production:** Water temperature is key to fish growth performance. As a result, 6 greenhouses for fish production were established in high altitude areas which are characterized by low temperatures. The greenhouses helped in regulating the temperatures. One greenhouse was established in each of the focal points (Taita-Taveta, Meru and Kisii), and two in KMFRI aquaculture stations in Sagana (Kirinyaga) and Kegati (Kisii). The ones established in Kirinyaga and Meru were for hatcheries.

**Production of Information Education and Communication (IEC) materials:** This work resulted in the development of Best Management Practices (BMP) handbook, grounded on sustainable fish rearing techniques as prescribed by the FAO code of conduct for fisheries and aquaculture. From the research findings, KMFRI has published and distributed over 2,000 units of fact sheets, brochures, booklets and posters in the three focal areas to inform communities on new development and opportunities available in the Kenyan aquaculture Value Chain.

The consortium also developed the Aquaculture Market Information Platform (AMIP) as a way to enable all aquaculture stakeholders’ access information on aquaculture via telephone and the internet. Currently, information on 240 fish farms and hatcheries has been recorded. The intention is to link all the stakeholders in the fish industry through the platform.

**An improved prototype of fish smoking kiln:** The project resulted in the improvement of a smoking kiln that had been developed by KMFRI in liaison with engineers from Jomo Kenyatta University of Science and Technology and selected *Jua Kali* (intermediate technology) artisans. The kiln is fitted with an insulator and a clay charcoal combustion compartment, which helps in reducing the amount of fuel used by 60% of the original kiln. It also has the heat regulator and a spice chamber which enhances the quality of the roasted fish. The improved kiln has been distributed to 4 project focal counties, one in each county. A total of 7 individual traders have also purchased the kiln.
Impact

Farmers are now more enlightened and are using more advanced approaches to fish production. Just like Kiama who now owns three vehicles which he bought from the proceeds of his fish farm, many fish farmers have recorded improved fish production and income. At his fish farm, Kiama has employed his three sons who have completed University education. He pays them better salaries than the respective market rates for the careers they undertook. “Fish farming is good and life has changed greatly for me and my family. Fish has become everything in my life. I look forward to the future with a lot of promise. As a family we have opened another farm near the river where we do not require to pump water in the ponds, water will be flowing through gravity to the ponds. I wish I started fish farming 20 years ago,” he says.

The innovations developed in fish value addition which have promoted diversification and preservation of fish products, have been well received among the common interest groups (CIGs)/ co-operatives along the aquaculture value chain. Some of the positive attributes of the innovations developed include boneless products, for example fish samosas, fish pies, fish fingers fillet, fish sausages, which can be achieved through early harvesting strategies and utilization of cost-effective inputs.

Some farmers are using greenhouses as fish hatcheries and for high value crop production. This approach is one way of optimizing production.
Conclusion and recommendation

Despite the great strides made in promoting the aquaculture value chain in the three focal areas: Taita-Taveta, Meru and Kisii counties, the aquaculture sub-sector is still behind other animal production sub-sectors in terms of economies of scale. For aquaculture to attain the economies of scale observed in the other livestock sub-sectors the national production should shift from the current 22% of the national fish production to 50%.
The African Indigenous Vegetables (AIVs), which constituted an essential source of food and nutrients to local communities over many centuries, were neglected with the coming of the colonial rule and European settlers, who introduced and promoted exotic, mainly European, vegetables for commercial production and marketing. However, the AIVs continued to be appreciated among the rural poor households for their nutritional qualities and as source of food security during times of scarcity, rather than for their economic market values. Nonetheless, farmers growing the AIVs face major problems including inadequate good quality planting seed/materials, low yields and poor produce quality. Further, high post-harvest loses, food safety issues, lack of awareness, limited value addition, and inadequate agribusiness opportunities are major challenges facing this sector. A survey on potential for commercial marketing of cowpea, nightshade and amaranth in Nairobi and Kisumu, reported annual traded volume of 4.3 tonnes worth Ksh 142 million in 2006 (Weinberger and Pichop, 2009). This is a clear indication of inherent potential for the AIVs in reducing food insecurity, generating more incomes and alleviating poverty.

Thus, following increased campaigns and sensitization on the nutritional and medicinal values of AIVs, their popularity and demand has increased.
The approach

During KAPP Phase II (KAPAP), a team of researchers and partners (KAPAP Vegetables value chain Research Consortium) undertook research activities aimed at improving productivity and incomes among African AIVs farmers within the KAPAP mandate area focusing mainly on amaranth in Meru County, cowpeas in Kilifi County, spider plant in Homa Bay and Siaya and pumpkin in Kakamega and Nyeri. The researchers’ intention was to enhance smallholder production, value addition and utilization of the AIVs; thereby, transforming the AIVs value chain into a commercially-oriented agri-business, while taking into account environmental and social safeguards including gender equity. In the initial phase of the project, the researchers focused on crop improvement including variety collection, selection and characterization, agronomic practices including plant population, fertilization and water use and Integrated Pest Management (IPM) approaches. However, during the second phase, i.e. deepening and up-scaling of identified activities, the focus was on post-harvest handling, value addition, and marketing and information communication. During this phase, a focus site was identified in Butere-Mumias Sub-County of Kakamega County for carry out the project activities for enhanced impact. The KAPAP Vegetables VC Consortium worked with smallholder farmers who cultivate these vegetables in the area.

Collaborators in the project

<table>
<thead>
<tr>
<th>Institution</th>
<th>Roles and responsibilities</th>
<th>Collaborators</th>
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<tbody>
<tr>
<td>Mount Kenya University</td>
<td>Coordination of collaborators</td>
<td>Prof. J.H. Nderitu – Principle Investigator</td>
</tr>
<tr>
<td>Chuka University</td>
<td>Implementation on pumpkins</td>
<td>Prof. D. Isitsa – Collaborator (Pumpkins)</td>
</tr>
<tr>
<td>University of Nairobi</td>
<td>Implementation on cow peas</td>
<td>Prof. M. Hutchinson – Collaborator (Cowpeas)</td>
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<tr>
<td>Jaramogi Oginga Odinga University of Science &amp; Technology (JOOUST)</td>
<td>Site coordination and provision of night shade</td>
<td>Dr. D. Andika – Collaborator (Night shade)</td>
</tr>
<tr>
<td>National Museums of Kenya</td>
<td>Implementation on amaranth</td>
<td>Dr. E. Kioko (Amaranth)</td>
</tr>
<tr>
<td>Egerton University</td>
<td>Implementation on spider plant</td>
<td>Dr. R. Mulwa (Spider plant)</td>
</tr>
<tr>
<td>Kenya Industrial Research &amp; Development Institute (KIRDI)</td>
<td>Mushroom spawn production</td>
<td>Dr. F. Mushieba (Mushrooms)</td>
</tr>
<tr>
<td>East African Nutraceuticals</td>
<td>Value addition and marketing</td>
<td>Mr. Wanyeki (Processor)</td>
</tr>
<tr>
<td>KAPP CSU, Butere-Mumias Sub County</td>
<td>Farmer mobilization</td>
<td>KAPAP Co-operative Farmer Groups</td>
</tr>
<tr>
<td>Masinde Muliro University of Science &amp; Technology</td>
<td>Farmer mobilization and capacity building - Service provider</td>
<td>KAPAP CSU Contracted Extension Service Provider</td>
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<tr>
<td>Butere-Mumias African Leafy Vegetables</td>
<td>Vegetable production and seed bulking</td>
<td>Farmer groups</td>
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Moving onto the farm

The researchers worked through on-farm research and surveys in seven counties- Homa Bay, Kakamega, Meru, Nyeri, Kilifi, Embu and Siaya. They first did reconnaissance surveys and stakeholder meetings and workshops in each of the seven counties to establish contacts with possible stakeholders. They also collected background information on the study locations before initiating the project. A questionnaire was developed to collect data on germplasm issues and the data was disaggregated by gender. Working with extension service providers and the KAPP County Service Unit, the team of researchers also identified individual or groups of farmers to participate in technology development, seed bulking and agronomic packages development in the project areas.

On-station research and laboratory work

To develop pure lines and establish economical spawn the researchers carried out on-station research at the University of Nairobi, Egerton University, Jaramogi Oginga Odinga University of Science and Technology, Chuka University, National Museums of Kenya and the Kenya Industrial Research Development Institute. They also evaluated germplasm to select the best pest and disease-free varieties/ectotypes of the vegetables for recommendation to smallholder farmers in the project areas.

Also, the team also conducted trials on cropping systems and other agronomic practices for the African indigenous vegetables on selected farms since they wanted to come up with production guides to be used by farmers and stakeholders. They also tested appropriate methods to promote an Integrated Pest Management (IPM) approach that would minimize the need for chemical pesticides during the vegetable value chain interventions. They also surveyed and mapped individual vegetable value chains and consumer preferences.

Trainings: The project trained 300 (57% women, 36% men and 7% youth) indigenous vegetable farmers on practices from beds preparation to harvesting, clean seed production including extraction and storage, leaf harvesting intensity and management, and utilization and recipes. Interactive trainings were conducted on entrepreneurship knowledge of the various technologies developed for AIVs, French beans and mushrooms and the markets and agribusiness opportunities available. During the trainings, participants exchanged knowledge and practices, including those on indigenous knowledge in AIV production. They were also trained on how to improve postharvest handling, value addition and utilization of vegetables, marketing and on how to prolong shelf life of indigenous vegetables. Drying of AIVs and increasing consumer awareness of utilization of dried AIVs was tested and evaluated.

Value addition and promotion of French beans and mushrooms: Apart from testing and promoting the dried, milled and blended mushroom flour, the team also promoted mixed French beans and other vegetables in local markets as packs for increased local consumption and
nutrition. This was to demonstrate the business opportunities in the African indigenous vegetables. Post-harvest handling and value addition of the vegetables, French beans and mushrooms was enhanced by demonstration of cooking of vegetables, mainstreaming of use of hygienic produce crates, packing bags and polythene bags, recipes and utilization models, sun drying and processing.

**Education and information sharing:** The research work included both researchers and postgraduate students who used the interventions for their post-graduate training. Chain actors in the African indigenous vegetables value chain were also trained on agronomic practices, post-harvest handling, value addition and marketing. Besides one video documentary on the vegetables, 25 Msc and PhD theses from ten universities in Kenya were developed from this work, alongside 25 scientific papers, one information booklet on good husbandry of the vegetables, 2 posters and fliers. These were disseminated for knowledge sharing. Also, as a result of the work, 10 newspaper reports (*Daily Nation*, *Standard*), 5 TV news reports, and 5 radio news were produced.

**Promoting indigenous vegetables**

**Crop improvement:** The researchers produced and recommended quality vegetable seeds. Out of the germplasm they tested, 30 accessions (ecotypes) of high yielding pumpkins were singled out and recommended to farmers. Also, 14 accessions (ecotypes) of high yielding Night

*Vegetative phase of the Spider plant enhanced through deflowering*
shade were identified, as well as 28 high yielding accessions (ecotypes) of cow peas. The indigenous species of mushroom in Kakamega County were also identified. Selection of pure lines of Night shade has been done at fields at Jaramogi Oginga Odinga University of Science and Technology.

**Improved agronomic practices:** Farmers targeted in this project engaged in clean seed production, improved planting, bed preparation, seed sowing and early crop care for Amaranth, Spider plant, pumpkins and Night shade. Different levels of CAN, DAP and organic fertilizers were established for different areas for increased indigenous vegetable and French beans yields. Deflowering and application of different rates of NPK extended the vegetative phase and productivity of Spider plants. The researchers also identified pests and diseases and effective botanicals and natural pesticides for the vegetables.

**Adoption of technology:** As a result of the interventions, farmers in Homa bay County have adopted the use of crates to bulk Spider plant. This has helped in reducing post-harvest losses. Also, farmers have adopted the solar-drying of the vegetables. This has increased consumer awareness of utilization of dried vegetables. It has also improved food security and farmer incomes during the dry periods.

**Value addition and markets:** Farmers in Butere Sub-County in Kakamega have adopted the practice of bulking their vegetables before selling them as a group. Those in Homa bay bulk their Spider plant, while those in Siaya bulk the Night shade. Attitude towards the African indigenous vegetables has positively changed due to awareness creation on nutritional and medicinal values as well as the agribusiness opportunities within the value chain.

**Lessons learnt**

Group approach, through the farmer field school where one central demonstration plot was collectively used as a training field, proved to be more appropriate. This approach impacts larger part of the community with minimal resources since each member is expected to replicate the knowledge gained to his or her individual plot. These efforts compliments the works by other organizations in the region since it provides an easy entry point to community development and empowerment without having to initiate a new group.

**Recommendations**

1. Farmers and seed companies should work together to enhance the production of identified clean and certified high-yielding local seeds of the vegetables identified in the project.
2. Further research work and farmers training on effective fertilizer applications, agronomic practices, IPM, post-harvest handling, value addition, utilization, and marketing of indigenous vegetables should continue in the project area and up-scaled in other areas in the country.
3. A policy on packing, transportation and marketing of African indigenous vegetables should be developed and implemented.
4. Processing of indigenous vegetables by farmer groups or processors and promotion of their recipes and utilization should be encouraged as a way of increasing marketing potential and availability throughout the year.
5. A course unit/outline for training farmers, service providers and students of middle and higher level institutions should be developed and implemented.

References

1. HCDA. 2010. Horticultural Crops Development Authority Annual Report

Jagero’s Spider plant and Nyar Egerton

Over the years, Mr. Jagero Bwana grew African traditional vegetables in his farm mainly for home use. He used a small section at the corner of the farm for these vegetables, reserving the bigger part to plant maize and potatoes. “At that time, I grew them (vegetables) just for their nutritional and medicinal value,” he says.

However, after the initial contacts and training by a team of researchers working on an indigenous vegetables project supported by KAPP, Jagero adopted Spider plant as one of his farm enterprises. He quickly made headways with the crop. After the first training on production technology for the Spider plant, he installed three demonstration beds in his farm with the support of the project. In three months, Jagero had expanded his planting to a quarter of an acre. He started supplying the nearby Chabera market with the much-liked vegetable. His wife also planted a quarter of an acre in an adjacent field, near a river, for seed production. Mrs Jagero harvested 20 kg of seed, which she sold to her neighbours in tea-spoonful packages costing Ksh. 5 each. From the earnings, together with her husband, they purchased a dairy cow, which they named Nyar Egerton – Osuga, at a cost of Ksh. 13,000. Mr Jagero also attests to paying school fees for his daughter, who is a student at the Kisumu Technical College, from proceeds of the vegetable sales. “Dek (Luo for Spider plant) has changed my life in a short time and I will always plant it if I can access good quality seed,” he says.
From livestock deaths to quality cuts and wealth among ASAL communities
Kanyari Paul, University of Nairobi

“State sets aside Ksh 600M to buy “dying” Livestock”

“Ministry asks for Ksh 800M to save dying Livestock”

These are some headlines hitting the Kenya print media nearly every year!
During drought, livestock farmers in the arid and semi-arid areas in Kenya lose their animals mainly due to acute shortage of feed, water, diseases, poor genetic breeds, poor coordination between pastoralists and the market and trade-sensitive diseases. Seasonality of feed quality and quantity, and lack of competitiveness in the regional and global markets due to lack of product traceability have also contributed to the livestock farmer problems. Interventions by the government have been ad hoc, thereby costing the country millions of shillings, yet the effect has never been long lasting. Due to drought and lack of feed farmers deliver emaciated and dying
livestock to Kenya Meat Commission. The emaciated animals fetch poor farm gate prices. At the same time the farmer has to deal with challenges of transport constraints and major mortalities. This brought the need for proper scientific studies to document and authenticate a feeding and animal traceability system that can guarantee a livestock farmer an edge for a wider market penetration. The system should also allow an acceptable sanitary level for beef animal finishing.

**Partners in the work**

<table>
<thead>
<tr>
<th>Participating Institution</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Nairobi</td>
<td>Lead institution</td>
</tr>
<tr>
<td>Faculty of Veterinary Medicine</td>
<td>Principal Investigator- Overall coordination and veterinary inputs</td>
</tr>
<tr>
<td>Department of Food Science and Technology</td>
<td>Aspects of meat science and technology</td>
</tr>
<tr>
<td>KARI (Now KALRO)</td>
<td>Animal health</td>
</tr>
<tr>
<td>GoK, Department of Veterinary Services</td>
<td>Traceability and policy alignment</td>
</tr>
<tr>
<td>Kenya Meat Commission(KMC)</td>
<td>Slaughter, carcass grading and processing</td>
</tr>
<tr>
<td>Nutrimix Feed Company</td>
<td>Feed formulation</td>
</tr>
<tr>
<td>NGO-COVAW (now Asilia Consultancy)</td>
<td>Social economic aspects</td>
</tr>
</tbody>
</table>

**Tackling emaciation and weight loss in cattle**

**Study site:** The partners (listed in table above), working as a research consortium, led by the University of Nairobi, set up a feedlot with a capacity to hold 50 animals, in a community-owned Mgeno Ranch, Taita Taveta County. The ranch covers an area of 53,000 acres. The climate around the ranch is semi-arid, with average annual rainfall in the 300-450mm range. The feedlot acted as the study site.

**Animal recruitment and handling:** To populate the feedlot, the consortium purchased bull cattle from the two predominant breeds Sahiwal and Zebu (based on colour). The two breeds were randomly purchased in equal numbers at a market in Garissa town, Garissa County. They were around two years old and weighed 150 Kg on average. The bulls were injected with ivermectin and a pour-on acaricide applied on the back side before being loaded onto a truck to the study site. On arrival, the animals were vaccinated for Contagious Bovine Pleuro Pneumonia, Foot and Mouth Disease and Blackquarter combined with Anthrax. They were also administered with a reticular bolus- a radio frequency identification device (RFID). Each breed was then divided into two- one half being grazed and the other put on semi-feedlot system. The researchers then observed the animals daily for disease conditions. They gave relevant treatment and conducted full post-mortem on any animals that died. They weighed the animals every two weeks.
Feed and feeding regime: Feed for the feedlot was formulated at the University of Nairobi in consultation with Nutrimix Feed Company and specifications given to a reputable manufacturer who mixed the feed in a single batch to ensure uniformity. Supplementary feed was given at 2 kg/animal/day in the evening while water was offered unlimited.

After 90 days, the animals were transported to Kenya Meat Commission for slaughter. Each animal was individually identified using the RFID identifiers and an ear tag then weighed. The bulls were then washed, stunned and slaughtered. The bolus was removed from the reticulum at slaughter in a process called “termination”. The boluses were recovered at a rate of 100 per cent and kept for future use. Carcasses were graded as per KMC grading system.

Results

Improved growth performance: There was minimal treatment of animals except for the application of an acaricide pour-on. Two bulls among the semi-feedlot group died from strangulation. Grazed bulls started with an average weight of 133.1 kg and finished at an average of 142 kg. This is compared with the feedlot ones which started at 129.75 kg and finished at 174.75 kg on average. This translates to a gain of 6.69 per cent and 34.36 per cent for the grazed and feedlot bulls respectively. At the end of the study, 16 semi-feedlot bulls had attained a weight of over 170 kg while only 2 in the grazed group reached the same weight.

Bulls were sorted from the lowest start weights to the highest and their percentage weight increase calculated as the difference between the start and finish. Among the grazed animals, 83.32 per cent gained below 10 percent, while 6.67 percent had even a negative weight gain. In the feedlot animals 96.43 percent gained 20 percent over their starting weight, and only 3.57 percent gained below 20 percent. Breed comparisons revealed that Zebu outperformed the Sahiwal in both the grazed and the feedlot groups. The feedlot Zebu had a steady weight gain while all the rest had a slight decrease towards the end of the experiment. At this time, the availability of forage and water was at its worst and competition for water with the wildlife was at its highest. This aspect required a more detailed study to allow for firm conclusions.

Better carcass grades: The feedlot animals were taken to the Kenya Meat Commission where they recorded a 2 percent higher dressed weight on average than the grazed ones. The quality of dressed carcasses was better in weight and grading among the semi-feedlot bulls compared to the grazed ones. This agrees quite well with studies carried in South Africa among Bonsmara steers. In other words, the feedlot animals performed significantly better than their grazed counterparts.

Adoption of technology: The management of Mgeno Community Ranch have chosen to adopt this semi-feedlot technology for purposes of finishing their bulls immediately.
Table 3: Price comparison between the semi-feedlot and feedlot bulls

<table>
<thead>
<tr>
<th></th>
<th>Live weight (Kg)</th>
<th>HDSW</th>
<th>KES</th>
<th>Price/Bull</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedlot</td>
<td>4431</td>
<td>2185.1</td>
<td>557,200</td>
<td>19,900.00</td>
</tr>
<tr>
<td>Grazed</td>
<td>4010</td>
<td>1817.6</td>
<td>463,488</td>
<td>15,449.6</td>
</tr>
<tr>
<td>Difference</td>
<td>421</td>
<td>367.5</td>
<td>93,712.5</td>
<td>4,451.6</td>
</tr>
<tr>
<td>Attributable %</td>
<td>9.50%</td>
<td>16.80%</td>
<td>16.80%</td>
<td>28.8%</td>
</tr>
</tbody>
</table>

A cost-benefit analysis for this semi-feedlot intervention revealed that the cost per bull over the 90 day period was Ksh 4,462. This figure almost balances out with the gains realised per semi-feedlot bull of Ksh 4,451.

The off take weight is taken as the weight at purchase and is converted at the respective dressing weight of the two groups. Price is calculated at Ksh 198 per kg for the accelerated off take (this is the actual price the government was paying at the time) and Ksh 255 which was the price KMC paid per kg. There was a 85.46 per cent increase in the price for the feed lot group and a 37.43% in the grazed animals.
Analysis

• This study shows that bulls averaging two years can be improved and saved from wastage if put in a semi-feedlot system that supplements feed obtained from the pastures in a semi-arid environment of Taita Taveta County.

• The weight gains in this study did not reach the target of 1 kg per day as demonstrated elsewhere such as in Botswana by Norris et al. (2002), the reason for this is attributed to the fact that the bulls were only in the feedlot partially having spent the day out in the range. However, this work shows that the feed supplementation for crude protein, minerals and digestible energy was serving the bulls effectively and this would translate to better monetary returns.

• This intervention when compared to the Government off-take programme, shows that carcass values are increased by over 85 per cent while natural pasture grazing improves them by only 37.4 per cent. The differences show that moving animals from drought-stricken areas to the ranches will save the animals from dying while slightly improving their body condition.

• The generic model semi-feedlots in this pilot study are not directly comparable to those previously used in high potential areas. The current intervention should be viewed against the backdrop of the massive livestock losses that pastoralists incur every year from drought due to lack of workable options. Indeed, International Institute of Rural Reconstruction (IIRR) in their Policy Brief of September 2014 recommended feedlots as a means of availing feed to the pastoralist animals during drought.

• Today, where feedlot finishing is embraced, the industry is dynamic, changing and adapting to new technologies, public concerns and economic constraints (Corbin and Griffin, 2006). The sanitary aspects of this intervention ensures easier and effective disease control measures in the production which is in tandem with the goals of feedlot finishing (Corbin and Griffin, 2006), and an important mitigation in the penetration of international meat market.

• Sustainable environmental management is central to successful livestock-based livelihoods, since livestock usually depend on environmental resources such as pasture and water for
survival and production (Livestock Emergency Guidelines and Standards, 2014). Such considerations also favour this current pilot system of production as there is less soil erosion and conservation of indigenous forage among other benefits.

- A further desirable aspect for entry into the international markets is traceability of meat and meat products. This pilot study has shown the RFID boluses are practicable and reliable and further supports the work by Matete et. al. (2009) in Kenya and Moreki, et. al. (2012) in Botswana. This technology is safe, environmentally friendly and tamper proof and can be relied on to identify individual animals country wide. If this bolus system can be integrated with satellite tracking technology using Global Positioning System (GPS) and Geographical Information System (GIS), stock theft can be contained.

Recommendations and conclusion:

- There is a need for more private sector expansion into livestock production since there is a low degree of commercialization in Kenya’s livestock production sector. Further, both nomads and agro-pastoralists use poor livestock production and feeding regimes and this semi-feedlots can serve to improve on animal feeding and bring pastoralists to the mainstream economy.
- Once bulls are finished through this semi-feedlot system, better markets should be sought as KMC does not compensate for ovals, hides and hooves, thus negatively impacting on the returns.
- The ranching community should organise bulk feed sourcing and mixing to capitalise on economies of scale as this study has revealed economic advantages of semi-feedlots over conventional pasture finishing.
- A more careful selection of bulls at the Garissa market would also give a better profit margin as opposed to the situation where sellers perceive the buyer to be a ‘donor’.
- The government should consider using feedlots as an intervention as opposed to the capital-intensive off-take programmes which uses millions of shillings but with very little impact. The feedlots can be located in all the ASAL Counties and up-scaled to handle 500 to 1500 animals at ago, and where inputs can be supplied centrally with ease. This can provide long lasting solutions to this chronic problem.

References

Moving the case for sorghum for food security, nutrition and industrial growth in Kenya

Erick Cheruiyot, Egerton University

Germano Mugambi from Mbuta Location, Miriga Mieru East Division of Imenti North District is a proud owner of a new permanent house, which he finished building recently from money he earned from his sorghum crop. He started growing sorghum in 2013. Before this, Germano had no other dependable source of income yet he had to support his children and aging mother. He started by cultivating 2 acres of the crop. The following season he planted 5 acres of sorghum from which he harvested 6,750 kg. This earned him an income of Ksh 175,000. He is one of the farmers from Meru county who benefited from training on how to double sorghum production. The training was conducted by a consortium supported by the Kenya Agricultural Productivity Programme (KAPP) to improve production and income among smallholder sorghum farmers. After the training, Germano planted another 5 acres of sorghum from which he estimates to harvest 10,000 kg of sorghum and earn an income of Ksh 250,000. He is also an agent, buying and bulking sorghum grain which he sells to Shalem Investments, a private company. In 2013, he mobilized up to 100 farmers who produced and sold 420,000 kg of sorghum worth Ksh 10,500,000. The sorghum was sold to Shalem Investments. Being one of the 100 farmers he used his share of the income to complete building the permanent stone house. This enabled him to move from the semi-permanent house he has been living in with his family for many years. Also, he purchased two bulls which he uses for ploughing. Germano is now a happy young sorghum farmer and he plans to start large scale farming by leasing land.
In Kenya, sorghum is one of the traditional cereal crops with a wide agro-ecological adaptation and great potential to improve food and nutrition security, and to enhance industrial growth. A baseline survey conducted in Nakuru (Ogeto et al., 2013) and Siaya (Akuno W., 2012) counties, found out that sorghum production and uptake is low. Despite the numerous benefits that sorghum possesses and research efforts made in the past, its adoption, production and utilization as a staple and commercial crop in Kenya remains low. This is largely due to low yield, lack of specific varieties for the diverse products, inadequate product promotion, poor marketing linkages and unfavourable policy environment. At the farm level, sorghum production is limited by poor agronomic practices, diseases and pests, un-developed seed supply systems and poor marketing channels. Besides, there has been limited involvement of women, who are the majority in agricultural production, in decision-making on production options.

A research consortium consisting of four universities, one non-governmental organization (NGO) and three industry players sought to work in this area. The consortium, through the funding support of KAPP’s Collaborative Research approach, focused on identifying and promoting sorghum varieties for use in brewing, baking and production of ethanol among other sorghum products. Each of the industrial players was to link with farmers for grain supply, thus providing agribusiness with additional benefit of improving rural livelihoods.

The collaborators

The researchers, drawn from Egerton University, University of Nairobi, Jomo Kenyatta University of Agriculture and Technology, Jaramogi Oginga University, Sacred Africa and the former KARI, together with East African Breweries Ltd. (EABL),
Spectre International and a bakery, all collaborated in this work. Farmer groups in Siaya, Nakuru and Makuenei were incorporated as the main producers of sorghum for industrial use. The whole process of bringing together the partners in this collaboration was facilitated by KAPP.

**Genotype evaluation for industrial uses:**
At the start, the research scientists and the industry engaged in a discussion on product development in line with their respective business engagements. Egerton University engaged three industrial players whose businesses required sorghum as one of the raw materials. In this regard, the East African Breweries Ltd (EABL) wanted a sorghum variety that is good for malting and beer brewing; a sorghum thresher to ensure delivery of clean and good quality grain from contracted farmers and; a suitable herbicide for use in sorghum production. Spectre International Ltd. wanted a sorghum variety with high fermentable sugars in stalk juice to be used in ethanol production. Nakuru Patisserie Bakery wanted a sorghum variety with good baking characteristics for making bread and cakes. This necessitated the collection of sorghum varieties for evaluation for the identified purposes as required by the industries. Over 150 different sorghum genotypes were collected from local farmers, neighbouring countries and the International Crops Research Institute in Arid and Semi-arid Tropics (ICRISAT). The materials were subjected to both field evaluation and laboratory analysis.

An engineer and an agronomist at Egerton University responded to the special request by the EABL on ensuring delivery of clean and good quality sorghum grain from contracted farmers by developing and testing a suitable sorghum thresher and evaluating suitable herbicides, respectively.

**Evaluating nutritional and health benefits:** In order to market sorghum for food, there was a felt need to establish its potential benefits for human health. The University of Nairobi (UON) evaluated sorghum grain quality for the various phenolic compounds in order to ascertain the grains potential for anti-cancer properties. The university also evaluated several sorghum genotypes for yield performance.
Community-based seed multiplication: To promote and sustain the sorghum production linkage between farmers and industry, a farmer-managed seed multiplication system was set-up. Jaramogi Oginga Odinga University of Science and Technology (JOOUST) took up the task of engaging the farmers in seed multiplication. They started with a farmer-group of 17 members with 5 kg seed of macia sorghum variety. The 17 farmers grew the seed in one block and later shared the yield for subsequent multiplication.

Farmer mobilization and training: Farmers were aggregated, trained and encouraged to register as common interest groups (CIGs) that would finally form co-operatives. Sacred Africa, an NGO, facilitated the farmer-mobilization and training activities in Nakuru and Makueni counties.

Post-harvest handling of sorghum: Safety of sorghum grain to consumers emerged as a concern. Research team from Egerton University undertook to ascertain the quality status of sorghum in farmers’ custody. A collection of sorghum samples was done from farmers’ storage facilities in Siaya, Nakuru and Makueni counties. A total of 88 samples were analysed for presence of fungi contaminants and a determination of toxins caused by the fungi. Following the results, it was observed that majority of the farmers heaped and dumped wet sorghum heads after harvesting, thereby providing suitable conditions for growth of the contaminants.

Grounding sorghum as a crop

Genotypes identified for industrial use: A total of 130 sorghum genotypes were evaluated for malting, brewing and baking quality. Out of 20 potentially good genotypes for malting and brewing, the EABL confirmed and approved two. One of the two is a hybrid which has since been submitted to KEPHIS/Variety Release Committee for the National Performance Trials (NPT) and subsequent release. Similarly, out of 130 sorghum genotypes for baking quality, 5 genotypes had very good quality for bread making at a ratio of 12-16 per cent sorghum to 84-88 per cent wheat flour. One of the 5 genotypes has been submitted to KEPHIS/Variety Release Committee for the National Performance Trials and subsequent release.

Egerton University, jointly with Spectre International Ltd. undertook evaluation of 25 sweet sorghum genotypes for ethanol production. Based on the ethanol yield, three genotypes were selected and submitted to KEPHIS/Variety Release Committee for National Performance Trials and subsequent release.

Technologies developed

As a result of this project, a sorghum thresher was developed by an engineer from Egerton University. The thresher has undergone tests in two farms; KampiYa Moto and Tharaka. The machine produces about 2-3 bags of clean sorghum grain per hour using 1 litre of petrol which translates to Ksh. 30 per bag. Threshing and cleaning efficiency is 100% and 95%, respectively. The machine which can be operated by two people threshes sorghum at 11-15% moisture.
content, and it weighs 110 kg. Farmer groups in Busia, Siaya and Tharaka have each been given one thresher as a means of promotion. Farmers can get the thresher by placing an order at Egerton University. In order to reduce on fungi contamination, a model of a portable drier was developed to help reduce moisture content and thereby avoid growth of fungi in sorghum after harvesting. The drier is portable (length 2.3 m, width 1.0 m and height 2.2 m) and easy to move around. Three driers have been distributed one each to a farmer-group in Busia, Siaya and Tharaka.

**Nutritional and health benefits:** Studies conducted by the University of Nairobi confirmed that polyphenols present in sorghum are known for anti-oxidant activity and are known to play a role in reducing incidences of cancer, hence its health benefit. Preliminary results show fibre content ranging from 2.27 – 3.06 per cent, protein content 4.2-9.7 per cent and total polyphenols at 146-542 mg/g.

**Community based seed multiplication:** Just as Germano found out that sorghum is a profitable enterprise, farmers in Siaya County also embraced the seed multiplication exercise for its economic benefits. As a result, the exercise reached 2000 farmers in the County. Also 20 acres of macia variety has been planted by the farmers who harvested 100, 90 kg bags of seed.

**Co-operative society:** As a result of mobilization and training, farmers in Siaya who had taken up seed multiplication formed Siaya Grains Co-operative Ltd. The society helps in bulking the seed and in marketing the produce from farmers as a group.

**Nutrition and industrial products:** As a result of genotype identification, bread baked from the five selected genotypes has been developed. Other baked food products include *mandazi* and *chapatti*. Some farmers are using the sorghum to make *ugali* (sorghum pate). EABL contracted farms in the sorghum growing areas to supply sorghum for use in making Keg beer. However, EABL reduced its involvement in the Keg beer market due to unfavourable tax regime. This resulted in some contracted farmers incurring losses.

**Sorghum grain safety and quality:**
This work generated information that helped farmers in handling their sorghum produce so as to minimize aflatoxins. This would contribute to low risk exposure to mycotoxin-producing fungi and post-harvest losses in sorghum grain conditions, which is a perennial problem among smallholder farmers in the sorghum growing sub-counties.

**Institutionalising sorghum**
The collaborative effort by both research and industrial players contributed to fast attainment of the results. Identification of suitable sorghum genotypes was achieved in less than two years, compared to a much longer time if scientists evaluated the genotypes without involving the end-users.
This initiative has demonstrated that sorghum can be promoted for diverse uses, targeting the needs of key industries. Therefore, sorghum production can be increased in Kenya, with the positive impact on agribusiness development as a result of contract farming. However, the challenge in attaining this goal lies on government policies which could directly or indirectly influence sorghum production. A case in point is the imposition of a heavy tax by Kenyan government on Senator Keg beer brand made from sorghum, which significantly led to reduced production of the beer brand. This led to reduced sorghum demand by EABL, thereby pushing out many farmers who were growing the crop as a business for the brewing company.

**Recommendations**

The uptake of the results of this work on sorghum, whose effect touches on agribusiness, food security, human nutrition, industrial sustenance and increased incomes in rural areas requires favourable policy environment. There is need to review the tax policy on Keg beer and related products in order to encourage sorghum production for industrial use. A policy needs to be put in place to re-focus sorghum production in Kenya to enhance food security.

**References**


A plant breeder from Egerton University together with the Regional Sorghum co-ordinator for EABL inspect sorghum in KampiYa Moto, Nakuru County.
Enhancing productivity of mango and passion fruit value chains

Joseph K. Njuguna, KALRO Kandara.

For a long time, Teresia Munyiva suffered severe losses from her mango orchard in Kawala, Makueni County of Kenya. Her mango fruits fell off the trees without proper maturing, and even those that ripened could not be sold because they had mango weevil and fruitflies. But even after she applied a lot of chemicals on the crop to keep off the insects and diseases, she could not sell the fruits in the markets outside Kenya because they contained too much pesticide, that could adversely affect human life.
In Kenya, Mango is ranked second most important fruit after bananas, in terms of value (Kehlenbeck et al., 2012). In 2011, a total 59,260 ha was under mango production, which yielded 636,585 tons of fruit valued at Ksh 11.8 billion (HCDA, 2012). Passion fruit, on the other hand, is the third most highly exported fruit in Kenya. In 2012, 2,163 ha were under passion fruit production generating Ksh 1.6 billion (HCDA 2013). However, development of the mango and passion fruits industries in the country have been limited by various constraints, which curtailed their activities. A baseline study conducted in 2010 by the KAPAP institutions indicated that 92.2 per cent of farmers in Kenya had problems of pests in their mango orchards. Up to 58 per cent of them mentioned mango seed weevil as the most serious insect while 32 per cent mentioned fruit fly (Gitonga et al., 2010). Another challenge for farmers like Teresia and her fellow mango producers is jelly seed physiological disorder which render fruits unmarketable (Chege et al., 2012). It manifests itself through formation of a watery region around the seed which produces a fermentation smell.

For passion fruit, the main production challenges, according to a survey by Kenyatta University- one of the collaborating organizations in the KAPAP Fruits VC Research Project, included die-back and fusarium wilt diseases. To control these diseases, farmers apply a lot of pesticides leading to problems of maximum residual levels (MRLs). The pests have also become largely resistant to the pesticides. Low access to quality healthy planting materials has also led to farmers using seedlings from uncertified nurseries, some of which contributed to spread of diseases.

For both fruits, farmers lacked adequate knowledge on post harvest handling and value addition. As a result, full economic potential of the two value chains was never achieved.
### Key collaborators

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Role</th>
<th>Collaborators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya Agricultural and Livestock Research Organization, (KALRO)</td>
<td>Lead Organization; Principle Investigator (PI) Validation and dissemination of mango integrated crop and pest management and overall project coordination.</td>
<td>Mr. J. K. Njuguna (PI) Others: Mr. Samuel Muriuki Shem Wanjala</td>
</tr>
<tr>
<td>Kenyatta University (KU)</td>
<td>Determine epidemiology of major passion fruit diseases.</td>
<td>Dr. Maina Mwangi</td>
</tr>
<tr>
<td>Jomo Kenyatta University of Science and Technology (JKUAT)</td>
<td>Developing value addition technologies, capacity building of cottage processors.</td>
<td>Dr. Willis Owino</td>
</tr>
<tr>
<td>University of Nairobi</td>
<td>Developing and validating mango post-harvest technologies.</td>
<td></td>
</tr>
<tr>
<td>Kenya Forestry Research Institute (KEFRI)</td>
<td>Developing mango database.</td>
<td>Dr. Phanuel Oballa</td>
</tr>
<tr>
<td>Kenya National Federation of Farmers (KENAFF)</td>
<td>Developing business plan for small scale processors.</td>
<td>Mr. Edward Gateiya</td>
</tr>
<tr>
<td>Kamurugu / RIDA Initiative</td>
<td>Supplying farmers with mango and passion fruit seedlings and capacity building.</td>
<td>Mr. Peter Mbogo, Muriithi Mr. Adrian</td>
</tr>
<tr>
<td>Kamumo Products</td>
<td>Value addition on mangoes.</td>
<td>Mr. Fredrick Kiilu</td>
</tr>
<tr>
<td>KAPAP County Service Units</td>
<td>linking researchers with value chains common interest groups and co-operatives.</td>
<td>CSU Coordinators: Embu, Meru, Makueni, Kilifi</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Mobilization of farmers and technology dissemination.</td>
<td>Mr. Samuel Muriuki</td>
</tr>
</tbody>
</table>

The collaborators focussed on the mango and passion fruit growing areas in Embu, Meru, Makueni, Kilifi and Uasin Gishu counties. The team first did an environmental and social management screening whereby stakeholders listed all potential chemicals and pesticides used by farmers for approval by KAPP.

### Tackling the constraints in mango value chain

**Mango weevil control:** To control the weevils, this project used the farmer field school approach. Eight orchards with at least 100 trees each were selected for this exercise. Mango trees trunks
were banded with a mixture of Dursban (Chlorpyrifos 480g/L) and white wash just before flowering. This was repeated at a monthly interval until when the fruits were the size of an egg. In addition, field sanitation was strictly observed. Dursban helped in repelling the weevil as well as preventing termites from climbing up the tree. The white wash on its part helped in identifying the treated trees as well as ensuring that the chemical was spread uniformly in the farm.

**Fruit fly control:** This involved a combination of pheromone traps and an attractant (sugar) laced with an insecticide. The idea was to attract male fruit flies using pheromones for population monitoring purposes and killing them. The attractant on the other hand kills both male and female fruit flies. It is sprayed on one side of the tree in alternate rows thus diverting fruit flies from the fruits. In addition, field sanitation was strictly observed as well as other field management practices.

**Flower induction:** Due to glut that occurs during the mango on-season, the collaborators found it necessary to develop a technology for inducing mango flowering off season. Consequently, a growth regulator called “Auster”, which is used for flower induction in other mango producing countries, was imported from Australia. It was tested at KALRO Kandara and at Kamurugu Initiative Farm in Mbeere.

**Jelly seed physiological disorder:** Application of dolomitic lime as a way of controlling jelly seed disorder was tested in Karurumo in Embu County. The trial involved application of 2 kg lime/tree/year which was evaluated against control (no lime).

**Making a mango database:** To enable mango stakeholders to access information, KEFRI led the process of developing an online mango data base. The database comprises information on mango varieties grown in Kenya, their characteristics and where they can be found among other information. Data on the mangoes were collected in terms of observations and literature review and grouped as per the origin, varieties, agronomic aspects, quality traits, and disease and pest tolerance status. Photographs of varieties were also included in the data to assist in mango identification.

**Postharvest and value addition technologies:** The collaborators, working with farmers, also worked on the maturity index of different mango varieties as well as various packaging materials. This was aimed at extending the shelf life of the fruit. They also trained 967 farmers (569 males and 398 females) on mango production, value addition and appropriate technologies for making various products, and on cottage processing.

**Marketing:** But one of the major challenges faced by cottage processors is access to markets. Farmers are having huge harvest with no markets for their products. To address this challenge and to create employment, KALRO— one of the collaborators—developed distribution equipment— a tricycle fitted with a cooler box. Traders would get mango products from processors and, using this equipment, sell them in urban areas.
Working on passion fruit value chain

On-station: The partners conducted on-station research at Kenyatta University, during which passion fruit diseased materials were sampled from production fields and pathogens isolated and identified. This was followed by a field survey in key passion fruit producing areas of Embu, Meru and Uasin Gishu counties, to determine the level of farmer constraints.

Counting the benefits - Quality mangoes: In all, the mango weevil control using stem banding and sanitation reduced mango weevil infestation- at KALRO Kandara site by 90 per cent, at Kanyuambora, Embu (92 per cent), at Giaki, Meru (82.7 per cent) and at Kawala, Makueni (100 per cent). Joseph Mawe, a farmer at Kathonzueni, Makueni County and a member of Makiyika Mango Growers and Processors, says he likes this technology because it is easy to apply and it is effective. For Teresia Munyiva, who is a member of Kawala Mango Growers association, this technology is effective and gender friendly. “We are now getting export grade fruits without incurring too much cost and without worrying about Maximum Residue Limits (MRLs),” says Teresia. It was established that application of Dolomitic lime at a rate of 2kg lime/tree per year also reduced jelly seed incidents by 77.2 per cent.

Fewer fruit flies: This project helped in reducing fruit fly infestations from as high as 40 per cent to less than 10 per cent. This resulted in better quality mangoes and subsequently more income for farmers.

Flower induction technology: The growth regulator (Auster) caused one month early flowering of Kent variety at Kamurugu farm in Embu County. It is now being tested on other varieties.

Mango data base: Farmers can easily access the online database set up by KEFRI, which established that there are more than 70 mango varieties grown in Embu, Makueni and Kilifi counties. Of these, only six varieties namely; Apple, Ngowe, Kent, Tommy Atkins, Van Dyke and Boribo are planted for commercial purposes.

Postharvest and value addition technologies: Three groups of farmers whose members benefited from training on processing and hygiene are in the process of acquiring Kenya Bureau of Standards certification for their products. One group, Kawala Mango Growers, in Makueni, has acquired a mango drier and has been linked to a mango buyer in Nairobi.

Improved marketing: A processed products distribution model involving the use of cooler boxes mounted on tri-cycles to deliver fruits from cottage processors to consumers was developed by KALRO.

The tricycle fitted with a cooler box, as an innovation, has been adopted by Mukiyika Mango Growers and Processors in Kathonzueni, Makueni. This has enhanced the group’s product distribution. The unique thing about this technology is that cottage processors concentrate on processing while traders get the products from them using the tricycle to sell in towns where there is a bigger market. The fact that the juice is sold in cold state makes it more attractive to customers. The whole equipment, at Ksh 15,000, is quite affordable.
**Passion fruit value chain:** For passion fruit, on-station research established that purple passion fruit, C5 and KPF4 varieties were most susceptible to dieback. On-farm studies confirmed drastic reduction of passion production by diseases and pests, and that consequently farmers spray their crops from pre-flowering to harvesting, leading to high residual levels.

**Enhancing capacity:** A total of 11 students have benefited from the project. Three of them have graduated with Master’s degree and one with BSc degree. Five are pursuing Master’s degree and two are pursuing doctorate degrees at various universities. The trained farmers have adopted the new technologies in production and value addition and they are disseminating the same to other farmers. Five scientific papers have been published or accepted for publication, 14 papers have been presented in workshops/conferences with proceedings while 6 bulletins/extension materials have been developed.

**Up-scaling and market linkage:** Following positive outcomes during validation stage, the integrated crop and pest management technologies were up-scaled to seven additional groups in Embu, Meru, Makueni and Kilifi counties. As a result of the improved quality of mangoes, farmers have been able to market their mangoes in local as well as export markets. Three groups- Kawala Mango Growers, Waia/Nduluku and Kambi ya Mawe Fruit Growers- were linked to an exporter.

Kamurugu Initiative and KALRO have produced 3000 superior mango root stocks (Sabre, 13-1 and Turpentine) and 1000 of these have been distributed to farmers.

**The lessons**

Involving beneficiaries in the evaluation of the developed technologies helped in facilitating faster adoption. The multi-disciplinary/multi-institutional approach enabled the project to benefit from synergies brought about by collaborating institutions which have different strengths and expertise.

**Not yet at the top**

Mango and passion fruit yields and farmer earnings from these crops have not yet achieved their potential. To achieve more results:

- There is need to continue training farmers on ICPM since it has been found to be effective.
- There is need to continue building the capacity of small scale processors so that they get the required certification and subsequently access market.
- There is need to continue linking farmers with markets and to enhance partnership along the value chain.

Teresia’s farm was selected by collaborators in this research project, funded by KAPP, for validation sites for mango integrated crop and pest management technologies in 2011. Farmers gathered at her farm every month to be trained on different aspects of mango production. Teresia, who turned
52 years in 2015, is married with four children. She was very keen to implement technologies disseminated under the project and to train other farmers in the area. Within one year under the project, she had already started seeing the fruits of applying appropriate agronomic and crop protection technologies which included: pruning, proper fertilization, mango weevil control through banding at flowering, use of pheromone traps to monitor and control fruit fly and proper harvesting. Consequently, Teresia, together with her Kawala Mango Growers Self Help group members were linked to exporters who started buying fruits from them. This was because they could now produce quality fruits. With improved market Teresia’s income from mangoes improved considerably from Ksh 100,000 in 2011 to Ksh 350,000 in 2014. With higher income she has been able to comfortably take her children to school. From the mango sales proceeds, she bought a plot and developed it. Besides buying inputs for her farm, she also increased the stock in her grocery shop which she hopes to turn into a wholesale soon. With increased productivity Teresia and her group requested for value addition technology for their mangoes. In response the project provided them with a mango drier. Teresia currently sells dried fruits alongside fresh ones. This earns her more income.

References

Conserving soil, land and water for the sake of livestock and crops in Kajiado’s Euwaso Kedong

A.O. Esilaba, KALRO.

Land degradation is a major challenge in Euwaso Kedong area of Kajiado County. Worldwide, soil erosion, nutrient depletion and loss of soil organic carbon have been identified as the main contributors to land and soil degradation (Lal, 2001). Residents of Euwaso Kedong, majority of them being agro-pastoralists Maasai community, also have to contend with climate change which has disrupted the normal weather patterns. Enkuishin in Euwaso Kedong Ward is a semi-arid area characterized by agro-pastoralist land use systems with key emphasis on livestock production. But overstocking of livestock has also led to land degradation. There is hardly any grass cover on the soil. There are inadequate livestock feeds and forage and surface sealing and runoffs are prevalent. Where arable farming is practiced, soil and water conservation is lacking. There is, therefore, need for innovative methods to address these problems. However, such methods need to be site specific and guided by soil types, vegetation and inherent climatic conditions.

A KAPP-funded project implemented by a consortium of five collaborating institutions (see table below), is part of this broad effort in the area. This area was among the micro-catchments in Euwaso Kedong within the Kikuyu/Kinale catchment that had been identified by Sustainable Land Management Project (KAPSLM) - a sister project of KAPP dealing with sustainable land management - as having severe land degradation issues. The initiatives set out to assist households to adopt environmentally-sound and sustainable land management practices. They were also to scale up the work on soil and water conservation and crop and livestock production for the benefit of farmers. More specifically, they were to identify, validate and promote appropriate pasture and fodder production technologies for land rehabilitation and livestock feeds. Some of the activities of the project focused on promoting appropriate technologies for the production of fruit crops such as citrus and mango.
Diagnosing the challenges

The project used preliminary surveys that included baseline surveys, soil survey and land suitability evaluation, mapping land use, land cover changes, documentation and inventories of the major vegetation species. The collaborating institutions approached the work using four components.
Diagnostic surveys: The first component was the diagnostic surveys. This included a baseline survey in 2014 in seven villages in Enkuishini to identify the socioeconomic and agronomic factors that have led to land degradation; the indicators to monitor for sustainable land management and; to establish intervention options for degraded land.

Soil survey and land suitability evaluation: The second component was soil survey and land suitability evaluation where the researchers adopted both grid and some free survey methods in evaluating the soils. The researchers characterized the soils using both auger hole and representative soil profile observations. In all, 32 auger hole and 8 profile pit observations were made, and soils sampled for physical and chemical laboratory analysis at National Agricultural Research Laboratories (NARL). From the vicinity of each profile pit, the researchers collected a composite soil sample for fertility analysis from a depth of 0–30 cm (where soil depth permitted). After compilation and correlation, the final soil maps were digitized and printed.

Land use, land cover and vegetation surveys: The third component involved mapping out land use and land cover changes in Enkuishini Sub-Location over time through use of Remote Sensing (RS) and Geographic Information Systems (GIS) tools. Multi-temporal Landsat images acquired in 1993 and 2014 were classified. To produce spatial patterns of land cover the team then classified images from six reflective bands of two Landsat images with the aid of ground truth data obtained from Google Earth images and field survey. The second part focused on assessment of land use and land cover changes between 1993 and 2014 by using change
detection comparison (pixel by pixel). They then calculated Normalized Difference Vegetation Indices (NDVI), an index that has long been used to monitor vegetation changes over time. The results showed that built-up areas had increased by 7.6 per cent, riverine woodlands had decreased by -3.6 per cent while wooded bush lands had also decreased by -2.1 per cent. Generally, the woodlands had decreased in percent coverage while bush lands had increased.

Also, in August 2014, the project carried out another study in Enkuishini Sub-Location to document and collect inventories of the major vegetation species found in the area and how they are utilized and conserved by the agro-pastoralists Maasai community. Selected farmers and community representatives served as guides and assisted in the collection of the data and in the naming of the vegetation species, using the local Maa language. The locals classified the plant species into uses such as fodder for livestock, food for humans, medicinal value to humans and livestock, economic value, environmental indicators, etc.

Through the help of the local farmers, the project team collected additional data regarding main vegetation changes over time and key drivers.

**AquaCrop model simulation:** In the fourth component, the work dealt with relating crop yield to water availability and climate change. Since water and climate change are key limiting factors in crop production in the arid and semi-arid areas, the researchers undertook a study to simulate maize yield response to rain-fed and drip irrigated farming in Euwaso Kedong Division. The intention was to identify the best-bet farming options for enhanced maize yields in rain-fed and drip irrigated farming in the arid and semi-arid areas. They did this using the AquaCrop model (UN Food and Agriculture Organisation model that is used to predict crop yield.

**Beating the pathway**

The diagnostics surveys established that re-seeding and improving soil and water conservation for feeds and fodder production at farm level were the best-bet technologies with a high adoption potential in Euwaso Kedong and similar arid and semi arid lands. These studies also established that community energy needs in form of firewood and charcoal production and overstocking of livestock were the main causes of land degradation in the area.

The results of a soil and land suitability evaluation for forage and horticultural crops in Enkuishini indicated that the best-bet fruit trees under rain-fed conditions include avocado, mango, guava as well as citrus. The project recommended African foxtail grass, Napier and other dry land grasses as rain-fed fodder and pasture grasses for the area. Irrigation can be used to improve overall productivity of the recommended fruit trees, fodder and pastures.

**Land use and vegetation inventory:** The application of Remote Sensing and GIS tools provided information that was used to identify the land cover changes that are negatively affecting
the natural and semi-natural ecosystems in Enkuishini. An inventory of land use and the local vegetation species and their uses was developed as a result of the documenting process.

In order to reclaim the degraded lands and vegetation, the project proposed interventions including planting of fast growing multi-purpose trees such as *Casuarina equitifolia*, *Jacaranda mimosifolia*, *Grevillea robusta* and *Croton megalocarpus*; planting woodlots around homesteads; fencing using wire and live fences to reserve pastures for the young, lactating and sick livestock; re-seeding degraded areas with recommended grass species; promoting pasture and forage conservation technologies such as hay-making; reducing excess livestock numbers through regular culling; public awareness on dangers of wanton charcoal production and enforcement of government policies.

**Information for best practices:** The results of the AquaCrop model simulations indicated that farmers with shallow soils (0.30 m soil depth root restriction) and rainfalls of less than 600 mm annually would generally be faced with severe crop failure and zero grain and biomass yields if they were to rely on rain-fed farming. Irrigating farmers would be able to achieve yields of 1.567 and 4.476 tons/ha of grain and biomass yields at very poorly fertilized soils at 24 per cent fertility and optimize production with drip irrigation to 7.347 and 17.918 tons/ha at 100 per cent soil fertility for no soil moisture stress. Drip wetting at 50 per cent and 100 per cent would produce the same yields but lead to uneconomical irrigation water wastage through drain and runoffs losses.

**Analysis**

The outputs and outcomes of the up scaling activities will improve the livelihoods of the people of Ewuaso Kedong Division through improved pastures and forage and soil and water conservation that would ensure sustainability of livestock and agriculture production enterprises. Technologies developed through this project can be used to increase grass and tree cover, and availability of quality and quantity livestock feeds in arid and semi arid lands in other regions of Kenya. Its approach of directly involving the smallholder farmers at the community level increases the level of awareness of available agricultural and livestock production technologies at community level. This enhances adoption.
Recommendations

- There is need to promote and upscale best-bet sustainable land management technologies that improve crop and livestock production.
- There is need to promote proper land use planning and community awareness of the implications of changes in land use.
- There is need to upscale re-seeding and improving soil and water conservation for feeds and fodder production.
- Farmers in these regions and those in similar geographical and soil type regions should grow rain-fed fodder and pasture grasses including African foxtail grass, Napier and other dry land grasses.
- There is need for supplemental irrigation to improve overall productivity of the recommended food crops, fruit trees, fodder and pastures.
- There is need for training and capacity building on biodiversity conservation and conservation techniques best suited to the Euwaso Kedong agro-ecosystem.

References


Finding new economic freedom in drylands of Kenya through sorghum and green grams

A.O. Esilaba, KALRO

Many low income households in the counties of Makueni, West Pokot and Siaya grow sorghum and green grams as staple food crops, just as many low-income resource-poor households in arid and semi-arid lands (ASALs) in Kenya (FAO, 2007; Kilambya and Witwer, 2013). In terms of tonnage, sorghum is Africa’s second most important cereal, and has the ability to tolerate and survive under adverse conditions of continuous or intermittent drought. It can even withstand temporary water logging. The potential for sorghum to be the driver of economic development in Kenya is enormous, especially as an alternative substrate for beer brewing. In these three counties, also classified as ASALs, enhanced production of sorghum and green gram can improve food production, food security, improved smallholder farmer incomes and economic growth. Between October 2011 and June 2015 KALRO, working in collaboration with other institutions and smallholder farmers, and with the funding support from KAPP, undertook a project targeting smallholder farmers in the three counties. The other partners involved in the project were Kenyatta University, Eldoret University, the ministry of agriculture, livestock and fisheries, and smallholder farmers in the three counties. Egerton University and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) provided the two sorghum varieties (Macia and Sila) used in the project.
The project used the collaborative research approach and it set out to promote and upscale integrated nutrient, soil and water management technologies and best-bet packages for sorghum and green gram production in the three agro ecological zones- Makueni, West Pokot and Siaya. The collaborators also wanted to strengthen the stakeholders’ ability to implement the best-bet technologies for sorghum and green gram production through training.

Collaborators and key partners

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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<tbody>
<tr>
<td>Kenya Agricultural and Livestock Research Organization (KALRO)</td>
<td>Validating and promoting integrated technologies and best-bet packages for sorghum and green gram production.</td>
</tr>
<tr>
<td>Eldoret University</td>
<td>Training and validation of integrated technologies.</td>
</tr>
<tr>
<td>Kenyatta University</td>
<td>Collaborator in training, validation and promotion of integrated technologies</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Implementation, validation, promotion and dissemination of integrated technologies.</td>
</tr>
<tr>
<td>Farmers in West Pokot, Siaya and Makueni counties</td>
<td>Beneficiaries: on-farm testing, implementation, validation, promotion and dissemination of integrated technologies.</td>
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Intervening in the areas

In all the three counties, the work was carried out in 2014 during long and short rains seasons. The project used two tillage and water harvesting systems-tied-ridges and flat tillage, and five crop combinations and three fertility sources.

Establishment of model demonstration farms: The first assignment was to evaluate the social, economic and environmental benefits and impacts of nutrients and water management technologies in the project areas. In each project area, the researchers identified model farms which they used to establish trials. This was followed by stakeholder feedback workshops in all the sites to determine the preference of farmers with regard to crop and soil fertility management.

Farmer training: The next component was to train farmers in the project sites using field demonstrations and on-site trainings. Also, in the process of up-scaling the project activities, and to disseminate the technologies the project used the farmer to farmer extension approaches. Tied-riding as opposed to conventional tillage was promoted as well as use of manure in combination with inorganic fertilizer, and adoption of drought-tolerant crops- in this case sorghum and green grams. The tied-riding system was promoted because of its ability to conserve soil moisture.

Trials: The project conducted research trials to build the capacity of the farmers who were involved in the project. These trials included on-station trials in Makueni county and on-farm
activities in West Pokot and Siaya. In Siaya, five farms were selected for the study. On-station activities included testing soil chemical and physical characteristics, and crop yield data analysis. Relevant socio-economic and bio-physical data was also collected. On the on-farm trials, farmers were encouraged to apply the technologies developed from the on-station trials. In all the sites in the three counties the on-farm field trials were conducted to assess the effects of water harvesting technologies, soil amendments and cropping combinations on yields of drought tolerant sorghum and green grams. The results of these trials were then shared with farmers during field days and exchange visits, and farmers were then encouraged to select the best practices and implement the same on their farms.

**Recording high yields**

In West Pokot, the green gram mono-crop had the highest yield (0.81t/ha) followed by the *Macia* sorghum-green gram inter-crop (0.56t/ha). Combining *Sila* with green gram significantly reduced green gram yield by 67 per cent compared to the mono-crop. The highest sorghum grain yields were obtained in sorghum mono-crop with either inorganic fertilizer (1.8t/ha) or in combination with farm yard manure, compared to the control (0.9t/ha). Planting sorghum in tied-ridges enhanced grain yield in mono-cropping system with 117 per cent higher grain in tied-ridges than flat tillage in West Pokot.

![Bar graph showing grain yield](image)

**Figure 10.** Response of green gram grain yields to crop combination and soil fertility amendment in Mongorion, West Pokot County, during the 2014 season.
The results in Siaya County indicated that sowing in ridges produced a better crop compared to flat planting due to increased moisture retention in ridges. Sole cropping of sorghum (Masia and Sila) and green grams was found to produce higher yields compared to inter-cropping. Significant differences were observed among farms that used both manure and inorganic fertilizer. Thus sorghum yields were 1.23 t/ha with no fertilizers, 2.87 t/ha for combinations of...
manure and inorganic fertilizer at 2.5 t/ha manure and 20 kg nitrogen per ha and 2.62 t/ha for the inorganic fertilizer at 40 kg N plus 40 kg P2O5 per ha. The green gram yields were 0.64 t/ha, 0.72 t/ha and 0.97 t/ha respectively. These results indicate that integrated soil, crop and nutrient management have a high potential for increasing sorghum and green grams production in similar agro-ecological zones.

**Macia is a more superior variety:** In Kambi ya Mawe and Kiboko in Makueni County the trials indicated that *Macia* is a more superior variety than *Sila* irrespective of the cropping system, tillage type, and fertilizer combinations. However, green grams grown on the flat seed-bed as a mono-crop without fertilizer produced significantly higher yields than those under tied-ridges. Thus, the yield under conventional flat tillage were 0.39 t/ha at Kiboko and 0.49 t/ha at Kambi ya Mawe as compared to 0.13 t/ha and 0.3 t/ha under tied-ridging at both sites, respectively. Therefore, water harvesting did not seem to impart significant increase in grain yield with or without fertilizer application during the project period.

**Farmers’ knowledge and information** on integrated soil nutrient and water management was enhanced through participation in field days and exchange visits. As a result, farmers in the arid and semi-arid lands in the 3 counties who have adopted both sorghum and green grams production are experiencing less crop failure than those still insisting on growing maize and beans.

**Analysis**

Involving stakeholders in the research process enhanced the potential of adoption of the best-bet technologies. The results obtained during the up-scaling phase of the KAPP project indicate that there is need to develop and promote drought-tolerant crops such as sorghum and green grams that do reasonably well with little rainfall and are resistant to pests and diseases. The use of Integrated Soil Fertility Management (ISFM) technologies that involve use of farm yard manure combined with inorganic fertilizers and locally adapted crops also needs to be promoted in similar agro-ecological zones in Kenya. This approach also contributes to sustainable land management practices.

**Recommendations**

- There is need to promote the uptake and adoption of the best-bet technology packages for sorghum and green gram varieties in Kenya.
- Water harvesting using tied-ridges or open furrows is a viable crop production option that should be adopted in semi arid regions with extended drought periods.
- Some farmers reported losses as a result of birds’ invasion of the early-maturing sorghum. Therefore, sorghum varieties that are resistant to bird damage are required for the area to ensure adoption. It is also recommended that planting of sorghum should be done after other grain crops have been planted to spread the risk of bird damage.
• More training should be conducted within arid and semi arid areas to up-scale and further strengthen farmers’ ability to implement these technologies.
• Due to the high labour intensity required for construction of tied-ridges and open furrows, fabricated machinery/implements which are either hand or animal drawn should be developed to enhance the adoption of this technology.
• Most farmers liked Macia sorghum and there is need to produce seeds in order to promote uptake.

Mary Ptukat’s praises for the new sorghum crop

“These new sorghum varieties (Macia and Sila) are very good. They have good yields and they do well when planted on their own (mono-cropping) in tied-ridges,” says Mary Ptukat, a farmer who was newly recruited into the KAPP project in West Pokot. Mary has been head over heels about the two sorghum varieties introduced in the area. Her farm was used for trials. “They mature quite early, after only 2½ months. They have very large heads and are easy to harvest,” she adds. In the year 2014, Ptukat planted the new varieties. She mono-cropped them in tied-ridges. The yields were quite good compared to a local variety that she plants in her field for home consumption.

However, Christopher Psengo who participated in testing of the technologies in west Pokot complained about the bird damage and high cost of labour in setting up the ridges and in scaring birds. Owing to the early maturity, the sorghum crop was the only available food source for birds, which led to total yield loss in some heads in Psengo’s farm.
References


Names of collaborators

<table>
<thead>
<tr>
<th>Scientist</th>
<th>Position</th>
<th>Organization</th>
<th>Role</th>
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<tbody>
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<td>KALRO</td>
<td>Statistical analysis of data</td>
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Combating maize lethal necrosis disease in Kenya

Anne Wangai1 & Ruth Amata, KALRO

Maize, Kenya’s staple crop, is currently under attack from the Maize Lethal Necrosis (MLN) disease, which can devastate entire farms. A consortium of researchers who worked on this project, funded by the World Bank through KAPP, observed that MLN was fast-spreading and was first reported in September 2011 in Bomet County of Kenya. Within one year, the disease was reported in Rift Valley, Eastern, Nyanza, Western, Nairobi and Central provinces. To date, over 77,100 ha of maize has been affected, translating to an estimated loss of 1.4 million bags or Ksh 4.4 billion in monetary terms (CGIAR 2012; FAO 2014). According to a survey conducted in 2014, major maize producing counties in Kenya including Uasin Gishu, Trans-Nzoia and Nandi experienced losses of 20, 40 and 70% respectively (MOA, 2014). In 2012, the consortium collected maize samples of infected maize fields which it tested for viruses. The tests found the samples were infected with Sugarcane mosaic virus (SCMV) and Maize chlorotic mottle virus (MCMV), the two viruses causing the MLN disease (Wangai et al., 2012). Further afield, the virus has since been reported in Tanzania, Uganda, Rwanda, South Sudan and Ethiopia.

1 Anne Wangai did not attend the writeshop
Identifying the MLN disease

The Maize Lethal Necrosis disease symptoms are expressed as pale yellow colouring with spots on leaves, starting from the base of the young leaves in the whorl and extending upwards toward the leaf tips, dwarfing and premature aging of the plants, death of young leaves in the whorl leading to a ‘dead heart’ symptom and drying up of whole plant. (Figure 9 MLND). Tassels of infected maize plants are small, ear bracts dry up and have poor or no grain filling and are highly susceptible to fungal infections leading to moldy growth on rotting cobs (Figure 10).

MCMV can be transmitted through mechanical means, by insect vectors (thrips, rootworms, leaf beetles and leaf hoppers), soil, water, pollen and infected plant debris (Nyvall, 1999) and seed (Jensen et al., 1991). Similarly, a number of aphid species were reported to transmit SCMV in a non-persistent manner (Brunt et al. 1996). Information on transmission of MLND in Kenya is currently lacking and this project aimed at addressing this gap.

Figure 9: Typical MLND symptoms as observed in infected maize

Figure 10: Symptoms of MLND on affected cobs.
Using the KAPP’s collaborative research approach, the consortium, led by KALRO, set out to develop technologies that could be used to diagnose and characterize MLND. They intended to generate information on the disease epidemiology and how it can be managed; to identify vectors of viruses causing MLND, their host range and develop their management options and; to enhance awareness on identification and management of MLND in maize.

The collaborators

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya Agricultural and Livestock Research Institute (KALRO)</td>
<td>Lead institution</td>
</tr>
<tr>
<td>University of Nairobi (UON)</td>
<td>Survey, detection, identification and characterization of SCMV and other cereal poty viruses in field crops.</td>
</tr>
<tr>
<td>Ministry of Agriculture (MOA)</td>
<td>Awareness creation on MLND among stakeholders.</td>
</tr>
<tr>
<td>Kenya Plant Health Inspectorate Service (KEPHIS)</td>
<td>Surveillance and monitoring of MLND; Capacity building.</td>
</tr>
<tr>
<td>International Centre for Insect Physiology and Ecology (ICPE)</td>
<td>Identification of vectors of viruses causing MLND, their host range and management options.</td>
</tr>
<tr>
<td>Pesticide Control Produce Board</td>
<td>Monitoring soil pesticide residue levels in seed treatments and foliar sprays; Holding stakeholder meetings and facilitating vector control and management activities</td>
</tr>
</tbody>
</table>

Confronting the MLND

**MLND survey:** The consortium randomly conducted a MLND survey in 39 counties in 2014, to determine the status of the disease in Kenya. The researchers collected leaf samples from 16 counties which were analyzed for MCMV and SCMV using direct and indirect ELISA (Enzyme-Linked Immunosorbert Assay) protocols, respectively. They then developed laboratory-based protocols to analyse leaf tissues and seed infected with MCMV and SCMV.

**Studying the hosts:** The project assessed cultivated and wild plants in the grass family, including 7 varieties of sorghum, 2 of finger millet, 32 of wheat, 9 of rice, 3 of barley, 2 of Napier grass and one type each of 9 wild grasses. This was to assess their ability to host MCMV or SCMV, or both viruses.

**Checking transmission through infected plant debris and soil:** To check whether the viruses could be transmitted through infected plant debris and soil, the researchers dried separately in the greenhouse maize plant materials (roots, leaves and stem) infected with either MCMV or SCMV. These materials were then tested if the drying had any effect on presence of either of the 2 viruses.

**Checking the role of agronomic practices in spreading MLND:** In Bomet and Narok counties, the researchers evaluated the role of spacing on incidences and severity of MLND. They used 5
treatments- spacing maize plants at 75x20cm; 75x30cm; 75x50cm; 90x30cm; and 90x50cm for this evaluation. Trials on other agronomic practices including effect of fertilizers, weeds, intercropping and crop rotation on incidences and severity of MLND were also done.

**Identifying potential vectors and alternative hosts:** Roving surveys in key maize production counties of Kenya were undertaken to identify potential vectors of MCMV and SCMV. The researchers carefully collected insects from the foliage of maize and wild grasses. The insects were then transferred to ICIPE laboratories for identification using morphological features.

**Creating awareness on identification and management of MLND in maize:** From ongoing research work, the project developed an integrated pest management package, which included information on causal agents of MLND, transmission, crop husbandry practices and regulatory interventions in the management and control of the disease. The information was then disseminated through brochures, posters, radio messages, training manual, policy and press briefs and during training of stakeholders.

### Results of the work

**MLND Status report:**

- The survey established that MLND was widespread across all maize producing counties with infection levels of up to 100 per cent. Leaf samples analysis established the presence of both MCMV and SCMV, but with MCMV being more dominant.

<table>
<thead>
<tr>
<th>County</th>
<th>MLND infection level %</th>
<th>MLND severity Score</th>
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</thead>
<tbody>
<tr>
<td>Uasin Gishu</td>
<td>5-100</td>
<td>mild to moderate</td>
</tr>
<tr>
<td>Trans Nzoia</td>
<td>80-100</td>
<td>moderate to severe</td>
</tr>
<tr>
<td>Bungoma</td>
<td>40-100</td>
<td>moderate severe</td>
</tr>
<tr>
<td>Narok</td>
<td>100</td>
<td>moderate to severe</td>
</tr>
<tr>
<td>Nandi</td>
<td>10-90</td>
<td>mild to severe</td>
</tr>
<tr>
<td>Nakuru</td>
<td>20-100</td>
<td>mild to severe</td>
</tr>
</tbody>
</table>

- As a result of the survey in 2014, a report on status of MLN disease in Kenya, and its implications on yield was generated and forwarded to policy makers to guide on decision-making on addressing food security and sufficiency in the country.

**Developing laboratory based protocols for detection of MCMV and SCMV**

- Protocols based on ELISA and Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) have been developed for detection of MCMV and SCMV from leaves and contamination. These protocols are currently being used in the project to detect MLND causal viruses in Kenya.
IPM package

Information generated so far from the ongoing host range studies of MCMV and SCMV has contributed to the integrated pest management (IPM) package with respect to selection of rotation crops for the management of MLND. Also, information generated from the study on transmission of viruses causing MLND through infected plant debris and infested soil was also used to develop IPM package in the management of plant residues. This information will give guidance to farmers on managing plant residues. The IPM package, generated through consultative stakeholder forums, was widely disseminated through 65,000 brochures, 19,500 posters and training manuals prepared and distributed through the Ministry of Agriculture County officers to stakeholders; radio messages; newspaper articles; workshops; and policy briefing meetings.

Identification of potential vectors and alternative hosts

- This work led to the identification of potential vectors of MLND in some of the maize farms. These included aphids, thrips, leafhoppers and stem borers. It also identified Napier grass and Kikuyu grass as other plants serving as hosts to some of these insects.

IPM Package Components

- Plant early and use certified seed;
- Use manure and/or include basal fertilizer and/or topdressing fertilizers;
- Practice regular scouting for insect’s vectors and early appearance of MLN disease and report to nearest agriculture office for advice;
- When disease onset occurs at early stages of crop growth (from germination to knee high), rogue out individual infected plants to minimize disease spread;
- If the disease sets in at later growth stages (tasseling and cobing), there are better chances of getting some harvest; However, do not use moldy maize stovers or cobs with discolored moldy grains for livestock or humans consumption;
- Observe a closed season by not growing maize during short rains or during other off season under irrigation;
- Practice crop diversification;
- Rotate maize with alternative crops like Irish potatoes, sweet potato, beans, green grams and vegetables during short rains season;
- Do not move green maize materials from infected regions to disease free areas within and/or outside the county and country to minimize spread of MLN disease;

Counties were encouraged to develop mechanisms to enforce these interventions, initiate surveillance and reporting to safeguard each county from trans-boundary pest problems.

Analysis

The multidisciplinary collaborative approach created an environment where adequate consulting could be done. This has been useful in generating information on the MLN disease without duplication among institutions.
Conclusions and recommendations

Completion of studies on this project will contribute greatly to the management of MLND. More awareness creation needs to be done on transferring knowledge on disease management and on adopting alternative food security measures such as crop diversification. Local media was noted to be prominent in transferring information hence the need to increase its use. Since the work is still on-going generated information will be used to make reviews where appropriate and to give guidance to the government and other relevant institutions. Future monitoring of status of MLND will be necessary for decision-making and prediction of food security in the country.

References


A list of collaborators

<table>
<thead>
<tr>
<th>Officer involved</th>
<th>Institutions</th>
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<tbody>
<tr>
<td>Wangai Anne</td>
<td>KALRO</td>
</tr>
<tr>
<td>Amata Ruth</td>
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<td>Kasina Muo</td>
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<td>ICIPE</td>
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<tr>
<td>Kimani Esther</td>
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<tr>
<td>Francis Mwatuni</td>
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<tr>
<td>Mwangangi Maureen</td>
<td>KEPHIS</td>
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<tr>
<td>Joshua Oluyali</td>
<td>MOA L&amp;F</td>
</tr>
<tr>
<td>Triza Karanja</td>
<td>MOA L&amp;F</td>
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</table>
Automating agricultural research processes in Kenya

Boniface Okelo Akuku, KALRO

Poor ICT infrastructure and capacity

Information management and communication technology remains a challenge to many agricultural research organizations in Africa (Ingram, et al., 2014). Kenya Agricultural and Livestock Research Organization (KALRO), a premier agricultural research organization in Kenya, is one such organization that has faced similar challenges. These challenges include ICT infrastructure, untimely access to information, knowledge and knowledge sharing tools, among others. The national research body could not keep up with regional and international peers in information-sharing and access. It could also not leverage on ICT to manage and communicate agricultural knowledge and information as set out in its mandate. Scientists at KALRO lacked access to both local and international knowledge resources thus making partnerships and collaboration difficult. They could not easily share knowledge and information even among themselves as the organization lacked an effective ICT infrastructure. This often led to duplication of efforts and wastage of resources. More so, the existing ICT resources were poorly managed. An assessment by KAPP in 2010 involving 2,959 KALRO staff members showed that 1,855 required computers in their daily operations. However, only 599 computers were available. This
is far below the recommended international standards which is 1:1 for scientists and 1:5 for support staff (ITU, 2001). Also, there were 300 printers, 34 scanners, 25 copiers, 259 UPS, and 23 servers, most of which were based on old technology. More so, most of the information was trapped in paper and very little was digitally interconnected to the rest of the organization.

**Approaching the challenges**

From 2009 to 2015, KAPP moved in to help strengthen KALRO’s institutional capacity to address the challenges. KAPP Secretariat began, in 2009, by commissioning a private consultant to conduct an ICT user needs assessment at KALRO. The assessment intended to identify the gaps and providing necessary recommendations, information and support necessary to the institution. In the assessment the project reviewed databases and applications, ICT infrastructure, ICT hardware and software, facilities, capacities, and management of ICT. This involved examining key documents, data collection on status of ICT, field observations, interviews with key management personnel and researchers.

An implementation framework, informed by the assessment, was then developed to guide the process of strengthening KALRO’s ICT capacity. KALRO on its part preferred a system where ICT is emphasized as an enabler and driver of processes as opposed to ICT being viewed as just a mere tool to support research process. The organization had realized that better research start with better information management.

**A sub-committee for the implementation**

The Ministry of Agriculture Livestock and Fisheries (MOALF), formed a sub-committee of the Agricultural Sector Programmes Steering Committee- comprising of ICT Authority, KAPP secretariat, KALRO, representatives from the Ministry of Agriculture, Livestock and Fisheries, and Agricultural Information Resource Centre (also of the Ministry of Agriculture, Livestock and Fisheries). The sub-committee spearheaded the implementation of the report of the study.

The sub-committee verified the report by the consultant and prepared specifications for the procurement of the ICT equipment identified in the report. The sub-committee also developed terms of reference for tendering. Relevant government procurement procedures were followed to acquire the necessary ICT equipment, services and systems. Various vendors and consultants were then contracted to deploy and install the ICT infrastructure and systems at KALRO headquarters and all its institutes and centers as recommended in the consultant’s report. The installed ICT infrastructure was later subjected to inspection and testing by the sub-committee before being handed over to KALRO.

**Developing e-service channels**: KALRO, having acquired an effective ICT platform, embarked on working on e-service delivery channels that would facilitate information sharing and delivery between itself and farmers and between and among its staff and centres. KALRO’s ICT and technical staff were also trained on the new system.
Increased computer ratio: Through the support of KAPP, KALRO acquired and operationalized 488 laptops for researchers and 533 desktops computers for support staff, resulting in staff computer ratio of 1:1 for scientists, and 1:2 for support staff. This was accompanied by 10 Blade Enterprise high performing servers, 27 LCD projectors, 34 Local Area Network infrastructure, Wide Area Network of 30 Mbps at KALRO headquarters and 2 Mbps at centres, point-to-point connectivity and Virtual Private Routed Network (VPRN). Other facilities included 2 video conferencing facilities, unified communication and collaboration platform, 2 cloud-based Data Centres for production and disaster recovery, and Enterprise agreement software licenses.

E-service channels: The effective ICT platform enabled KALRO to develop e-service delivery channels for information sharing and delivery. These are Plant and Animal clinic (e-Mimi), the Kenya Rice Knowledge Bank portal- which is used to share simple information on rice farming with farmers and stakeholders, and the Short Message Services (SMS)- which enables stakeholders to access research knowledge through mobile phones. The SMS service is used to send notifications on crop and livestock information to farmers. Farmers also use the service to send to KALRO questions that needs to be addressed. The e-resources for the library and information services has access to 20,000 online resources, and include library automation and digitization of local content, business process automation through an enterprise resource planning software, centralised resource utilisation, data and information security systems, and live back-up and restore system.

Improved website: This work resulted in an improved KALRO website, with improved website uptime and quality and social media component.
Mr. Hasa Omutelema, a farmer from Ebuluka focal group in Emuhaya sub-county, Vihiga County of Western Kenya, stands next to his maize crop. He has grown the crop using improved soil fertility management technologies he received through KALRO’s e-service delivery portal on ecological organic agriculture.
Institutionalising ICT

The user needs assessment approach used to identify ICT requirements at KALRO embraced the Public Private Partnership model in line with the objectives of the KAPP programme. It was also instrumental in the planning and delivery of effective solutions to the ICT problems in the organization. Further, the involvement and consultation with the concerned beneficiaries ensured that critical issues that needed attention were adequately addressed. The findings of the needs assessment exercise made a solid case for funding.

Recommendations

KALRO should continuously avail resources to maintain, support and upgrade the ICT infrastructure and systems as necessary to fully utilize and exploit the benefits of the ICT infrastructure and systems for the benefit of agricultural research.

There is a need for continuous training and capacity building of the staff to cope with the changing and dynamic developments in ICT.

In conclusion, conducting agricultural research and technology development has little value if the information does not reach farmers and stakeholders without loss or delay, hence, ICT should be maximized to drive and enable agricultural research and technology.

References


Irrigation for mangoes, rice and fish in Makueni and Busia counties

By Francis W. Kariuki, Kenyatta University

Patricia Mutuku from Makueni County had for many years wondered what could be wrong with her mango trees. The trees produced very little, and she could not suspect this was caused by the dry spells which at times could go for months on end. No wonder she could not help appreciate the presence of drip irrigation in her farm, an initiative of KAPAP aimed at improving mango productivity in the area. The initiative was undertaken in the area by the KAPAP Collaborative Research Consortium in Natural Resource Management (NRM) and was led by Kenyatta University. “This is a savior that has helped increase the productivity of my mango crop,” she said in praise of the drip irrigation installed in her farm. Patricia and her fellow mango farmers in Makueni had never seen mango crop put under 100 per cent irrigation.

In Kenya, the arid and semi-arid lands (ASALs) make up over 80 per cent of the country and support approximately 30 per cent of the population. Agricultural activities in these areas are mainly pastoral livestock keeping. In some areas rain-fed crop production is practiced as in the case of mango in Makueni County. Irrigation is limited to areas where water is available and where the government has invested in establishing irrigation systems. Rice is one of the important grain crops grown under irrigation. In the ASALs, water is the most limiting resource for agricultural production. This requires a strategy for maximization of land productivity. During the 4 years, from 2011 to 2014, this project explored the potential for integrating rice and fish production and irrigating mangoes to maximize efficiency in yield per unit land in ASALs. The research consortium concerned itself with approaches on how to achieve effective use of water in both irrigated and rain-fed agriculture.
Traditionally, in eastern, coast and central regions of Kenya, mango production is undertaken in rain-fed conditions on sandy loam soils, whose water retention capacity is low. Rice, on the other hand, is the third ranked staple food crop after maize and wheat in Kenya; and is predominantly grown on alluvial flood plains, under flooded irrigation.

Despite the contrasting growing conditions for mango and rice, the productivity of each is faced with unique challenges with water being common to both. Under irrigated rice monoculture, low yields have been recorded over some time now in certain fields, as opposed to the expected annual average of 5.5 tons/ha. This is because of management reasons and also because monoculture system does not optimize the use of water, land and labour resources, which is compounded further by declining soil fertility (MIAD, 2010). Mango production is constrained by the water scarcity since its flowering stage coincides with a period of low soil moisture resulting in flower abortion, fruit drop and subsequently low number of fruits per tree at harvest.

Mango yield and quality can be increased through providing water during critical growth stages. However, knowledge of when to irrigate and how much water should be provided to the tree during vegetative and reproductive growth stages in order to realize the full potential yield was lacking.

In the case of mango, the research team worked with farmers in Makueni County.

In the case of rice-fish integration, the team engaged paddy rice farmers in Budalangi area of Busia County. The argument was that fish farming is a non-consumptive user of water and if integrated with rice growing could increase agricultural productivity by reducing fish production costs. It could also be a source of additional income to the rice farmers.

Partners in the consortium

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<tr>
<th>Partner</th>
<th>Roles and responsibilities</th>
<th>Collaborators</th>
</tr>
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<tbody>
<tr>
<td>Kenyatta University</td>
<td>Lead organization, lead principal investigator</td>
<td>Dr. Francis W. Kariuki</td>
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<tr>
<td></td>
<td></td>
<td>Others:</td>
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<tr>
<td></td>
<td></td>
<td>Dr. Moses P. H. Gathaara</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mr. Hilary Rotich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mr. Peter Juma Muchemi</td>
</tr>
<tr>
<td>KALRO Kabete</td>
<td>Technical leadership, laboratory facilities and backstopping</td>
<td>Dr. Anthony O. Eslabah</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mr. Isaya V. Sijali</td>
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<tr>
<td></td>
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<td>Dr. Peter T. Kamoni</td>
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<tr>
<td></td>
<td></td>
<td>Dr. Catherine Kibunja</td>
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<tr>
<td></td>
<td></td>
<td>Mr. Francis Karanja</td>
</tr>
</tbody>
</table>
Partner | Roles and responsibilities | Collaborators
--- | --- | ---
KALRO Katumani | Developing, validating and promoting integrated packages | Dr. M. N. Kifuko-Koech
KALRO Kitale | Developing, validating and promoting integrated packages | Dr. K.W. Ndung'u-Magiroi
University of Eldoret | Developing, validating and promoting integrated farming systems for rain-fed agriculture | Prof. John R. Okalebo
National Irrigation Board (NIB) | Irrigation extension support to project. Farmer mobilization | Mr. Joel Tanui
Ministry of Agriculture | Agricultural extension support | Ms. Anna Mutinda
Smallholder farmers | Participants in trials, evaluating technologies | Prof. Kiplagat Kotut
Embu University college | | Dr. Stephen Wambugu
Chuka University | | |

**Systems approach**

This project used a system’s approach that integrated crop, fish, soil, and nutrient and water management for maximization of resources productivity. Relevant existing and emerging technologies on sustainable crop production under rain-fed and irrigated agriculture in the ASALs were evaluated. This was to assist farmers select the most appropriate technologies for use in their respective environmental conditions.

**Workshops:** The research Consortium organized a start-up workshop during which trial sites in Makueni, for mangoes, and Bunyala irrigation scheme, for rice-fish cultures, were selected. Also, methodologies and approaches to be followed during the trials were agreed upon. Follow-up workshops were conducted, one at each trial site, where the research teams, extension officers and farmers identified the constraints and ranked them in order of their magnitude. The workshops proposed some integrated water and soil nutrient management technologies to be tested in farmers’ fields. A total of 75 farmers, 35 for Makueni County (15 males and 20 females) and 42 for Bunyala (40 males and 2 females) attended the workshops. Other participants included 3 members of staff of the National Irrigation Board and 2 members from the private sector. During the workshops, farmers volunteered to participate in the trials.

**Mango trials**

**Establishment of trials:** The researchers together with farmers, established on-farm trials that served as demonstration and learning plots. The researchers facilitated 3 selected mango farmers to construct water pans lined with dam liners. This was to help them harvest rainwater and install
Rainwater harvesting and storage

Full irrigation

Partial irrigation

Mango size 8 packed ready for export.

Mango size 9 packed ready for export.
drip irrigation system to irrigate 18 trial orchards for each of the 3 farmers. The orchards were subjected to 9 irrigation treatments rates categorized into two- full and partial irrigation ranging from 100 percent of water treatment of each to 0 percent (no irrigation). For full irrigation, both sides of the tree canopy had one emitter (button drippers) each while for partial irrigation, each orchard had two emitters on one side of the canopy along the drip line per mango tree.

At harvest time, farmers congregated at each of the trial farms; and harvested and graded the mangoes, according to the Horticultural Crops Development Authority (HCDA) criteria for grading fruits, where mango fruit sizes 8 and 9 represented the best quality.

**Rice-Fish farming trials**

**Establishment of trials:** The research Consortium assisted each of the 3 selected farmers in Bunyala to grow two rice varieties- a Basmati 370 (a new variety in the area) and the local IR 2397- on separate plots of the same size; one stocked with fish and the other without fish. The plots with fish were initially physically modified to provide refugia1 for the fish each with an area of 52 m² and a depth of 0.5 m. At harvest, rice yield from each plot was determined with participation of other farmers. Thereafter, the plots were flooded again and rice was allowed to grow again but only Basmati produced a ratoon crop. At harvest time, Basmati was harvested together with fish stocked in the plots for fish. Total yield and economic returns from rice and fish in all plots was determined with the participation of farmers.

A brooding pond was constructed and stocked with brooding stock of Nile Tilapia to reduce cost of fingerlings.

**Farmer training and trial monitoring:** For mango and rice-fish sites, the research Consortium trained farmers through demonstrations/field days, workshops and expert farmers. The trainings focussed on how to implement the various technologies and value addition. Data on various growth parameters of test crops was collected by the researchers, students and farmers to assess the outcome of the various technologies tested.

**What were the results?**

**Mangoes**

Mango water requirement is similar for all soil types tested in Makueni and increases with decreasing rainfall irrespective of growth stage. The highest water requirement occurred during fruiting and maturation stages. Mango plants should be irrigated starting at the beginning of August until the beginning of November when rainfall is sufficient to meet the crop water needs.

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1 Temporary holding water facility (ditch) during draining of water from rice fields
Mangoes that were irrigated 75 to 100 percent produced the highest quality of fruits of grades 8 and 9.

Irrigation increased number of mango fruits per tree by over 100 percent and decreased fruit drop by 65 percent.

Encouraged by the trials, 5 more farmers have since joined the trials and have dug water pans on their farms in readiness for the next mango season.

Due to improved yield, farmers requested to be trained on value addition of mangoes. A facilitator from KAPAP Fruits Value Chain research Consortium trained 18 farmers as Trainer of Trainers (TOTs). The TOT farmers in turn trained 6 mango growing groups. This project created interest among farmers as Patricia observes: “The drip irrigation method saves energy and labour as we could open a tap to allow water to flow for a specific period of time”. She promised to put drip to the rest of mangoes if she gets funds as these will ensure higher production and better quality in terms of size and weight of mangoes. This will make her fetch more money to sustain her family.

**Figure 13:** Mango water requirement in relation to rainfall, soil type and phenological stage

- **Rainfall**
- **Sandy Clay**
- **Clay Loam**
- **Sandy Clay Loam**
• From this work, one MSc student has written a thesis on mango water requirement and the influence of supplemental irrigation on mango quality and yield.

**Rice-Fish results**

• The research team and farmers demonstrated that Basmati 370 and IR 2397 rice varieties can be grown concurrently with fish. For Basmati 370, three crops, (two main rice crops and one ratoon crop) and one fish cycle can be obtained from the same piece of land. However, farmers felt that the initial cost to establish integrated rice-fish farming was high.

• Basmati rice variety is suitable for Bunyala since its yield is similar to that of locally grown IR 2397 variety. However, Basimati fetched more money per kilogramme compared to IR 2397.

• Under research conditions, irrespective of the variety, rice yields are higher than farmers practice by 45 percent.

**Situation analysis**

Demonstration of water harvesting stimulated an interest in the use of harvested water. Two among the farmers involved in the trials diverted the water to unplanned uses. One farmer pumped out the water into a storage tank and used it to grow vegetables. The other farmer introduced fish into the water pan. Although the other farmers used the water to grow vegetables too, the quantity used did not hamper the implementation of the trials.

Also, farmers felt that some of the available technologies were either expensive or labour intensive.

**Conclusions/recommendations/way forward**

• Rainwater harvesting should be out scaled.

• Regular and timely irrigation during flowering and fruit development is recommended for mangoes to ensure high yield and quality.

• Due to lower returns from IR monoculture, IR rice farmers should be encouraged to adopt rice-cum-fish system while Basmati farmers may continue with monoculture.

• The farmers who grow IR variety could be encouraged to try alternate/rotational rice-fish culture.

• There is need for socio-economic benefits analysis since elsewhere positive impacts appear to be highest among farmers involved in integrated rice-fish farming.
B=Basmati rice, B+F=Basmati rice and fish, IR= IR 2397, IR+F=IR 2397 + fish

**Figure 14. Culture Type Average Net Annual Income (KES/Ha)**

One MSc student has written a thesis on integrated rice-fish farming from this work and through interaction with this student and the Principal Investigator from KAPP NRM project, 2 more MSc students have gotten involved in integrated rice-fish farming research.
Enhancing production and marketing of indigenous chicken to improve livelihoods in Makueni and Kakamega Counties

Lucy Kabuage & David Ayieko, Kenyatta University

For a long time, Juliana Kiema was an ordinary farmer in Uviluni, a rural village in the semi arid area of Makueni County. Like her neighbours and out of ingrained cultural practices, she kept a few indigenous chicken which roamed her homestead and sometimes crossed over to other farms scavenging for food. The chicken took about seven months before they could start laying eggs. Similarly, the cocks grew slowly and could not be sold in the market for meat by the age of six months. She did not give any attention to these birds and some frequently died due to diseases and predation.
In 2011, researchers working on the indigenous chicken (IC) sub-component of the KAPAP Meats Value Chain Project arrived at her village and started holding a series of community sensitization meetings and training on IC production and marketing. She decided to attend these meetings and began participating in the training. As a result, she was trained on IC production technologies including, incubation and brooding, flock management, housing and bio-safety issues. In addition, she received improved indigenous chicks from the KAPAP project team. Also, the project provided her with some equipment including drinkers and feeders. Because of challenges experienced in getting drinking water in Makueni, the project provided her with a 1000 litre water tank to ensure adequate water at all times for her chicken.

Also, just like her neighbours, Julian had challenges in accessing quality commercial feed supplement for her chicken due to its high cost. Thus, because of the poor and limited feeding, her chicken’s growth rate and overall performance were poor. In response, the project team provided Juliana with sunflower and sorghum seeds, which she planted on her farm for production of chicken feed. After she harvested the sunflower seed and sorghum grain, the project team used the products in on-farm demonstration of formulation and production of bird feeds for the IC. The project also trained the farmer group that she belongs to, on how to use a feed mixer in the production of the IC feeds and on other birds’ management technologies.

Kenya’s fast growing population has led to increased demand for poultry products. The poultry industry contributes 1.7 per cent to the GDP of Kenya (MoLD, 2010). Further, the popularity of poultry continues to rise because of increasing consumer preference for white meat due to its superior nutritive value including low fat content, versatility and delicious flavour (FAO, 2009). The IC constitutes 75 percent of the poultry population in Kenya and in terms of enterprise choice, it has an advantage over many other enterprises because of low capital and recurrent input requirements and short production cycle. Hence, is a suitable enterprise for women and youth, and indeed its popularity among women and the youth is growing. However, a baseline survey conducted in Makueni by the KAPAP research team, showed that the smallholder farmers keeping IC face major challenges. The challenges include poor quality chicken meat resulting from poor feeding, and other management practices including inadequate disease control. Also, high cost of farm inputs, inadequate knowledge and poor management skills, unavailable extension services, and low access to high value markets affected the performance negatively. Other constraints identified by the research team included poor housing and bio-safety, lack of quality breeds, poor brooding technology, shortage of clean drinking water, and unsuitable feeding and drinking equipment. All these factors resulted in small flock sizes averaging 14 birds per household that was not sustainable for commercial production.

The aim of this research project on the KAPAP’s meats value chain was to promote the production and marketing of IC among smallholder farmers in Makueni and Kakamega Counties for enhanced incomes and improved livelihoods. The project was undertaken by a team of researchers from different institutions led by Kenyatta University.
### Project collaborators

<table>
<thead>
<tr>
<th>Organization</th>
<th>Role / Responsibilities</th>
<th>Collaborators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenyatta University</td>
<td>Principal investigator (PI); Overall project leadership/co-ordination</td>
<td>Prof. Lucy Kabuage</td>
</tr>
<tr>
<td>(Lead Institution)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Nairobi</td>
<td>Coordinating chicken health and bio-security. Linking farmers with health service providers.</td>
<td>Dr Joseph Kuria</td>
</tr>
<tr>
<td>KALRO Kakamega</td>
<td>Co-ordinating project activities in Kakamega</td>
<td>Dr. Ludivic Okitoi</td>
</tr>
<tr>
<td>Blake &amp; Morton Associates (Consultants)</td>
<td>Linking farmers with stakeholders in marketing and processing</td>
<td>Dr. George Onyango</td>
</tr>
<tr>
<td>KAPP CSU Makueni</td>
<td>Collaboration on extension services and information communication</td>
<td>Ms Esther Wambua,</td>
</tr>
<tr>
<td>KAPP CSU Kakamega</td>
<td>Collaboration on extension services and information communication</td>
<td>Mr. John Manyengo</td>
</tr>
<tr>
<td>Others: County Livestock &amp; Veterinary Officers in Makueni &amp; Kakamega</td>
<td>Collaboration on policy, partnerships and information sharing and nutrition, health and stakeholders</td>
<td></td>
</tr>
<tr>
<td>Farmers</td>
<td>Target group; implementers of interventions</td>
<td>IC value chain farmers in Makueni and Kakamega</td>
</tr>
</tbody>
</table>

### The interventions

**Establishing improved parent stock:** The researchers began by procuring high quality indigenous chicken from KALRO Naivasha station and distributing the same to 88 project nucleus farmers and 112 satellite smallholder farmers in Makueni County. Services of a local hatchery operator were used to demonstrate standard brooding technology.

**Farmer training:** The project trained farmers in various management and production skills. This included flock management, breeding, disease and parasite control, and predator control for chicks using the hay box brooder. In Makueni, a total of 88 farmers were trained on proper housing for chicken, bio-security measures, and synchronized incubation and brooding technologies. Farmers were trained also on chicken feed production, formulation and mixing using a fabricated manual feed mixer and feeding modalities. To do this, the project procured planting seeds for both sorghum and sunflower before the feed mixing was done to ensure a consistent supply of raw materials. Manual feed mixers were procured in readiness for the ration mixing exercise. A total of 200 farmers in Makueni were trained on the control of diseases and linked to service providers such as animal health service providers. Also, a total of 7000 vaccines were procured and used to vaccinate chicken for 88 project farmers and 112 satellite farmers. In Kakamega, 40 farmers were initially selected for breeding and flock improvements. Eggs from improved breeds were procured from KALRO Naivasha and hatched using the mass incubator at KALRO Kakamega and distributed to the selected farmers for production of elite chicken.
Promoting plastic crates: As a way of discouraging the use of cages, the project bought plastic crates which were used to demonstrate to traders how to package and transport the indigenous chicken in humane manner.

Establishing sustainable marketing systems: The collaborators, working together with farmers, identified potential markets and their requirements for indigenous chicken. They then helped organise farmers before training them on batch marketing and linking them to low risk credit providers. Two existing slaughter houses- Makueni Times and Salama were identified and linked with farmers. A total of 20 slaughter house operators were trained on safe slaughter and post-slaughter handling of meat. In addition, the consortium trained 35 farmers on indigenous chicken market quality requirements, value addition, packaging and labelling.

Dissemination of best practices: The consortium facilitated exchange visits for farmers taking part in the project. Technical reports, pamphlets, brochures and posters promoting best practices in IC farming were published and distributed in the two counties. A newspaper article and a documentary on the value of IC products were also produced. The research consortium also produced information technologies packages for flock management, feed production and feeding, disease control and safe chicken transportation. In addition 48 water tanks with a capacity of 1000 litres each were distributed in Uviluni and Mang’auni in Makueni County. This was to ensure the farmers had adequate water supply for indigenous chicken production.

Benefiting from the work

Improved parent stock: In Makueni County, a total of 880 one month old, improved breeder stock chicks were distributed to 88 farmers (8 hens and 2 cockerels per farmer) belonging to Mwang’a and Uviluni groups of Wote and Salama common interest groups (CIGs). Additionally, 1,120 improved indigenous chicks were distributed to satellite farmers in the Makueni project. In Kakamega County, improved indigenous chicken parent stock was established on-farm by 40 farmers (25 chicks of mixed sex per farmer) in Shinyalu and Butere sub-Counties. The chicks were sourced from KALRO Kakamega. A total of 240 farmers were linked to breeders in both counties.

Improved housing and flock management: Three indigenous chicken model houses were built in Makueni County. As a result, a total of 88 contact farmers either constructed new units or improved their structures using the model.

Improved feeding: As a result of training on improved feeding, the 88 contact farmers started feeding their IC on balanced feed supplements, formulated and mixed on-farm, using own grown feed ingredients such as sorghum for energy and sunflower cake for protein. Also, 54 per cent of the farmers in Makueni County that were supplied with seed and fertilizer inputs harvested sunflower and sorghum grain valued at Ksh 109,200 and Ksh 33,568 respectively.
Improved marketing channels: Two categories of indigenous chicken markets and their requirements were identified. A total of 120 farmers were also organized and trained on synchronized batch marketing.

Information on best practices: As a result of the interventions, a farmer training manual was developed by the project team in Kakamega spearheaded by KALRO Kakamega. In addition, one of eight post-graduate students who worked in the project graduated in December 2014 after working on a thesis on indigenous chicken marketing, while the remaining seven were headed for graduation by the end of 2015.

Adoption of best practices: There is notable qualitative change in smallholder farmer IC husbandry practices in Makueni and Kakamega Counties. For example, Mrs Kiema, who interacted with the project from its inception, attended several trainings and exchange tours to other IC producing areas organized by the project. The training and tours exposed her to different production skills and technologies. With the adoption of the demonstrated technologies, she has seen an increase in her flock size. She has also improved the housing unit for her chicks, and maintains good bio-security practices. As a result, she has experienced an increase in number and production of large size eggs and quality chicken. In most cases, she now sells her chicken and eggs at premium market prices. This gives her higher household incomes; and because of her experience with the project, she has become an example and a contact farmer used by extension agents to showcase best practices for indigenous chicken production and marketing in Makueni.
Analysis

The cultivation of traditional crops as a raw material for animal feed is not an entirely new innovation. However, revisiting their use with enhanced knowledge on feed formulation and value addition classifies them as primary sources of food and feed diversification, with potential for reduced feed costs; hence, increased income for the smallholder farmers. KAPAP promoted partnership for service provision and input supply amongst IC stakeholders resulting in improved extension service provision and distribution of inputs to smallholder farmers.

Recommendations

• Breeding centres should be established in key commercial IC producing counties as sources of local supply for improved IC parent stock. Private institutions and individuals should be facilitated to undertake the breeding of parent stocks.

• Stakeholders along the IC value chain should be trained on bio-security measures to prevent introduction of disease organisms in the IC flocks and transmission of zoonotic bacteria to humans from chicken and their products. This can be enhanced further through establishment of farmer field schools in IC producing counties by county governments, to ensure bio-safe IC products for human consumption.

• Both the public and private sectors should invest in value addition of sunflower to ensure that there is increased edible oil and raw material for feedstuffs formulation. Increased income generation would be realized through sales of extractable edible oil and seed cake for livestock feed formulation.

• Public-Private Partnerships should be strengthened in order to increase access to inputs and markets, and to enhance provision of extension services to smallholder IC farmers country wide.

• An information platform should be established to enable smallholder farmers access information on IC production and marketing in Kenya.

References

1. FAO (2009). The State of food and Agriculture 2010-11, Livestock in a balance, FAO, Rome, Italy


Overcoming bottlenecks in dairy improvement in Meru and Nyeri counties

John N. N. Kang’ara, KALRO.

Many times goat milk producers in Meru and Nyeri counties had their bulked milk returned to them by buyers. This was because the milk had been adulterated with cow milk. The farmers eventually lost the market for the goat milk. This was more so after the buyers lost some of the customers who were allergic to cow milk.

As a result, the goat milk producers had nowhere to take their milk. Some farmers had to sell off their herds.

In Kenya, milk production is mainly from dairy cows, dairy goats and the camel. Current average milk production is only 1,800 liters per lactation per cow (Kenya Dairy master plan, 2011), far below the potential 3,500 liters per lactation of 305 days. The Country also, has about 0.2 million dairy goats which have become popular with diminishing land sizes. In Mount Kenya region where 81 per cent of the national dairy goat herds are found, there is a potential of producing over 600 liters of milk per lactation of 218 days. Currently, the national average milk production is only 153 liters per lactation per goat (Marete et al 2014). The Camel population is
estimated to be 2.9 million. Only 12 per cent of camel milk is marketed, 38 per cent consumed by the producers and about 50 per cent is wasted for lack of market owing to the harsh environmental conditions it is produced in (Musinga et al, 2008).

Just like in the entire country, dairy farmers in Meru and Nyeri counties experience low milk production due to inadequate quantities and quality of feed. This is as a result of seasonality of forage production and unependable quality of commercial dairy meal supplements. In addition, farmers in Kenya suffer from lack of organized markets for goat and camel milk. Those in the two counties have also experienced loss of existing goat milk. Because goat milk fetches higher prices than cow milk due to its superior nutritional and medicinal benefits for human health (Park et al., 2005), unscrupulous farmers and traders tend to adulterate it with cow milk, to increase volumes and, hence, sales. The loss of market has discouraged farmers in the two counties from investing in dairy goat improvement. Compounding the farmer problems are diseases that affect milk production and milk quality. This called for urgent measures to improve the availability of quality feed throughout the year. There was also need to organize milk marketing and curtail goat milk adulteration, to control diseases of dairy animals and, to diversify camel milk products to improve its market and its shelf life.

For six years, from 2011 to 215, KALRO, together with other partners including farmers, undertook a research project in Meru and Nyeri counties to address these problems.

**Key collaborators**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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<tbody>
<tr>
<td>Kenya Agricultural and Livestock Research organization (KALRO)</td>
<td>Lead institution, project coordination, addressing feed related issues and development of goat milk testing kit.</td>
</tr>
<tr>
<td>University of Nairobi</td>
<td>Management of diseases and development of bacteria cultures for fermentable camel milk products.</td>
</tr>
<tr>
<td>State Department of Livestock (Ministry of Agriculture, Livestock and Fisheries)</td>
<td>Mobilization of farmers, farmer training on IPM.</td>
</tr>
<tr>
<td>Kenya Medical Research Institute (KEMRI)</td>
<td>Study on evaluation of nutritional and medicinal value of goat milk on infant feeding.</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Co-ordination and clinical management of babies participating in the study.</td>
</tr>
<tr>
<td>Dairy Goat Association of Kenya (DGAK) and Meru Goat Breeders Association (MGBA)</td>
<td>Mobilization of goat keepers for on-farm trials, training and milk marketing.</td>
</tr>
<tr>
<td>Friendly Farms Dairy Ltd</td>
<td>Goat milk processing, milk products development and marketing.</td>
</tr>
<tr>
<td>Vital Camel Milk Ltd</td>
<td>Camel milk processing and marketing.</td>
</tr>
<tr>
<td>Sigma Millers</td>
<td>Formulation, processing, computation, commercial production and marketing of dairy meal for goats and cattle.</td>
</tr>
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</table>
The project, funded and coordinated by KAPP through its collaborative research approach, used six intervention pillars to tackle the problems:

**Six intervention pillars**

**Improving feed availability:** KALRO, working together with the collaborators screened 26 indigenous fodder species selected earlier by milk farmers in the two counties. Out of these, three species were selected based on yield and nutritional value. These include Mutundu (*Croton macrostachyus*) which has wide ecological adaptation, Muki (*Achyrospermum cavalhi*) which is suitable for high altitude zones and, Muthiriti (*Lippia kituiensis*) for low potential areas. The species were selected for domestication. Fodder from these species was then bulked for feeding and seed production at KALRO Embu. Three farms in drier areas of Nakuru-Rongai, Solai and Later were planted with dual purpose sorghum. The heads of the sorghum were harvested and made into silage for dry period feeding.

Also, the project screened 5 varieties of cassava and 2 varieties of sweet lupine for adaptation. The aim was to use these varieties as alternative for maize in dairy meal production for cattle and goats.

**Managing diseases affecting milk production:** The researchers visited 60 farms in Meru, Embu and Nyeri counties. The visit helped establish the prevalent goat diseases in the three areas. They conducted clinical tests for mastitis, pneumonia and other diseases and took samples and specimen from the sick goats for further analysis. The prevalent camel diseases were also determined using 60 camels from 40 pastoralists in Garissa County. Also, clinical signs were observed and samples and specimen from sick camels obtained for further laboratory investigation. In the laboratory, investigations centered on the disease-causing organisms and their biochemical behavior.

**Developing technology for fermenting camel milk (Thermo-stable Bacteria cultures):** For quality fermented camel milk products, the researchers, led by the University of Nairobi, isolated 30 thermo-stable strains of lactobacilli (fermentation bacteria for milk) from fermented camel milk cultures from different parts of the country. The strains were then refined and tested. This was intended to be used for yoghurt production.

**Promoting milk marketing:** The project conducted milk marketing research survey in Nyeri, Embu and Meru counties. Information generated from this survey formed the core for a milk marketing strategy. Further, literature research was conducted to establish if there were any unique characteristics in cow milk which were not in goat milk. Testing goat milk for the presence of these unique characteristics in the cow milk was then undertaken to establish adulteration.

**Building the capacity of farmers:** The project trained 278 (180 men, 98 women) farmer common interest group (CIG) leaders on group dynamics, clean milk production and ethics relating to milk marketing. They were trained to be vigilant and to watch for their neighbours in order to combat milk adulteration. Marketing research by the collaborating institutions indicated that milk
quality was low due to poor handling and adulteration. Farmers were therefore trained on clean milk production, ethics to reduce incidence of milk malpractices and how to come together and purchase milk coolers for bulking. They were also trained on organizing joint transport for their produce, group dynamics as well as development of their own by-laws for their CIGs and co-operatives.

**Collaborative research on milk for nutrition:** Upon obtaining Ethics clearance from the KEMRI Scientific and Ethical Review Committees (ERC), the project investigated goat milk for its nutritional and medicinal value as a supplement for mother’s milk for infants aged above six months, and as alternative to cow’s milk, especially in cases where the child is allergic to cow’s milk. Mother’s milk diet for 130 babies was supplemented randomly, 65 with cow and 65 with goat milk. They were then monitored monthly as they attended the post natal clinic using the standard operation procedures. The anthropometric data, lab test for urine and blood were monitored. Their feeding and medical experiences from the mother was also recorded.

**More technologies**

**Diversification of fodder plants** has increased the fodder plant species, by three. These fodder plant species are available for feeding dairy goats. Even if one fodder species get a pest or disease farmers will still have alternative fodder species to plant in their farms. Some farmers are now planting Mutundu along the farm boundaries, terraces and fences and managing the already existing ones as they now value them. The three fodder species have been adopted by farmers as feed material in their respective adapted areas. Farmers who have been producing dual purpose sorghum are now able to conserve the green crop residue into silage for dry season feeding. Three cassava varieties and sorghum grain were selected for compounding dairy meal. These meal compounds were eventually used for feeding trials at Marimba Government farm by M Sc students studying under the project.
Disease control: Control and treatment measures of the prevalent diseases—Mastitis, Pneumonia and diarrhea— in the focus area have been put in place. Khalid (a swelling disease) in camel was also prevalent and although it was difficult to control, it responded well to treatment with tetracycline. Only 20 per cent of isolated micro-organisms did not respond to ampicillin or tetracycline.

Adoption of technologies: As a result of the training, a farmer group in Meru County acquired a cooler tank. They have also constructed a goat milk processing plant. In Nyeri County farmers have revived the disused cooler tank. As a result of the adoption of the milk testing kit and ethics, buyers have since felt assured of the wholesomeness of goat milk. After capacity building on ethics, farmers were so annoyed by their own members who adulterated milk to a point that they suggested punitive measures to offenders. This included embargo on accepting their milk for sale in the group and losing all unpaid milk they had delivered during that period.

Technology for testing goat milk for adulteration: The goat milk testing technique has been adopted by the Dairy Goat Association of Kenya and Meru Goat Breeders Association as well as the farmer CIGs. The milk test technology, developed as a result of this intervention, can detect up to 3 per cent cow milk addition within 10 minutes. This technology has helped reduce adulteration of goat milk in the 3 counties.

Yoghurt from camel milk: The technology for fermenting camel milk (Thermo-stable Bacteria cultures) developed during the project has resulted in the production of a yoghurt brand, which was tested among pastoral communities for acceptability and flavors.

Analysis

The organized market and training has made the farmers to realize the role the county government can play in improving milk marketing. This project was successful since it used the common problems approach, while using the locally available resources such as the fodder crops.

The developed technologies are in line with government policies vision 2030 and Dairy Master Plan and are readily consumable by the dairy producers.

Conclusion and recommendation

The technical and social findings of this project need to be put into practical use and be up-scaled in other counties and other interest groups.
Names of collaborators

<table>
<thead>
<tr>
<th>Institution</th>
<th>Officer involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya Agricultural and Livestock Research Organization (KALRO) - Lead institution</td>
<td>John N.N. Kang’ara, The Principal Investigator</td>
</tr>
<tr>
<td>University of Nairobi</td>
<td>Dr. C. G. Gitao, Co-Principal Investigator</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries (MoALF) State Department of Livestock (SDL)</td>
<td>Robert N. Principal Investigator</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries (MoALF) State Department of Livestock (SDL)</td>
<td>Mboroki Kiambi</td>
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<tr>
<td>Ministry of Agriculture, Livestock and Fisheries (MoALF) State Department of Livestock (SDL), Embu</td>
<td>A. Kiema.</td>
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<tr>
<td>Kenya Medical Research Institute (KEMRI)</td>
<td>Phelgona A. Otieno</td>
</tr>
<tr>
<td>Ministry of Health, Provincial General Hospital, Embu</td>
<td>Dr. Martin Chabi</td>
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<tr>
<td>Dairy Goat Association of Kenya (DGAK)</td>
<td>Mr. Warui</td>
</tr>
<tr>
<td>Meru Goat Breeders Association (MGBA)</td>
<td>Mr. Ndeke</td>
</tr>
<tr>
<td>Friendly Farms dairy Ltd.</td>
<td>Susan Njeri Kanyeki</td>
</tr>
<tr>
<td>Vital Camel Milk Ltd.</td>
<td>John Oguk, Manager</td>
</tr>
<tr>
<td>Sigma millers</td>
<td>Vandan Shah</td>
</tr>
</tbody>
</table>
Supporting KALRO research programmes

Lawrence O. Mose, KALRO Headquarters

Through its network of centers, the Kenya Agricultural and Livestock Research Organization (KALRO) formally Kenya Agricultural Research Institute (KARI)’s research activities are carried out in all counties in Kenya. Despite this presence, the organization has yet to meet all the client demands for agricultural knowledge, information and technologies/innovations. This is due to the large number of challenges confronting the agricultural sector. Key among the challenges is inadequate financial resource. Available financial resources mainly from the Government of Kenya and development partners have not been adequate to address all priority areas identified by the counties. Furthermore, since the country is dependent mainly on rain-fed agriculture, effects of climate changes have negatively impacted on efforts by KALRO to contribute to increased food security and household incomes. Negative effects of climate change are manifested in prolonged drought periods and exceedingly heavy rainfall resulting in flooding; hence, the rising and regular incidences of crop failure due to moisture stress or the floods; and, emergence of new crop and livestock pests and diseases.

Further, food security issues link agricultural research outputs to human welfare; hence, KALRO’s role is central to the generation of technologies that meet consumer demands.
Product value chain approach

KALRO adopted the agriculture product value chains (APVC) approach in an effort to address the challenges facing the agricultural sector. KALRO has the scientific and legal mandate to carry out research in agriculture and veterinary sciences. Broadly, this mandate covers crops, livestock, natural resource management and socio-economics research. The APVC approach integrates producers and markets to make the agricultural sector more responsive to consumer demands. It aims at contributing to the transformation of smallholder agriculture from subsistence to an innovative, commercially-oriented and modern economic activity. This approach encompasses a series of processes, stakeholder linkages and public-private partnership (PPP). It permits a participatory analysis of the whole product value chain system. This analysis facilitates the identification and prioritization of constraints and opportunities throughout the value chain system, leading to the development of realistic and well-targeted research agenda. The APVC based research approach is characterized by increased vertical coordination from resource management, production, post-harvest handling, processing, marketing and interaction with consumers. The KAPAP Research Grant Manual (RGM) guided the development and implementation of research proposals developed through the APVC approach.

In KALRO, regardless of source of funding, research activities are organized in the form of programmes and projects which address at least one of the following five key institutional result areas:

- Technologies and innovations for demand-driven agricultural product value chains generated and promoted.
- Markets and marketing strategies for agricultural product value chains developed and promoted.
- Policy options for enhancing demand driven agricultural product value chains facilitated and advocated.
- Capacity for implementing agricultural product value chains research strengthened.
- Availability of knowledge, information and technologies on agricultural product value chains research enhanced.

Partners

KALRO secured the support and partnership of KAPP to implement research activities. KAPP funded and supported various research activities in all KALRO research programmes. The funds also supported a number of value chain analyses in livestock, food crops, horticulture and industrial crops.

Partners who have contributed to successful implementation of research activities in KALRO in the recent past include:
### PARTNER ROLE/RESPONSIBILITIES

<table>
<thead>
<tr>
<th>PARTNER</th>
<th>ROLE/RESPONSIBILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Universities</td>
<td>Collaboration/partnerships in the implementation of research programmes.</td>
</tr>
<tr>
<td>Regional and international organizations</td>
<td>Capacity building, resource mobilization, and technical support.</td>
</tr>
<tr>
<td>Community-Based Organizations, Faith Based Institutions,</td>
<td>Community empowerment and technology /information dissemination.</td>
</tr>
<tr>
<td>and farmer organizations</td>
<td></td>
</tr>
<tr>
<td>Agribusiness such as processors, input dealers, seed companies, merchants</td>
<td>Provision of quality agricultural inputs, credit facilities, dissemination of modern technologies</td>
</tr>
<tr>
<td>Private sector</td>
<td>Partnership in research and resource mobilization, and entrepreneurship development.</td>
</tr>
<tr>
<td>Farming communities</td>
<td>Local knowledge, resource ownership, technology development, adaptation and uptake.</td>
</tr>
<tr>
<td>Regulatory bodies</td>
<td>Provision of regulatory services and setting of standards.</td>
</tr>
<tr>
<td>Development partners</td>
<td>Provision of technical and financial support, and capacity development.</td>
</tr>
<tr>
<td>Electronic and print media</td>
<td>Dissemination of information and awareness creation.</td>
</tr>
</tbody>
</table>

### Interventions

Following prioritization of identified value chains, research projects were developed and implemented. The identified projects were all aligned to the five institutional/organizational result areas. In order to deliver on the five institutional level results, the research in KALRO including the KAPP funded activities, was categorized into six broad-based thematic areas of intervention namely:

- Development and promotion of integrated crops product value chains.
- Development and promotion of integrated livestock product value chains.
- Enhancement of sustainable and integrated management of natural resources.
- Enhancement of use of biotechnology and genetic resources management.
- Enhancement of utilization of socio-economic and applied statistics information in research.
- Enhancement of appropriate adaptive, outreach and partnership methodologies and approaches.

Specific projects undertaken included:

- Baseline studies on priority value chains.
- Developing stress-tolerant crop varieties and accompanying complementary information.
• Developing crop and livestock disease diagnostic kits.
• Developing a database for Maximum Residue Levels (MRLs) for pesticides in horticulture.
• Developing marketing strategies including linking farmers to crop and livestock product markets.
• Conducting economic, gender and preliminary impact assessments of developed technologies and management practices.
• Developing and disseminating efficient and cost-effective vaccines and drugs.
• Initiating studies on climate change adaptation and mitigation.
• Creating databases on soils, land use/land cover and crop suitability maps.
• Building capacity of scientists in specialised fields such as DNA fingerprinting and Marker Assisted Selection breeding techniques.

What this work achieved

Institutional strengthening: The KAPP funded work resulted in completing the revision of KALRO’s Second Strategic Plan and its Implementation Framework, to reflect changes in the government structure of the devolved system. It also helped in re-invigorating KALRO’s research coordination committee that allocates resources to prioritized research projects that reflect client needs. Also, as result of the intervention, KALRO acquired computers for use by the Monitoring and Evaluation personnel for the automated KALRO Project Performance Monitoring System (KPPMS). This system will provide real time project data and reports in the institute. In addition, KALRO has developed an Intellectual Property (IP) reward and recognition policy to guide registration of IP for public and commercial purposes and to reward staff effort, respectively.

Technologies: Research conducted within the prioritized areas following value chains analyses resulted in generation of 190 technologies, among them 93 in horticulture and industrial crops, 70 food crop technologies and accompanying information management packages. Among the technologies generated were; superior cereal varieties, i.e., 13 in maize, five in sorghum and three in wheat. In addition, at least five natural resource management and six animal health technologies/innovations were generated. They include the drip irrigation kit for the smallholders, and the animal vaccine infectra kit which has been patented. A total of 34 databases have been created on (i) soils, land use/land cover, agro-Ecological zones, agro-climatic zones, soil drainage, soil depth and mean annual rainfall, (ii) crop suitability for cassava, tomato, spinach, sorghum and millet and (iii) pasture suitability for Kikuyu grass, Lucerne, Napier, Silver leaf desmodium, Rhodes grass, Nandi Setaria and Kenya white clover. Also, superior horticultural and industrial crop varieties have been introduced and evaluated on-station and on-farm for suitability in various agro-ecological zones for tolerance to pests and diseases. Tissue culture protocols for various crop commodities including oil palm, and pyrethrum have been developed to enhance mass production of clean planting material. Complimentary agronomic, integrated pest management (IPM), post-harvest and value addition technologies for various crops have been validated and disseminated to the end-users.
Analysis

The APVC approach is flexible and realistic; thus, it easily accommodates emergence of unforeseen research demands such as, the Maize Lethal Necrotic Disease (MLND), which is now an issue of national concern requiring urgent research solutions. However, such flexibility has in some instances resulted in diversion of resources from the originally planned activities.

Conclusion

Concerted efforts is required to create awareness of the existing technologies/innovations, which are able to address farmer demand for increased productivity along the respective value chains, in order to enhance their adoption. These efforts will lead to improved food security, increased employment and sustainable natural resource environment.

Also, with an expanded research mandate for KALRO, there is need to tap on available opportunities, while tackling new and emerging challenges.

References

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Lessons from collaborative research cases

The 12 projects featured in this book under the Supporting Agricultural Research theme covered a wide range of activities, approaches, agro-ecologies and socio-economic conditions. The work involved research aimed at improving production and incomes from five value chains: meats; dairy; grains; fruits, nuts and vegetables; and natural resources management. To analyse the projects and bring out the lessons we chose three broad intervention areas: collaborative research, deepening and up-scaling, and developing and testing of technologies and innovations. We asked the project leaders to answer six questions on each: Why is this area of work important and what problems and opportunities does it address? What worked well and why? What has not worked and why? What should be done differently? What remains to be done?

Collaborative research

Why is this area of work important?

This approach was important because it enabled the KAPP projects to benefit from synergy in human resource and physical facilities. It allowed the problems to be addressed holistically, while avoiding duplication of efforts and resources. It also allowed for networking and exchange of information among project personnel.

KAPP supported this approach because it was in line with its mandate. The approach facilitated efficient utilization of resources, and was effective in addressing research, one of the areas of interest of KAPP.

What worked well and why?

The problems in the projects were well addressed using this approach. It enhanced networking and inter-institutional collaboration. It also facilitated the sharing of physical facilities like laboratories and equipment among the collaborating partners. Also, it enhanced learning and sharing of information and experiences.

It worked well because there was concerted demand for solution. The research was demand driven. Effective monitoring and evaluation complimented the other efforts to make this work successful.

What did not work well and why?

In some instances, some collaborators failed to co-operate with their colleagues to deliver the outputs due to lack of work ethics. Also, some projects did not start in time due to delay in disbursing funds. Such projects faced coordination challenges. This affected timely procurement of equipment and machinery and effective up scaling and out scaling of the projects. Bureaucracy in procurements also affected the flow of some projects. Time allocated for up scaling the projects was too short and was not effective.

What should be done differently?

Such projects require regular meetings where team members can air their views. The use of ICT can be encouraged to improve communication and procurement process. Also, focusing
narrowly leads to failure to address the problems adequately, and focusing broadly leads to loss of focus and failure.

What remains to be done?
There is need to recognize, acknowledge and appreciate top performers, including the partners and farmers, and their contributions.

Deepening and upscaling

Why is this area of work important?
After 2 years of the collaborative research projects, there was significant progress and achievement to warrant deepening and up-scaling of specific identified aspects focusing on issues of feeds and feeding, fast tracking availability of good quality seeds for improved productivity, climate change, post-harvest handling and value addition for enhanced performance and impact.

This work addressed the problem of poor technology transfer and adoption among farmers. It did so by bringing together chain actors and by fast tracking the out-scalling and up-scalling activities of the project. KAPP supported work in this area to address the issue of food security and wealth creation, job creation, and to enhance agribusiness.

What worked well and why?
Identification and packaging of activities and technologies was successfully done. It worked because it was highly participatory. It involved most of the stakeholders and was well facilitated.

Most of the projects successfully initiated the process of technology transfer. The research interacted with CSUs, service providers and the farmer institutions and, in some cases, the industry. For example, in the vegetable value chain focal area in Mumias, the research worked closely with Nutraciticsals East Africa Limited, a private company, for value addition. (See case: Supporting research in African indigenous vegetables value chain among smallholder farmers in Kenya).

This project led to wealth creation among the beneficiaries.

What did not work and why?
The diversity of stakeholders’ background and the large numbers involved contributed in slowing down the rate of the projects’ implementation. Further, the geographical spread of the chain actors also slowed the process.

What should be done differently?
The project should be well clustered with respect to ecological and geographical locations, chain actors, and expertise to enhance efficiency of resources and capacity utilization.
There should be a limit to the number of collaborators and collaborating institutions to optimize the use of resources. Steady flow of resources as per the planned activities and timelines should be ensured.

Co-funding from the national government should take precedent over donor funds to ensure consistency and sustainability. Governments should stop relying solely on donor funds on projects affecting development of key sectors of the economy.

What remains to be done?
The ongoing activities should be fast-tracked for impact.

Creating strong linkages for sustainability of the project activities.

The project initiatives should be linked to county governments.

Developing and testing of technologies and innovations
Why is this area of work important?
It addresses challenges that had been identified by the stakeholders. This is in line with KAPP’s development objective, the Agricultural Sector Development Strategy (ASDS) and Vision 2030. Also, it addresses the challenges identified along the priority value chains.

What worked well and why?
Sorghum varieties suitable for different agro-ecological zones and product development were identified and tested. Sorghum varieties were also evaluated for industrial uses, nutrition and health benefits. Community-based seed multiplication also worked well, alongside farmer mobilization and training.

In working with the fruits value chain, the approach with integrated Crop and Pest Management worked very well for mangoes in Makeuni, Kilifi, Meru and Embu.

• On beef value chain, the technology on traceability of animals using electronic rumen boluses (see case: Moving from livestock deaths to quality cuts and wealth among ASAL Communities) worked well. The same was also true for feed formulation for drought semi-feed lot for beef animals.
• For indigenous chicken, the projects succeeded in establishing parent stock; breeding and brooding technologies; on-farm feed formulation and mixing; growing of locally grown crops such as sunflower and sorghum for indigenous chicken feeding and sale of sunflower oil. Farmers adopted these technologies after being trained.
• Four technologies worked well for the vegetables value chain. These are: postharvest handling and value addition, development of germplasm for the African indigenous vegetables, hygienic produce crates for bulk handling of vegetables, and adoption of preservation methods.
• Dairy value chain also recorded technologies that worked very well. These are Thermostable culture for camel milk products, goat milk testing kit, and three indigenous fodder species (see case: Overcoming bottlenecks in dairy improvement in Meru and Nyeri counties).
• In aquaculture, the production of filial generation five (F5) of tilapia, which increased
production by 5%, worked well as well as formulation of 12 growth specific diets for three fish
species under culture and categorizing the feed for different climatic zones. The project also
managed to diversify fish products (fish sausage, fingers, fish balls, skewers and fish pie, etc)
• For the NRM value chain, integrating rice and fish farming worked well.

These worked well because there was wide consultation with other stakeholders such as
politicians for goodwill and support.

• The level of funding from KAPP was also substantial.

What did not work and why?
• The slow flow and accounting for funds by consortium institutions affected implementation.
• Conflicting interests of individuals among collaborating consortia also affected the flow.
• Some private sector players were not willing to sacrifice their time for the project because
the returns were not commensurate with their expectations. Also, institutional and personnel
changes affected implementation, particularly the extension staff that were regularly transferred.
• There were also weak research-extension and farmer linkages. The failure by some Principal
Investigators to release funds on time to their collaborators also affected implementation.
• Some services were costly and this affected the flow of implementation in some instances.
This was because institutions, including government, had commercialized their services, e.g.,
soil sampling.

What should be done differently?
• Improve financial management and reporting by the consortia.
• Explore ways of strengthening research-extension and farmer linkages.
• Inter and intra-institutional management issues should be streamlined with regard to financial
management.
• Such projects should involve the industry in research.
• Awareness creation should be enhanced on new technologies that address beneficiaries’ felt
needs to encourage adoption.
• Policy briefs should be developed in this regard to inform and influence policy decisions.
• A large consortium poses challenges in project management - reporting, delivery of expected
outcomes and co-ordination. The size should therefore be not too large and not too small to
affect delivery and impact.
• A large consortium also poses challenges of incorporating incompetent partners.

What remains to be done?
• Because of the above challenges and in order to create life-long impacts, there is need to
continue the programme to conclude the work that is still going on.
• A forum should be created and supported for continued consultations among the consortium
members after the project ends. This is to backstop and chart new frontiers in supporting
agricultural research.
Chapter 4: Improving extension services
Introduction

Combining productivity and profitability is critical in establishing a successful and sustainable agricultural development model. KAPP embarked on a journey to work with a consortium of service providers drawn from diverse disciplines (agronomy, animal science, agricultural marketing, social sciences, food science and technology, agricultural economics, natural resource management, research etc.), skills and experiences to improve extension services and to assist the farmers to attain food security, income security and poverty alleviation. The extension work focussed on dairy, meats, grains and nuts, local vegetables and natural resources management value chains.

What is it?

KAPP employed an Extension Approach which uses participatory processes to build the capacities of farmer groups to identify and evaluate opportunities. This approach would also enable smallholder farmers to develop suitable and profitable enterprises, increase productivity, link farmers to markets, and maintain the natural resource base that agriculture and their livelihoods depend on. It encouraged the public, private partnership. Through its County Service Units in the 20 counties in Kenya, KAPP engaged the services of the private sector to facilitate the process. Service providers from the private sector were contracted in this respect.

The approach has five steps described as follows:

1. Identifying the constraints and opportunities, and creating awareness
Farmers working together with agricultural service providers identify the problems and opportunities, prioritize them and then develop strategies to overcome the problems or exploit the opportunities. The identification is done through a Community Resource Assessment conducted by the farmers themselves through the facilitation of KAPP, relevant government departments and the local administration. The service provider then disseminates the strategies to a wider client base to create awareness of the opportunities with the aim of recruiting those interested to register and form groups for agro-enterprise development. Becoming aware of problems, opportunities and others’ experiences is fundamental to the ability of farming communities to collectively adapt and sustain their livelihoods and environment.

2. Formation of farmer common interest groups (CIGs)
After the promotion of opportunities, farmers interested in the same enterprise come together and form groups. They elect their leaders as it is critical that the farmers themselves drive the process of agro-enterprise development. Enabling the farmers to take charge of their agribusiness is one of the fundamental responsibilities of the service provider. In electing the farmer leaders the following standards are used:

- Adherence to the one-third gender rule to promote inclusivity and participation in decision-making;
- An active smallholder farmer;
- Respected in the community;
- Awareness in community needs and issues;
- Democratic, a good communicator, a good listener, eloquent and open to new ideas; and;
- Has demonstrated good leadership skills.

118
The service provider uses the group to guide the agro-enterprise learning process, wherein group members discuss, make decisions and work together for the success of the agro-enterprise. The group meeting sessions are also used to report on individual farmers’ progress on implementation of the agreed action plans and achievements. This enables the group to learn and reflect on each member’s performance.

3. Preparation of the agribusiness plan

One of the most important documents for any business is a business plan. It enables the business owners to make decisions concerning their relationship with a business. In order to capture the farmer’s insight or perspective and have their full support of the document, the farmer leaders work together with the service providers in developing the document. Later, the document is disseminated and shared with all the group members for information and concurrence. This forces all the farmers who are also the business owners to systematically consider all facets of the business. In doing so, they become more knowledgeable on the business, the industry, and the market environment in which their business operates. The process also helps to define the business goals and assess the impact that uncertainty may have on the future business. Most importantly, the written plan can be used to keep the farmers moving towards the common goals established within the business plan.

4. Implementation of the agribusiness plan

Implementing the activities outlined in the business plan require active participation and support from the full range of stakeholders. The first step in the execution of the business plan is to present it to all farmer members for adoption. Once the business plan has been adopted by the generating meeting, specific action must be taken to ensure that the business plan will be implemented and executed. The development of the business plan will have been an exercise in futility if it is simply approved and placed on a shelf. In order to execute the plan, the farmer leaders must take responsibility for implementation and must ensure that all the stakeholders play their role effectively. At each group meeting individual farmer members must give an update on progress. Groups that are achieving goals and accomplishing their objectives have an easier time generating, educating, mobilizing and sustaining members and leaders because the public can see that they’re making a difference in the community.

Training is another significant aspect of implementing the agribusiness plan. Through trainings, the stakeholders get access to valuable knowledge in order to make informed decisions. For this reason, a series of training programmes are organized. The common training programme include processes of increasing productivity, data collection, record keeping, good agricultural practices, marketing, insurance and agricultural finance, participatory monitoring and evaluation, leadership and management, agro-processing and value addition, and other felt needs.

5. Participatory monitoring

Participatory monitoring is the process of collecting, processing and sharing data and information to assist the project participants in decision-making and learning. The purpose is to provide all concerned with information that would enable them determine whether group objectives are being met. Farmers meet monthly to share updates.
Contracting Service Delivery model

F. M Baiya, KAPP

This work in phase 2 (KAPAP), dealing with agricultural extension services, was guided by the contracting service delivery model.

The traditional approach to Extension Services is carried out by extension officers in the Agricultural sector ministries of Agriculture, Livestock, Fisheries and Forestry. Primarily the services focus on training farmers through individual visits, organized trainings at Agricultural Training Centers (ATCs), field days, demonstrations and study tours among others. In spite of the growing need for agribusiness and Public Private Partnerships (PPPs), agribusiness interventions are rarely incorporated in the extension menus.

Also, the extension staff/farmer ratio has declined tremendously due to the government freeze on employment. This is compounded by the unrealistic inverted pyramid staff imbalance between the graduate staff and the technical assistants who ideally are the face of agricultural extension.

As a way of tackling these problems, KAPP decided to contract extension services. It used the Contracted Service Delivery model (CSD) to implement all the extension service work in the project, including those featured in this book.

Why the model was designed

The Contracted Service Delivery model was designed to promote an outcome-based accountability system that enhances efficiency in service delivery and higher productivity and incomes. In the model, the beneficiaries take the leading role in planning, managing and accounting for the service delivery resources as demanded by the devolution process in Kenya. The design is geared towards enhanced farmer empowerment.

How the model works

- Extension services are offered by a consortium of service providers formed around key priority specific value chains or enterprises.
- The consortia are identified or selected through a competitive process by the county-level implementers. This is to ensure the tasks are allocated to appropriate service provider firm. The selection is based on a technical proposal that the service provider would sell to the beneficiaries, in this case farmers, if selected.
- The beneficiaries are then identified through a ‘carrot dangling’ strategy where the prospective service provider firm is expected to formulate a viable investment opportunity on the value chain/enterprise which they later advertise or flag to the members of the community in the identified project area. Those farmers interested in investing in the flagged or advertised opportunities are enlisted as Common Interest Group (CIG) members in order to benefit from the services. Under this model farmers are investors just as in any other sectors of the economy.
- The consortia together with the beneficiaries develop a Value Chain Development Plan (VCDP) highlighting the implementation and expected achievement benchmarks.
• The beneficiaries, through their CIGs, are issued with value chain development grants that fall into two categories namely; a) contract fees for paying the consortium (service provider) and b) for equipment and inputs for value chain development. The consortia are contracted by the beneficiaries, through the CIGs, during a value chain specific participatory contracting workshop (PCW) forum.

• To be able to manage the grants, farmers have to organize themselves by democratically electing their leaders starting at the grassroots, the ward, up to the county level, and registering their groups with the relevant authorities, in most cases the department of social services or as co-operatives. The elected officials take charge in ensuring smooth implementation of the value chain-based development plans, cohesion among CIG membership, regular data collection, record-keeping and management and administration of the farmer grants. On behalf of specific value chain farmers the elected signatories open bank accounts and deposit the grant funds.

• The terms of the contracts are derived from the VCDP and through a negotiation process anchored on two principal beneficiaries who are eager to realize value for money for their grants and; a service provider firm eager to earn professional fees in good amounts and within the contract period. The underlying principle, however, is that for the service provider to earn the contract fees, the farmers ought to have realized some wealth first.

• The contracts periods are usually one year renewable depending on the availability of the grant funds and performance.

Co-ordination: The planning and implementation of the model was co-ordinated by the KAPP secretariat. In the counties, coordination was delegated to KAPP’s County Service Units (CSUs). Implementing agencies (Agricultural Sector Departments- CASPSC) representatives formed the technical teams, i.e. County Technical Team (CTT) and Sub-County Technical Teams (STT). These teams played major roles in identifying project areas, value chain analysis, community mobilization, community resource assessment and competitive selection of service provider consortia. The teams also played capacity building and supervisory roles.

Operational procedures: All the projects using this model were guided by standard operational procedures. This was to ensure a logical, synchronized and harmonized process within the participating/target counties. The operational procedures took into account concerns on desirable
policy attributes, contracting of services, promotion of agribusiness, farmer empowerment to demand access and benefit from the agricultural extension services provided, and the mainstreaming of gender, social and environmental safeguards at all levels. The procedures also included adoption of good practices that avoid perpetuation of the dependency syndrome among beneficiaries. Monitoring and evaluation structures were also built in the procedures to ensure transparency and accountability.

How the model was used
The projects were planned and implemented using the CSD model and followed key steps as follows:

- A co-ordination structure, namely the Agricultural Sector Programmes Steering Committee (ASPSC) drawn from amongst key implementing agencies—departments of Agriculture, Livestock, Fisheries, Co-operatives, KALRO, and KENAFF and the corresponding structures at the County level was established.
- The implementing agencies were then mobilized by the CSU office to constitute implementing teams at the County, sub-county and ward levels (County Technical teams, Sub-County Technical Teams).
- Communities were then mobilized and sensitized through farmer meetings or chiefs’ barazas (meetings) to create awareness on the project and to sensitize them to participate in the project activities.
- This was followed by a Community Resource Assessment (CRA) carried out by the Sub-County Technical Team to establish the baseline status of the target area in regard to agricultural production, the associated challenges and available opportunities toward increased productivity and incomes of the priority value chains.
- A service provider consortium was then identified using the normal government procurement procedure that includes advertisement through an “Expression of Interest (EOI)” and vetting of EOI responses.

Monitoring & Evaluation: Monitoring and evaluation of progress and outcomes of extension service model was done through laid down project’s Monitoring and Evaluation systems that include; inbuilt tools within the implementation processes, Management Information System (MIS), regular monitoring exercises by beneficiary leaders, CSU and KAPP secretariat as well as quarterly and annual report by the CSU and service provider firm. Every individual farmer was provided with a card on which to record his/her productivity and sales, and was expected to avail this data to the County officials for onward transfer to the CSU Monitoring and Evaluation officer through the county value chain officials. At the CSU office, the data was logged into the MIS system and exported to KAPP secretariat for aggregation and further analysis.

The returns on the contracted extension services: A total of 81 consortia of service providers were selected using this model. They were contracted to offer agribusiness focused services to 4,683 beneficiary groups with initial registration of 230,000 farmers at a cost of Ksh. 368 million as service (contract) fees. These funds were issued out as grants to these beneficiaries to access services from the respective consortia. This enabled the group to make gross earnings of Ksh. 7.64 billion over 4 years.
**Return to Investment Index (RII) of Service Delivery.**

This is an estimate indicator on the efficiency of service provision: It is calculated by dividing the change in farmers’ earnings attributable to the professional work of the service provider by the amount of service fees paid to the service provider. It is about the wealth created for every shilling paid to the service provider. However, in reality this index cannot be attributed to the service provider alone but rather to the three key actors in the CSD process. These are the beneficiary as the implementer and grant manager, the service provider as the facilitator and the CSU as the overall manager. RII is therefore a composite performance yardstick of the three players. For example, meat value chain in Garissa recorded the highest RII of 71.48. The aggregate RII for all the 96 value chains is 3.39. This is also the KAPP project overall RII.
Indigenous chicken production is one of the most popular enterprises in Homa Bay County among small scale farmers. This is according to a community resource assessment (CRA) carried out in 42 locations in the county in the year 2010 by KAPP in collaboration with KENAFF and the Ministry of Agriculture, Livestock and Fisheries. This is because it requires little capital and small space to establish. However, farmers who keep the chicken face a number of challenges. These include high mortality rates due to prevalence of diseases, poor feed qualities, high cost of feeds and drugs, low prices of the products and lack of organized marketing. The CRA report further indicated that 2706 farmers earned an average of Ksh. 3,148 each annually from the sale of 26,491 chickens despite their efforts to increase production. There was therefore a great need to address these challenges.
Identifying the consortium

Through its County Service Unit for Homa bay, KAPP, for five years beginning in 2010, undertook a project in the County where it worked with other partners to address these problems. The partners included 1,700 farmers, the County Agricultural Sector Programmes Steering Committee (CASPSC) and a service provider who was identified through competitive bidding. Several firms had expressed their interest in finding a solution to these problems. Among them was BENHAIM consultancy, which after vetting was contracted as the service provider to help build the capacity of farmers with a view of improving production of the indigenous chicken and incomes. BENHAIM then formed a consortium by enlisting the support of the locally existing extension services.

Whipping farmers into action

BENHAIM, in partnership with local farmers, engaged in activities that were aimed at increasing farmer incomes from local poultry production. These included mobilizing the 1,700 (935 males, 765 females) farmers in the 42 locations, with the help of the local chiefs. The service provider used the barazas (meetings) of the same chiefs to sensitize the farmers on the benefits of working as a group. Two farmer sensitization meetings were held in each location. Out of these, 168

Mr. Patrick Odira’s local poultry house before the project
common interest working groups (CWGs) were formed, four in each location. The groups elected their leaders who helped BENAHIM and KAPP in organizing training meetings for farmers and reporting on the progress of each and every farmer. The farmer mobilization was done with the assistance of KENAFF.

The service provider, with KAPP’s support, organized farmers to form a co-operative society which focused on setting up a hatchery, establishing collection centers for birds and eggs at each sub-county level and establishing marketing infrastructure. Other interventions included improved poultry husbandry, formulation of home-made feed rations, improvement of poultry housing and diseases and pests control.

**Partners and their roles**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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<tbody>
<tr>
<td>KENAFF</td>
<td>Mobilization of farmers and capacity building, Monitoring and evaluation.</td>
</tr>
<tr>
<td>BENAHIM Consultancy</td>
<td>Service provider (Capacity building, market linkage, group formation).</td>
</tr>
<tr>
<td>County Government of Homa Bay</td>
<td>Policy guidelines and regulations, extension services.</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, guidance of the partnership, monitoring and evaluation, coordination of activities.</td>
</tr>
<tr>
<td>Equity Bank</td>
<td>Financial literacy, credit to farmers</td>
</tr>
<tr>
<td>Farmers</td>
<td>Beneficiaries</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Technical backstopping, implementing agency.</td>
</tr>
<tr>
<td>Ministry of Co-operatives and Industrialisation</td>
<td>Co-operative formation and capacity development.</td>
</tr>
<tr>
<td>County Agricultural Sector Programmes Steering Committee (CASPSC)</td>
<td>Oversight; approving community micro-projects</td>
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</tbody>
</table>

**Trainings:** Each of the 168 groups was trained 10 times on co-operative society formation and management, diseases control, group dynamics, formulation of home ration feeds, housing for poultry, vaccinations, pests management and other cross-cutting issues such as gender and HIV/Aids and its effects on agricultural production. They were also trained in record-keeping and report writing. The farmers individually implemented what they learnt and the consortium maintained close supervision, providing the farmers and farmer groups with technical advice on extension.

**Grant management committee:** In order to empower the farmers to manage their affairs, the three officials were elected by each CWG to serve at the sub-county level. Each sub-county elected another three officials to serve at the County level. These County officials, also referred to as the Grant Management Committee, managed the grant from KAPP on behalf of the farmers.
They also signed extension services delivery contract with the service provider as its employer and supervisor. Also, the officials aggregate the reports from the field before the service provider is paid by the farmers.

Hatching the benefits

**Increased productivity and income:** As a result of the sensitization meetings, 168 CWGs were formed and later organized into marketing groups. A total of 2,706 farmers (1487 males, 1219 females) have been enlisted as members. All the 2,706 farmers have embraced vaccinations and good management practices as a means of disease control. This has led to low prevalence of diseases, at 44 per cent, and a 44 per cent drop in mortality rate. As a result, productivity and incomes have improved. The number of chicken kept until market weight has increased from 17,974 at the beginning to 232,000 leading to accumulated wealth of Ksh. 70,572,920, up from Ksh. 6,257,850. Adoption of use of incubators by farmers has helped increase number of chicken compared to conventional way of brooding.

**Enhanced marketing and partnerships:** As a result of these interventions, the price of one bird has improved from Ksh.300 initially to an average of Ksh. 500. This improvement has been brought about by the farmers being organized into small marketing groups and a co-operative which enabled them to have stronger bargaining power and ability to explore better markets, especially in local supermarkets and hotels. The co-operative directors have also acquired a business number from Safaricom telephone company to enable members do mobile phone banking. They are now marketing through the co-operative; a practice which has led to better price per bird. The co-operative has acquired 300 incubators from the County government. Marketing is being done at the co-operative level with collection centres established at each sub-county level. The co-operative has been earmarked for a co-financing grant from KAPP.

**Improved housing:** As a result of demonstration on improved chicken housing, 700 farmers have embraced the idea by putting up poultry houses separate from their residential houses. A special case is of Mr. Patrick Odira Ogalo of Kayambo location in Ndhiwa sub-county who has used papyrus reeds to construct an improved poultry house. Patrick used to lose chicken to preying birds, thieves and wild cats. He is now a proud farmer who earned Ksh. 60,000 within his first year in the business. He has used the income to pay school fees for his two sons in the local school.

**Behavior change:** The farmers, especially women have organized themselves into small table-banking groups to save and raise funds for investment instead of waiting for support from donors.

**Improved feed quality and prices:** Training by the service provider and the Livestock Department equipped the farmers with the knowledge on home-made ration formulation. As a result, up to 1000 farmers formulate home-made ration from rice germ, maize bran, sunflower cake and leftovers of fish and omena (Silver Cyprinid) fish. This has led to improved feed quality. This
has also led to low cost of feed since farmers use the produce from their farms. The County government has also put up a livestock feeds processing plant in Homa bay town after being convinced to do so by the project. This has solved the problem of poor quality feed and the high feed prices.

**Analysis**

Use of locally available materials, especially in constructing chicken house and feed formulation, encouraged adoption of the technologies thereby increasing production.

The cumulative earnings since the beginning of the project reached Ksh. 70,572,920, giving a return to investment (RI) of 12.32.

**Conclusion**

Group approach has proved to be the best way of marketing. Members should therefore be encouraged to embrace and strengthen this structure, especially the co-operative society.

There is need to establish a slaughter house and a cold room to support farmer and the co-operative efforts in value addition.
Milk collection at Kabichbich.

Milking money from dairy farming in West Pokot

Wycliffe Amarati, KAPP West Pokot

"Nowadays our wives no longer beg for assistance from us. This is because they can fend for themselves through the sale of evening milk. They no longer hawk the milk. We are happy as they are also economically empowered," says Charles Rumot, a dairy farmer in West Pokot. These sentiments are confirmed by the West Pokot county dairy value chain chairman, Pius Lokita. "Our milk production has increased compared to the times before KAPP started working with us. Our farmers have started engaging in other developments like building better houses and buying better dairy cows," says Lokita.

For a long time, dairy farmers in West Pokot County have experienced low milk production occasioned by inappropriate dairy breeds, frequent disease outbreaks, poor feeding regimes due to insufficient fodder and pastures, and inadequate Artificial Insemination (AI) services. They have also suffered low milk prices. For a long time also, proceeds from milk delivered to buyers have solely belonged to the males because they are the heads of the households. This has accelerated the hawking of milk by the females. Those who kept dairy animals had very weak access to extension services. This is because the staffing level by the government was very low. A community Resource Assessment supported by KAPP confirmed these problems.
Stakeholders in the project

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<tr>
<th>Institution</th>
<th>Role</th>
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<tbody>
<tr>
<td>Smallholder dairy farmers</td>
<td>Beneficiaries</td>
</tr>
<tr>
<td>County Government of West Pokot</td>
<td>Co-financing, installation of milk coolers.</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Implementing agencies, technical backstopping.</td>
</tr>
<tr>
<td>Ministry of Co-operatives and Industrialisation</td>
<td>Formation and capacity development of Co-operatives</td>
</tr>
<tr>
<td>Kenya National Farmers Federation (KENAFF)</td>
<td>Farmer empowerment</td>
</tr>
<tr>
<td>Small &amp; Medium Agribusiness Enterprise Development (SMAED)</td>
<td>Extension service provider, capacity development</td>
</tr>
<tr>
<td>County Agricultural Sector Programs Steering Committee (CASPSC)</td>
<td>Oversight and approving community micro-projects.</td>
</tr>
<tr>
<td>Kenya Agricultural &amp; Livestock Research Organization (KALRO)</td>
<td>Generation of technologies</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, capacity building</td>
</tr>
</tbody>
</table>

Tackling the problems head-on

**CRA Process:** A team made up of KAPP’s County Service Unit for West Pokot, beneficiaries and implementing agencies undertook a community resource assessment (CRA) exercise which enabled the West Pokot dairy farmers to come up with a list of immediate needs and possible solutions to overcome them. The CRA findings were shared with community members through barazas (public meetings) convened in each of the nine locations for ratification and ownership. Service providers used this as an entry point to develop workable agribusiness interventions to address the identified dairy production and marketing challenges.

**Forming the Common Interest Groups (CIGs):** During the barazas, farmers who were interested in dairy enterprise enrolled as members of the dairy farmers’ common interest group (CIG). The farmers wanted to increase their incomes through a series of laid out interventions. The farmers, through their CIGs, then conducted elections where 3 officials were elected to provide leadership at each location. This was scaled up at sub-county and at the county level. A team of officials was elected at the county level to form the grant management structure. Their role was to manage the grant resources acquired from KAPP.

**Contracting the service provider:** KAPP then identified SMAED, through a competitive bidding process, to provide technical guidance to the farmers. The aim was to raise milk production from 4 litres to 8 litres per cow per day. The service provider was to strengthen organised marketing system using the existing co-operative societies.
Developing the capacity of farmers: SMAED trained 2017 farmers (1320 males, 697 females) from 9 CIGs on pasture management, feed formulation, pest and disease management, clean milk handling, group dynamics, record keeping, breed improvement, gender mainstreaming, environmental and social safeguards and business plan development. Demonstrations were used to disseminate technologies to farmers. The CIGs were further exposed through field days and learning tours.

Business plan development: KAPP trained three officials and the service provider on development of a bankable business plan. A five-year business plan (2013-2017) on dairy processing in West Pokot County was then prepared, upon which the Pokot Dairy Processing Co-operative Union—a union bringing together 17 existing dairy co-operatives was formed. The union worked to champion aggregation, processing and marketing of milk as per the business plan.

Five more cooling plants

Increased productivity: As a result of the interventions, milk yield per cow per day increased from 4 to 8 litres. This has translated to an increase in milk volume in the county from 20,000 to 35,000 litres per day. In response to the increased production, the County government has installed 5 more milk cooling plants, increasing the number from 4 to 9. Farmers were able to reduce the amount of milk rejected by the buyers thus increasing their income by about 20 per cent.
**Increased earnings:** Up to 2,000 farmers collectively recorded increased earnings from milk from Ksh 55 million to Ksh 215 million.

**Improved livestock production practices:** At least 50 per cent farmers have established pastures and fodder crops such as Napier grass, Boma Rhodes grass, oats and lucaena species to supplement natural pastures. A number of farmers have also adopted zero-grazing as a production system. Incidences of disease infections and pest attacks have also gone down through improved livestock husbandry practices like spraying and deworming.

**Gender equity:** Milk hawking has significantly reduced because milk proceeds are now shared within the household between the male as the head of the household and the wife.

**Farmer empowerment:** Through the creation of grant management structures (GMS) farmers have been empowered and are able to manage their own resources. They are also able to keep their own records thus enabling them to determine whether they are making profits or not. Farmers can now voice their concerns and influence policy direction through GMS. The co-operative union also works to aggregate farmer needs and benefits.

**What this means**

By allowing private sector participation in extension service delivery, the approach bridges the gap created by the low public extension staff: farmer ratio. The process is community-driven and bottom-up in approach thus addresses beneficiaries felt needs. The approach is multi-stakeholder and therefore enhances synergy in service delivery. The Contracted Service Delivery approach involves all the key stakeholders right from problem identification, analysis and in seeking solutions. This makes the approach responsive, transparent and accountable.

**The remaining challenges**

Low adoption of technologies occasioned by low literacy levels.

Entrenched cultural beliefs affecting technology adoption, e.g., the community strongly believes in natural mating as opposed to AI.

**Conclusion and recommendation**

The CSD model is therefore a good model for agricultural service delivery that should be adopted by the County governments.

The gender equity model used by dairy farmers in West Pokot should be popularised for adoption by other farmers.
Making bubbling income from bulb onions of Batei ward, West Pokot

Mr. David Roron, Chairman of Ortum Farmers Co-operative Society, used to earn Ksh 120,000 each year after planting one acre of bulb onions. This was before KAPP started working with farmers in the Batei ward of West Pokot County. This soon changed after he interacted with the KAPP project in the area. His income rose to Ksh 350,000 per year for the same acreage of bulb onions. “From my first earnings, I constructed a good house, I paid school fees for my children. From the subsequent ones, I re-invested back in the farm, purchasing inputs on time. The co-operative society is doing the marketing bit, and I can access inputs directly from it. More farmers are now joining this co-operative society. Bulb onion farming has impacted my life positively,” says Roron.

Bulb onion is one of the major horticultural crops in Batei ward of West Pokot County. Initially, bulb onion was not commercially grown here. Most families survived on relief food as maize they produced was not enough to feed their families. But even bulb onion production was characterized by low yields, high cost of inputs, low market prices as a result of un-coordinated marketing and high post-harvest loses. Middlemen took advantage of this situation to exploit farmers. All these resulted to low farmer incomes. On average, farmers produced 4 tons per acre and the onions sold at Ksh 20 per kilogramme. This was very low compared to an optimum production of 10 tons and a selling price of Ksh 50 price per kg when the season is good.
The stakeholders

To address the farmer problems, KAPP worked with a team of stakeholders including the bulb onion farmers, Kenya Seed and East African Seed Company who offered seed varieties, PAVES, Amiran Kenya, and Syngenta who supplied seed and agro chemicals. The Kenya Commercial Bank provided financial services, the Ministry of Co-operatives Development facilitated co-operatives formation and capacity building, the County Government of West Pokot created enabling environment and co-financed the project, while the Ministry of Agriculture, Livestock and Fisheries were the implementing agencies. KAPP provided the funding, co-ordination, monitoring and evaluation.

Intervention approach

KAPP, through its West Pokot County Service Unit, carried out a community resource assessment (CRA) which revealed that 1339 bulb onion farmers (1,268 men, 71 women) were earning Ksh. 65 million per year. This translated to Kshs.48,000 per farmer per year. Farmers could not break even as the cost of production of bulb onions per acre per season was Ksh.50,000. To address the low productivity and incomes, CHOTWO Agricultural Consultancy was engaged as a service provider to conduct high level interventions on production and marketing linkages. CHOTWO was to raise bulb onion productivity from 4 tons to 8 tons per acre and bulb onion price from Ksh 20 to Ksh 40, through organized marketing.

Capacity building: CHOTWO helped organize farmers into four common interest groups (CIGs) - Parua, Kerelwa, Muino and Chepkokogh locations- for the purposes of training. In 7 training sessions, farmers were then trained on good agricultural practices, high yielding varieties, integrated pest and disease control, nursery management, harvesting and post-harvest management. Demonstrations were also used and farmers were taken to an exposure tour to learn new technologies in Kieni West, Nyeri County.

Marketing: Four collection centers at each CIG location were established to grade, sort and aggregate bulb onion produce in readiness for linkage to markets. To ensure project sustainability, CHOTWO mobilized the 4 bulb onion CIGs to form Ortum Farmers Co-operative Society. To strengthen business activities of this organization, a five-year business plan was developed. The business plan emphasized organized marketing, bulk acquisition of inputs and linkage of affordable credit facilities for farmers.

Grant management structure. In line with KAPP’s Contracted Service Delivery Model, a grant management structure of value chain officials was put in place at the location, division (ward) and county levels. The role of this structure was to empower farmers to give them control over the grant’s financial resources.
Promoting high yielding varieties: Red Tropicana and Red Pinnoy, known for high yields, were introduced. Optimum production of these varieties is 10 tons per acre. Galigan, an efficient weed control chemical, was also introduced to cut down on weeding labour costs.

The bulbs, the benefits

Increased yields: As a result of enhanced farmers’ knowledge and skills on onion farming and management, bulb onions average yields increased from 4 tonnes to 8 tonnes per acre.

Adoption of high yielding onion varieties (Red Tropicana and Red Pinnoy) and use of Galigan also resulted in increased productivity.

Increase in farmer incomes: Farmer earnings at household level increased to Ksh. 320,000, from Ksh. 100,000 on average, due to enhanced market linkage, increased production and high yielding varieties. Increased farmer productivity and incomes has consequently improved the county government’s revenue collections. As a result, the County Government of West Pokot has reciprocated by opening up access roads in bulb onion-producing areas and building markets structures. It has further facilitated the Ortum Farmers Co-operative Society with a grant of Ksh. 3 million to purchase high yielding onion seed in bulk.

Farmer empowerment: In the 2013-2014 onion planting season, the farmer co-operative secured farm inputs worth Ksh 1.4 million for its members on credit from PAVES, an input dealer. The bulb onion farmers no longer rely on relief food. Bulb onion farming is rapidly expanding to new locations such as Ywalateke, Mokoyon and Kapyogen.
Challenges

The bulb onion market fluctuates as a result of competition from other bulb onion farmers in other regions. Timely planting has been used as a way of addressing this challenge.

Pastoralists always employ wait and see attitude. This affects technology adoption rates.

Bulb Onion production relies on irrigation water from Parua and Kerelwa streams. Increase in population pressure coupled with increased demand for water on bulb onions may be a challenge in future since water levels have gone down significantly.

The cost of producing bulb onion is capital intensive, and this requires very committed farmers.

Gender imbalance: Bulb onion is a male-dominated enterprise. Whereas women do most of the manual jobs in farms, proceeds go to men. Out of 2,800 farmers in this project in 2014, only 400 were women.

Lessons learnt

Involvement of stakeholders such as agro input dealers, banks and county government can improve bulb onion productivity through support and synergies. This enhances project ownership.

Continuous capacity building is key to attitude change. Consistent trainings, demonstrations and sensitisations would motivate pastoral communities in West Pokot and other areas to slowly consider taking up new innovations.

Recommendations

Production efficiency should be encouraged to bring down the cost of bulb onion production. There is a need to scale up the membership of Ortum Farmers’ Co-operative Society to include other bulb onion farmers within the County so that they can benefit from gains achieved through group marketing and bulk acquisition of farm inputs.

There is need to create more market linkages and maintain the current linkages to ensure sustainable marketing of onions.
Promoting African indigenous vegetables as an agribusiness in Siaya

Phoebe Muchele, KAPP Siaya

African indigenous vegetables have been grown all over the world and are considered a source of healthy food and of medicinal value. In Kenya they are regarded as traditional food crops with little attention from policy makers in regard to research and development. In Siaya County, farmers cultivate local varieties that are low yielding. This is because they recycle own seeds, thereby compromising incomes. This is despite the fact that there is great potential for African indigenous vegetables production in the county, whose rainfall ranges between 800 mm to 2000 mm in two seasons. Besides the recycled seeds, there exists a negative attitude towards the enterprise among the general population of Siaya. Cultivation of these vegetables is associated with low educated and most economically deprived within the society. According to a community resource assessment (CRA) conducted by KAPP, apart from low productivity, other factors influencing the development of this value chain include lack of formal structures for group production, distribution and marketing; middlemen exploiting the producers, traders and consumers; lack of clean certified seeds for indigenous vegetables and; inadequate extension services.
In the face of the challenges

KAPP, through its County Service Unit (CSU), for five years from 2010, mobilized various stakeholders, including the local community, with an aim of increasing incomes of the small holder African indigenous vegetable farmers in the County. Three consultative meetings were held to spell out the roles of each stakeholder. The roles were defined as follows: KAPP was to supervise and fund the project, build the capacity of the stakeholders and provide backstopping. TATRO Women Group was contracted as the service provider to help build the capacity of the farmers in agribusiness and to provide extension services.

KAPP though its CSU first created awareness among the implementing agencies at the regional and district levels. This was followed by the following interventions:

**Group formation:** Farmers in 15, out of 54, locations in the county registered the highest number of farmers who expressed interest and enlisted in the project. These farmers formed common interest groups in each of the 15 locations. The CIGs came together and transformed into the Siaya Local Vegetable Producers Value Chain, community-based organization (CBO), which got registered in December 2011. Initially, the CBO had 1,200 (685 Men + 515 Women) members, recruited from the 15 locations. The CIGs also identified training sites and the beneficiary host farmers.

The farmer CBO then transformed itself into the Siaya Vegetables Production Co-operative Society (SIVEPCO).

The farmer CBO, with the guidance of TATRO, developed an enterprise development plan. This also guided the development of a business plan for African indigenous vegetables.

**Training of farmers:** The farmers, through the CBO, were then trained on how to develop and manage agribusiness, co-operatives and entrepreneurship, and quality control of produce by sorting and grading. TATRO facilitated the trainings.

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*Black night shade seeds*
**Demonstrations:** The CBO members also participated in skills demonstrations aimed at promoting value chain development, value addition, entrepreneurship among other activities. The demonstrations were held in 16 exemplary sites, one in each of the 15 locations and an extra one for Siaya sub-county. While at the demonstration sites, the farmers collected performance data which was used for gauging the payment to the service provider. The group members performed roles that were gender compatible. The youth and female farmers were assigned activities that conformed to their genders. For example, the co-operative established ‘Spraying Teams’ by the youth and ‘Seed Processing Teams’ by the women.

**Plucking the gains**

**Improved production and incomes:** As a result of the interventions, area under production of local vegetables by the members of the farmer CBO rose from 0.25 acre to 1.0 acre per member, improving yields from 400 kg to 1500 kg per acre. Producer price also went up from Ksh. 15 to Ksh. 48 per kg. Likewise, there was an increase in quantity sold from 240 tonnes to 4344 tonnes of indigenous vegetable leading to subsequent increase in revenue to the farmers from Ksh. 3.7 million to Ksh. 169.2 million.

**Collective marketing:** The group formation resulted in the formation of the Siaya Vegetables Production Co-operative Society (SIVEPCO) which co-ordinates the bulking and collective marketing of produce and in the process guarantees sustainability of the project. The co-operative also helps in building the farmer capacity, promoting agribusiness through its collection centres, market linkages and linkage to other services, value addition, and sorting and grading of farmer produce.

**Adoption of best practices:** The farmers have adopted good practices and have included indigenous vegetables in their farming systems. County leaders as well as other sister projects like the World Bank-supported West Kenya Community Driven Development and the SIDA-supported Agriculture Sector Development Support project, regularly seek technical input from TATRO and the co-operative management on group development among other skills. The co-operative, together with KALRO and ASARECA, have identified and contracted lead farmers within the co-operative to undertake seed multiplication and bulking. The partnership has also ensured efficient generation, transfer, adoption and application of new technologies for improved productivity and incomes from indigenous vegetables.

**More markets:** As a result of this intervention, farmers have established links with sustainable local and regional markets. These include supermarkets and identified hotels in Kisumu. This has helped promote the concept of contract farming among smallholder farmer households in Siaya County. Farmers also raise additional revenue through the sale of clean seeds to other farmers in the locality and beyond.
Challenges
Very little effort has been put in place by policy makers as well as private sector seed producers to mainstream indigenous vegetables seed production.

The community at large believes that since the project is “theirs”, they have the right to change some procedures at their convenience. This may derail project outcomes.

There are many stakeholders working in the same locality doing similar activities but synergy is lacking.

Recruiting the farmers into the co-operative was a challenge due to bad past experience with co-operative movement. This delayed take off as farmers adopted a wait-and-see attitude.

Lessons
The demonstrations and collaboration with research institutions encouraged farmer to farmer learning. This facilitated the replication of innovations and technologies in the villages because farmers copied the practice in their neighbour’s farm due to peer influence.

The Contracted Extension Services Model gave the farmers control and a sense of ownership of the project. This greatly facilitated project acceptance and adoption of its technologies.

Farmer management of the grant also created a sense of ownership since it made the service provider directly answerable to the farmer organization. This fits well with the government’s policy of agricultural reform and of public, private partnership (PPP).

The co-operative, as an institution, provides great hope for sustainability and growth of the project even after the exit of KAPP.

Recommendations
**Lack of certified seeds:** The national and the county governments should create an enabling environment for the development of African indigenous vegetables certified seed production system.

**In marketing,** there is need to establish, in local markets, aggregation centres with cold storage since the indigenous vegetables are equally very perishable as the other types of vegetables.

There is need to further build the capacity of the co-operative on resource mobilization, as well as in engaging and lobbying the County Government for additional support for value chain development.
Improving the lives of smallholder goat keepers of Taita Taveta

Albert Mulwa, KAPP Taita Taveta

Majority of households in Taita Taveta rely mostly on livestock keeping, especially those who live on the rangelands. This is due to the poor rains received in many parts of the county. Goats for meat form the major species of livestock kept by these households. But these goat farmers have persistently been exploited by brokers who offer them very low prices. This is because the farmers sold to brokers as individuals and had very little knowledge of prices in the market. They ended up getting as low as Ksh. 1000 for a 20 kg goat, and they only sold their animals when they had a serious domestic problem requiring urgent cash. The farmers also kept very poor breeds of goats which took up to 5 years before reaching market weight. All these together with the fact that these animals were poorly managed meant that there was serious inbreeding and poor parasite and disease control practices. This led to poor growth rates as well as high mortality rates.
Collaborating for a better course

From 2010, through to 2015, the KAPP, in its second phase (also known as KAPAP) ventured into Taita Taveta to work with farmers. The idea was to increase production and to enhance farmer incomes from goat keeping. Through its County Service Units (CSU) in Taita Taveta County and implementing agencies, government ministries, Taita Agriculture and Livestock Enterprises (a local service provider) and the provincial administration, KAPP worked with the farmers to develop the goat meat value chain. The implementing agencies included the Ministry of Agriculture and Livestock, KENAFF, Ministry of Co-operative Development and the Taita Taveta County Government.

The CSU, together with the County Agricultural Sector Programme Steering Committee (CASPSC), identified and engaged the services of Taita Agriculture and Livestock Enterprises, which then helped in identifying and facilitating farmers and their groups. The CASPSC is made up of heads of implementing agencies at the county level.

Together with the divisional technical team (comprising of members of implementing agency at the divisional level), the service provider conducted a broad-based survey, which also entailed a community resource assessment (CRA) in all the 20 locations. It was on the basis of the CRA, that the service provider flagged the meat goat value chain as a viable enterprise.

Formation of common interest groups: The CSU then facilitated the farmers, the service provider and the divisional technical team to develop a business plan for each of the 20 locations. Farmers who got impressed with the Community Integrated Action Plan (CIAP) and the flagging got enlisted to become members of the common interest group (CIG). As a result, 20 CIGs were formed in the County. Each of these CIGs was composed of 4 sub-locational common interest working groups (CWGs). The interventions were being undertaken at the CWG level.

Farmer forums: The CIGs were then registered with the Department of Social Services. This enabled them to carry out their activities formally as farmer marketing groups. All the farmers in the 4,510 CIGs, 40 per cent of them women, were then sensitized on the benefits of marketing as a group.

Public, private partnership: The service provider established a public-private partnership (PPP) working relationship with grassroots partners, which included Department of Livestock and other private individuals. This partnership provided extension services to the farmers through their groups. This process benefited 230,000 farmers, 40 per cent of them women.

Linkages: The service provider linked four CIGs to World Vision and Land O Lakes, organisations that work in value chains and marketing in the county.
The benefits

As a result of this work, the County recorded improvement in goat meat production and increased earnings from goat husbandry by households. This is well illustrated in the figure below.

Figure 15. Incomes from the meat goat enterprise 2011-2015

Before the interventions, farmers sold 2 goats per year on average (according to the Broad baseline report, KAPP 2010). This went up to 6 goats per year.

- **Formation of co-operative society**: The organisation of the farmers into groups for purposes of group marketing led to the formation of Taita Taveta Meat Goat Farmers Co-operative Society. The society has helped in sourcing for markets and extension services. This has resulted in better prices and improved production of meat goats. The county government has also supported the farmers by giving them 50 breeding bucks.

- As a result of the linkages the farmers, through 4 of their groups, received 450 improved goat breeds from the World Vision. They also got capacity building support from Land O Lakes.

- **Improved production practices**: Also, as a result of capacity building and extension services which came courtesy of their groups, the farmers now practice buck-exchange, to avoid in-breeding. The improved breeds are taking a shorter time, up to 2 years, to reach market weight.
Douglas Mwabeta and other farmers from Kasighau location, Taita Taveta County, came together to form a farmer common interest group (CIG). This was after the meat goat opportunity had been flagged by the service provider, Taita Agriculture and Livestock Enterprises. Mwabeta and his group were trained on how to produce and add value to meat goat as a business. Their skills were built on value addition and how to market the goat meat to increase their income. Upon acquiring these skills, Mwabeta decided to increase his flock from 40 to 110 goats. His effort soon bore fruits when he started selling 50 animals per year at Ksh. 3,500 per goat, on average, as compared to the 6 he used to sell before the KAPP interventions.

“As a result, we have noted improved flock. The mortality rate of the newly-born kids has drastically reduced. I can report improved growth rate of my goats as a result of these interventions. The farmers have also been able to sell the goats at very good prices,” he says.

As a result of the increase in his flock, Mwabeta has engaged a herdsman to take care of his goats. He has also purchased a motorcycle to assist him in moving around as he manages his affairs. From the earnings of the goat sales, he pays school fees for his first born son who is in secondary school, besides providing for the household budget. Meat goat keepers in his CIG have started buck exchange initiative where they would exchange the males among themselves after one and half to two years to avoid in-breeding.
What we can learn?

Buck exchange among farmers has proved to be a good initiative since it enables farmers to minimize in-breeding.

The Common Interest Groups at the locational level and the Common Working groups at the zonal level provide a good opportunity for the service provider to reach the farmers very conveniently without the farmers having to cover long distances in order to meet with the service provider.

Training on group dynamics helps build cohesion among farmers.

Recommendations

Due to challenges of managing a county-based co-operative, it would be more appropriate to form co-operatives at the sub-county level.
Milk cementing marriages in West Pokot

Jane Njeri Ngugi & Florence Odweso, KAPP.

The introduction of formal milk marketing structures led to the exclusion of women in West Pokot. This was despite them playing all the roles in milk production. Initially, the Murunyi Dairy Co-operative in Lelan ward, Pokot South sub-county of West Pokot, registered only men as its members. This left women with limited access to the proceeds from milk as payment was received by the men. In order to benefit from their hard labour, the women resorted to hawking part of the milk. This led to the volumes of milk collected by the co-operative dropping. The price offered by the milk buyer also dipped. This presented a major challenge to the co-operative and its efforts to sustain the market. There was therefore need to minimize milk hawking and to attract women to market all the milk they produced through the co-operative. A gender perspective was required in the design of such an intervention. Already, a key lesson from phase one of the Kenya Agricultural Productivity Program had emphasized the need to strengthen women’s capacities to accumulate resources, retain incomes, and have a voice in decision-making bodies.

Using the gender equity model

For 5 years, from 2011, KAPP, through its County Service Unit in West Pokot and other actors, piloted a gender equity model at the Murunyi Dairy Co-operative Society. Key among the actors were the dairy co-operative managers, local leaders, KENFAP county officer, dairy value chain service provider consortium and the Murunyi Dairy Co-operative Society.

The co-operative had registered only males, as household heads, as its members. The project adopted a KAPP gender equity model in this work. This involved sensitizing the male co-operative members to register their wives alongside themselves as members.

The man and his wife/wives were given separate membership numbers to enable each receive earnings separately from the milk delivered. The beneficiaries’ households agreed that women were to benefit from the evening milk and men from the morning milk. Initially, a few men resisted. However, they later gave in upon realizing that they would be lone rangers while queuing alongside women for their fortnightly milk payment. This was because gender concerns were also integrated in the design of the payment schedule. Women received payment every two weeks and men at the end of the month. This enabled women to meet their social obligations of purchasing food and other household basic needs, as the men take charge of bigger financial needs. The milk transporters, majority of them women and youth were also paid directly by the co-operative at the end of each month at a rate of Ksh. 2 per litre of milk delivered. Both men and women members also benefit from the cash and in-kind credit facilities offered by the co-operative depending on one’s capacity to repay.
The benefits

Data collected by KAPP secretariat in collaboration with the West Pokot CSU show increased women and men membership in the co-operative as a result of the application of the model. There was also increased volume of milk collected by the dairy co-operative, and increased milk earnings for women and men. The co-operative sells milk to Brookside dairy at Ksh. 38 per litre of which Ksh. 33 goes to the farmers and the rest meets the administrative and maintenance costs.

Women membership at the co-operative increased from 250 in 2012 to 529 in February 2015, while that of men increased from 350 to 749 within the same period. A similar trend was also exhibited in regard to the milk collected and the earnings received by both men and women. The volumes of milk delivered by women increased from 400,500 litres in 2012 to 986,909 litres in 2014, while that by men increased from 517,875 litres to 556,908 litres within the same period.

There was also marked reduction in hawking of milk and introduction of a savings and credit facility by the co-operative at Murunyi Shopping centre through which the farmers can access their payment. The model contributed to the financial empowerment of the women farmers whose mean monthly earnings from the evening milk was reported to be Ksh. 4,131 as compared to Ksh. 5,976 for men from the morning milk.

![Figure 16. Milk delivered by men and women](image)
The data collected showed that the model has impacted positively on the beneficiaries in various ways both as individuals, households and community. This is in regard to good household gender relations and improved social capital.

**Improved gender relationships within households.** This included improved consultations and relations among husbands and wives. The spouses could even lend each other money. The local administrators reported reduced workload in solving household conflicts.

### Challenges

- Some husbands initially resisted the model arguing that men owned the cattle and that once the women become empowered they would stop respecting their husbands.
- Women from polygamous households expressed fears that the earnings paid to their husbands would not benefit all the wives equally despite all of them having contributed towards producing the morning milk.
- Women faced challenges in accessing credit from co-operative society due to the set procedures which at times required the husbands to guarantee the credit.
- The low milk production still remains a key challenge to the Murunyi Dairy Co-operative society.

### Recommendations

- There is need for further sensitization on the model and its importance on the value chain development with particular emphasis on equal sharing among the men and women of the total milk produced within their households.
- KAPP in collaboration with other development partners in the agricultural sector should support efforts aimed at up-scaling and out-scaling the gender equity model among all dairy farmers as well as in other value chains.
- There is need to broaden the activities of the dairy co-operative to include milk processing of products that result in higher gains.

### Institutionalising the model

The piloting of the gender equity model not only resulted to addressing the milk hawking challenge but also contributed to the strengthening of women’s capacities to accumulate resources, retain incomes, and have a voice in decision-making bodies.
The pastoralist lifestyle of the Pokot community had slowed down the uptake of the agribusiness concept disseminated through KAPP’s service delivery system. Majority of the households persists in their traditional systems characterized by large herds of local breeds and grazing in paddocks with little or no supplementary feeding.

**Conclusions**

The achievements and impact of this model qualifies its inclusion among other feasible gender equity models with minimal modifications. The model has the potential to foster gender equity within smallholder households both in Kenya and beyond. The achievements of the model also confirm the statement by Maitrayee M. that gender inequalities between men and women are social constructs that are specific to societies, and can and do change (KIT, Agri-Profocus and IIRR. 2012).

![Figure 17. Earnings from milk for men and women](image)

**References**

Tapping from a cultural heritage:
The story of bees and the liquid gold of the Ogieks

Purity Kaburu, KAPP Nakuru

The Ogiek, an indigenous community living largely in the Mau Forest complex within Nakuru County of Kenya, have been traditional bee-keepers. They use traditional methods and for a long time have relied on the wild to keep their bees and to sustain their livelihoods. But times have changed. The Mau Forest, which has been Ogiek’s traditional habitat, has been invaded by other communities. The invasion has depleted the forests resources including the habitat for bees. This has greatly destabilised the livelihoods of the Ogiek. More so, a recent move by the government to evict all communities living in the forest has resulted in the loss of traditional habitat and source of livelihood for the Ogiek. Because the Ogiek were traditional honey hunters and gatherers, they did not have an organised market system for the honey. Therefore, even if they earned anything from the honey, it was very little.

Who was involved in this work?

KAPP and its Nakuru County Service Unit worked with Agritek Solutions Africa (a local service provider contracted by KAPP to facilitate the process), the Ogiek community, Baraka Agricultural College and the Network for Eco-farming in Africa (NECOFA), to help tackle some of these problems faced by the Ogiek people. The project was implemented for five years from 2010 to 2015.
<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAPP Secretariat/County service Unit</td>
<td>Funding, capacity building, coordination, supervision and facilitation.</td>
</tr>
<tr>
<td>Agritek Solutions Africa</td>
<td>Service provider.</td>
</tr>
<tr>
<td>Implementing agencies</td>
<td>Technical support to the service provision firm in capacity building of communities.</td>
</tr>
<tr>
<td>Ogiek honey farmers</td>
<td>The participating community.</td>
</tr>
<tr>
<td>Baraka Agricultural College</td>
<td>Agricultural capacity building: Supporting farmers in honey production, processing, other honey products, production of improved hives.</td>
</tr>
<tr>
<td>Network for Eco-farming in Africa (NECOFA)</td>
<td>Provided hives to the communities in kind</td>
</tr>
<tr>
<td>Kenya Forest Services</td>
<td>Contributed some hives to the communities and offered space to site the hives in the forest.</td>
</tr>
</tbody>
</table>

**Interventions**

KAPP identified the Ogiek as a community whose livelihoods had been destabilised and therefore needed some support through a partnership. Together with Agritek Solutions, KAPP mobilised the community members to form common working groups (CWGs). In total, 16 CWGs were formed in 8 locations, in the first KAPP grant. Of this, 9 were Ogiek groups in Mariashoni (4 groups), Nessuit (4 groups), and Sururu (1 group). During the second grant, the project out-scaled into more Ogiek locations as well as to other ecologically viable bee-keeping zones in Naivasha and Gilgil sub-counties.

**Trainings and demonstrations:** In order to build the capacity of the community members to increase production and improve quality of honey, KAPP together with the service provider conducted 8 training sessions in each CWG. The trainings focussed on Apiary siting and management, honey harvesting, beeswax and propolis, value addition, marketing and market linkages, and environment and gender issues. Other issues emphasized on in the second grant included Apiculture as a business, business planning, honey processing, honeybee botany and forage establishment, environmental conservation, marketing strategies, product diversification of bee products and co-operative management.

**Strengthening of farmer structures:** Through locational, divisional and county fora, farmers from different areas in the county came together and shared their challenges and knowledge on how they were dealing with their issues. The farmers also used the fora to review the progress of the honey value chain. A grant management committee was then set up at the county level to manage and administer the payment benchmarks for the service provider.

**Exhibitions and learning tours:** The CSU facilitated 18 farmers who attended five exhibitions, including the Agricultural Society of Kenya (ASK) Agricultural shows in Nakuru and Nairobi. This was meant to expose farmers to new markets as well as opportunities for learning and sharing of experiences and technologies. Also, 40 farmers visited the Baraka Agricultural College,
Molo (about 60 kilometres south west of Nakuru town), where they were trained on apiary management. The college also produces improved Kenya Top Bar and Langstroth hives. They also have a processing unit which they use to train farmers on the production of quality honey and honey products. The farmers also learnt about improving production and marketing. Also, farmers in one location were linked with those in another location and other players in the value chain to learn best practices.

**Linking farmers to markets:** The farmers opened a business outlet in Mariashoni, in Elburgon Division of Molo. The outlet serves as a honey collection centre as well as an outlet for local and regional markets, including Nairobi.

**Harvesting the honey**

**Increased earnings:** The groups’ total earnings from honey sales went up to Ksh. 124,760,480 from Ksh. 13,524,222 by the close of the project.

**Increased Production:** The farmers recorded improved production, up from 55,065 litres to 238,922 litres of honey. This was attributed to improved management of apiaries and increased adoption of improved hives. Currently the farmers have adopted 5,328 Langstroth and Kenya Top Bar hives (KTBH).

**Increased buy-in by the community:** At the end of the first KAPP grant, 275 (188 males, 87 females) farmers from the Ogiek community were involved in the project activities. However, the number has grown steadily to 358 farmers (206 males, 152 females) with more women joining the groups.

**Increased involvement of women:** Traditionally, beekeeping was a preserve of men among the Ogiek. However, as a result of the interventions, more Ogiek women (from 87 to 152) joined the enterprise.

**Formation of co-operatives:** As a result of strengthening the farmer structures including the CIGs, 4 co-operative societies have been formed and registered to serve the farmers. The co-operatives also help in marketing honey from farmers. These include Malando Co-operative in Mariashoni serving the Ogiek communities in Nessuit and Mariashoni; Makilanjo Co-operative Society- serving the farmers in Mau-Narok division; Nanga Bee-keeping Society- serving farmers in Maiella location in Naivasha and; Hifadhi Bee keeping Co-operative- serving community in Ndabibi in Naivasha sub-county.

**Award of 2.3 Million grant to Malando Co-operative**- After successfully developing a viable business plan, the Ogiek farmers working through the Malando Co-operative were awarded a grant by KAPP to improve honey refining. This enhanced marketability of the honey.
**Product branding:** As a result of training on marketing, farmers, through their groups, are currently selling their certified honey products in branded containers bearing their bar codes and labels. This was after the products passed the Kenya Bureau of Standards (KEBS) certification process.

**Analysis**

The choice of honey as a product for the Ogiek relied on an already existing cultural practice by the community. Absorption of the idea and technologies was easy since this aimed at supporting an already existing but greatly destabilised livelihood system.

Basic market requirements such as KEBS certification and bar coding can hinder progression of value chains. Support and capacity building towards fulfilling these requirements may help communities unlock fortunes in their enterprises.

**Recommendations**

There is need for continued support to the Ogieks to develop the honey enterprise while also intervening in other spheres of their socio-economic lives. Support to indigenous peoples is important in improving their livelihoods. More interventions are needed to engage the communities and slowly bring them to the level of other communities.

There is need for the government to continue supporting the formation and nurturing of the co-operatives in order to make them viable businesses that drive the value chain. There is need for the government and other institutions to support more research on honey production. New information is required to spur productivity in this enterprise.

**Kimosop’s dalliance with bees**

Kimosop is an Ogiek living in Mariashoni area of Elburgon, Nakuru County. He had 15 traditional hives and harvested 7 kgs of honey from each hive. He has also lived for a long time as a crop and livestock farmer. He didn’t get much money from his hives because of low productivity, low quality honey and poor marketing strategies. After joining a common working group formed through the support of KAPP, he was trained on improved hives which in turn would improve productivity as well as quality of his honey. He soon felt empowered after the trainings and decided to invest in 40 modern hives. This greatly improved Kimosop’s income from honey. He currently harvests 800 kgs of crude honey per season. This translates to Ksh. 400,000 per harvesting. The honey enterprise supports his family expenses and he is able to save some of the money. Besides the honey, Kimosop continues to grow his crops. He also keeps livestock. Even as he works hard to expand his bee-keeping enterprise, he has taken keen interest in the environment so that he can improve the habitat for his bees. The price of honey has improved from a mere Ksh. 150 to Ksh. 500 per kg.
Unleashing the potential of indigenous chicken in Nakuru

Purity Kaburu, KAPP Nakuru

Since 2005, KAPP had been promoting indigenous poultry enterprise in Nakuru County in two locations within Subukia Division. The project was done in two phases. In the second phase of the project, the local poultry enterprise was out-scaled to 12 divisions across the County.

Most farmers in this County, majority of them women, kept local poultry for subsistence. But they faced many challenges including low productivity and incomes from the enterprise. Most of the breeds kept by the farmers took long to mature (7-9 months) with most birds recording weights of less than 800gms. Egg production was equally low with an egg cycle of 48 eggs. Other factors that contributed to this included poor breeds, in-breeding, poor feeding, poor poultry management skills, lack of farmer structures, and lack of organized marketing structure.

Who was involved?

Different stakeholders or institutions were involved in the development of the project at different stages and also played different roles.
<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAPP</td>
<td>Funding, co-ordination, supervision.</td>
</tr>
<tr>
<td>Implementing agencies (Departments of Agriculture, Livestock, Co-operatives)</td>
<td>Technical support</td>
</tr>
<tr>
<td>KALRO Naivasha</td>
<td>Provision of improved breeding materials and technical support.</td>
</tr>
<tr>
<td>Self Help Africa (SHA)</td>
<td>NGO supporting farmers in improved breeding and registration of Co-operatives.</td>
</tr>
<tr>
<td>KENAFF</td>
<td>Farmer mobilization, capacity building.</td>
</tr>
</tbody>
</table>

**Working with farmers**

Community needs were identified and prioritized through a community resource assessment (CRA), which was conducted by KAPP in collaboration with the farmers. A service provider, Laser-Envi Consultants, was identified and engaged to work with the farmers with the aim of improving productivity and incomes of the farmers through the poultry enterprise. The project used a number of activities to achieve this goal.

**Farmer mobilisation:** KAPP used the service provider to mobilize farmers. This exercise created awareness on the project activities as well as farmer buy-in. As a result, 1200 farmers registered into 75 farmer common working groups (CWGs) across the County. The CWGs came together at the location level to form the common interest groups (CIGs). The project encouraged farmer leadership structures right from the grassroots to the county level. KENAFF supported the strengthening of these groups through capacity building efforts, starting with CIGs through to the divisional, and up to the county level.

**Farmer forums:** These forums were held from the location to the county levels and served to bring farmers together into discussing issues of the chains at the different levels. The forums also focused on encouraging individual farmers into joining co-operatives, increasing shareholding and strengthening the co-operatives.

**Trainings and demonstrations:** These capacity building efforts targeted different groups of farmers. Basic interventions were at the CWG level while other trainings focused on value chain leaders at the county level. The poultry trainings focused on several aspects: Markets and marketing management, product standardization, co-operative development and management, breeding and brooding, disease control, hatchery management, housing, feeding, and chick management. Study tours also served to expose farmers to markets as well as production issues.
Business plan development: As the value chain evolved, there was need to strengthen farmer institutions into stronger legal entities to serve the farmers. The business plan would ensure that the development of the value chain followed a logical and structured path of growth for the subsequent 5 years.

Counting the benefits

Women engagement: More women (1860) than men (1100) participated in the project. This confirms the fact that women tend to be more involved in local poultry activities than men due to low investment required to start it.

Increased earning: Before the project, farmers earned a total of Ksh. 3,566,870. At the end of the first KAPP grant, farmers increased their earnings to Ksh. 152 Million. This was as a result of improved poultry management and organized farmer marketing groups.

To handle some challenges like the high cost of commercial feeds, some groups were able to formulate feeds for themselves and for sale to the rest of the community members. Other farmer groups have opened small agrovet shops that offer products for poultry management.

Increased productivity: Farmers were able to get improved birds from KALRO to upgrade their own local breeds. KALRO offered birds that mature between 4-5 months. With the adoption of these breeds, farmers were able to build their flock sizes from 10 to between 50 and 150. Through partnership with Osho chemicals, most farmers got the capacity to vaccinate their birds, and manage other diseases affecting their poultry. This led to reduced chick mortality, and increase in flock sizes.

Improved market access: The more organized groups meant farmers could now plan their marketing activities. The farmers could sell their produce in hotels and markets. The county group embarked on certification and standardization, bar-coding and branding of their products. As a result, the farmers secured markets such as Naivas supermarkets and Supa dukas retail outlet that sells meat regionally.
Conclusion
While demand-driven extension gives farmers an opportunity to demand from extension what they need, personal contact with the extension personnel is very important for growth in the enterprises. Apart from offering the personal touch to farmers, the KAPP extension model helped the groups envision their development paths which slowly have translated into increased benefits to individual farmers.

Indigenous poultry is Anjimbi’s gem

Benson Anjimbi’s life has changed for the better. This was after he started engaging in indigenous poultry farming. Having lived the better part of his life in Lanet Umoja, of Dundori Division within Nakuru County, he was quite used to the traditional way of keeping indigenous poultry. He could keep just a handful of them, using a makeshift structure to house them. At times he could share his hut with the birds. But this soon changed after KAPP ventured into the area to work with the local poultry farmers. In 2011, Anjimbi joined a common interest group in Lanet, upon which he received training on indigenous poultry keeping and production then decided to go into the business. He started with one bird. Then he bought 4. He soon increased the flock by buying 5 improved birds from KALRO Naivasha. Through the 4 years of keeping the birds, Anjimbi has built his flock size to 800 birds.

Being in an organized group, he joined other farmers in learning new skills and in marketing their poultry as a group. This gave him more money. From the money he earns from poultry farming, he has educated his four children in private schools and university. More so, besides buying a piece of land within Ndundori location, he has also built his family rural home using these proceeds. The birds also provide manure that enriches his farm, and so he saves on fertilizer costs.
Promoting local poultry value chain in Kakamega

Indigenous chicken is central to life in Kakamega County. It plays a significant role in food security and supplements household incomes in 90 per cent of rural households in the County. However, farmers here raise these birds largely under the free scavenging system. This brings many challenges. The number of indigenous chicken kept by households was too low, at only 5 birds on average; the birds were poorly housed; there was inadequate diet supplementation and poor disease and parasites control and; the farmers used inappropriate breeding system. The farmers were poorly organised and lacked the capacity to develop indigenous chicken as a vibrant agribusiness. They also had poor linkages with other value chain actors. It is for this reason that for four years, beginning 2011, the Kenya Agricultural Productivity Programme (KAPP) implemented a project in this area to address these challenges. To do this, KAPP worked with a team of partners.

The partners

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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<tbody>
<tr>
<td>County Government of Kakamega</td>
<td>Co-financing and development of infrastructure.</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Technical backstopping.</td>
</tr>
<tr>
<td>Department of Co-operative</td>
<td>Formation and capacity building of co-operatives.</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, coordination, supervision, monitoring and evaluation.</td>
</tr>
<tr>
<td>KENAFF</td>
<td>Farmer mobilisation.</td>
</tr>
<tr>
<td>KALRO</td>
<td>Collaborative research.</td>
</tr>
<tr>
<td>Western Water and Sanitation Forum (WEWASAFO)</td>
<td>Service Provider.</td>
</tr>
</tbody>
</table>
**Two grants, one project**

After identifying the existing opportunities in the indigenous chicken value chain, in 2012 KAPP facilitated indigenous chicken farmers to contract the services of the Western Water and Sanitation Forum (WEWASAFO). WEWASAFO’s mandate as a service provider was to work with the farmers to address the challenges. KAPP provided two grants in this project. During the first grant the service provider engaged the farmers spread across 19 locations in 10 divisions distributed in five sub-counties namely; Kakamega Central; Kakamega East, Kakamega South, Navakholo and Malava. It also developed an action plan outlining activities to be implemented over a 12-month period under the supervision of KAPP County Service Unit (CSU) and key stakeholders including the departments of line ministries at the county level and KENAFF. In the second grant in 2014, efforts were geared towards deepening gains made during the first grant and furthering the value chain activities. The following interventions were used:

**Group formation:** A total of 16 grassroots service providers were hired by the main service provider to work as a consortium. They worked with KENAFF in mobilizing and organizing farmers in various sub-locations within the County into common working groups (CWGs). At the location level, farmers were organised into common interest groups (CIGs). Leadership structures were put in place through democratic elections of officials from the CWG; CIG, divisional and county levels. The group formation led to the registration of a co-operative society.

**Capacity building:** The main approaches used to enhance farmers’ skills were trainings and field days. Through these, farmers were trained on standard poultry housing; supplementary feeding using commercially compounded feeds or home-made rations; diseases and parasites control strategies; general aspects of poultry management (record keeping, culling of unproductive birds, synchronized hatching and brooding, egg handling and storage, testing for egg fertility etc.) and; poultry breeding. The farmers were trained also on leadership skills, group dynamics, agribusiness, group marketing, and cross-cutting issues such as gender, governance and advocacy, HIV/AIDS and environmental management.

**Formation of marketing groups:** The farmers were organised into product marketing groups which supported them in bulking birds for predetermined supplies. Data on sale of birds across different value chain levels was collected and aggregated by farmer leaders who presented the reports to the CSU. This information was captured in the project management information system (MIS), where it played a key role in fast-tracking the implementation progress of the KAPP project.

**Linkages:** The farmers were linked to service providers including banks, research institutions (in this case KALRO), nutrition health researchers, hotels, guest houses and a slaughter house; Shirere Slaughter House.
Results

Increased access to credit: As a result of working as a group through the CWGs and the co-operative, Asset Based Community Development Programme (ABCP) gave out loans totalling Ksh. 600,000 to farmers in four groups. The Kenya Commercial Bank gave out loans totalling to Ksh. 500,000 to two farmer groups. Equity Bank disbursed Ksh. 800,000 to 20 farmers in Murhanda.

Adoption of technology: As a result of farmer capacity building, 1,720 farmers in the groups constructed improved houses for the chicken. Transportation of birds was enhanced by improvised cages that were mounted on pick-up trucks. All the 3,499 farmers have adopted the vaccination technology as a disease control measure. They also practice feed mixing at farm level using locally available raw materials.
Benefits from linkages: TechnoServe, an NGO, linked farmers to KALRO Naivasha and assisted them procure 20,992 improved breeds. Afya Plus (an NGO) project supported 600 households with a start-up flock of 10 hens and one cockerel.

The indigenous chicken farmers secured a supply tender of 200 chickens weekly at the Golf Hotel, Kakamega. This earned them Ksh. 3,000,000 during the first KAPP grant.

Improved production and income: Farmers managed to raise a breeding flock of hens yielding 250 fertile eggs on a daily basis. Also, farmers were contracted to supply 14,000 birds aged 3 months at a selling price of Ksh. 350 per bird. This earned them Ksh. 4,900,000. These birds were sold to Kisii, Homa bay, Siaya, Vihiga, Butere, Kwisero, Kisumu, Bungoma and areas covered by the project within Kakamega County.

Analysis

• Mobilizing farmers into groups enhanced their visibility, whereby the groups are now linked to several other actors with fairly good results.
• Linkage to financial institutions jointly with the group approach largely helped in changing farmers’ attitude, as most viewed business loans as very risky. Trainings from the institutions and development of farmer friendly products where groups act as guarantors has encouraged farmers to increase the borrowing rate.
• Although farmers have been linked to Shirere slaughter house, which has a capacity to dress 1000 birds per day, the facility does not operate on a daily basis. This is because backyard slaughter is widely practiced in the County.

Lessons Learnt

• Group approach at every value chain level is an important tool for commercializing the sector.
• Linkages with other value chain actors served as an important exposure to the farmers and this needs to be sustained.

Recommendations

• The on-farm feed formulation and mixing technology need to be up-scaled.
• Farmers should be encouraged to grow grains, cereals and other crops such as sorghum, maize, sunflower, cassava, millet and sesame to serve as raw materials for feed mixing.
• The appropriate public health Act on food safety needs to be enforced to ensure hygienic slaughter of chicken in the county.
From destitute to grand poultry farmer: The story of Mary Muhatia

Did you know there are real opportunities in the local poultry sector? Asks Mary Muhatia, a widow who hails from Murhanda location, Kakamega East sub-County. The darkest hour in the life of this mother of four came when she lost her husband in 2010. She had to take care of her family, single-handedly. She took up odd jobs including working as a house help and selling illicit brews. At times she could do casual labour at nearby farms, just to provide for her household. In 2011, a new opportunity was flagged by KAPP and that marked a turning point in her life. The KAPP project promoted indigenous chicken. Mary joined a group of farmers who had expressed interest in taking up the indigenous chicken venture as a business. She had 12 local chickens but was rearing them traditionally. She joined the Itenyi local poultry keeping group in Kakamega County and attended the KAPP training sessions on poultry housing, pest and disease control, poultry feeding and nutrition and, implemented all that she learnt.

She benefited from the linkages made to the local Kenya Commercial Bank (KCB) among other stakeholders. The bank trained her group members on credit management, after which she borrowed Kshs. 50,000. She used the money to procure improved indigenous chicken from the KALRO Naivasha. She also improved her poultry house, purchased feeders, drinkers and feeds.

Six months later she was in business. Her first crop of birds was ready. This happened at a time when the service provider firm had just linked her group with the Kakamega Golf Hotel. The hotel required 200 birds every week, part of which she could supply. The firm later introduced her to the concept of relay stocking and she again procured a loan of Ksh. 100,000, which she used to improve her chicken house. She partitioned it into 6 units which she stocked at monthly intervals for sustained production of volumes demanded by the local market.

This approach has converted the enterprise into a full time occupation for Mary. She currently maintains a stock of 10,000 birds. She sells between 100 and 150 birds per week to the Golf Hotel at Ksh. 600 per bird. She also sells eggs. This gives her gross earnings of between Ksh. 60,000 and Ksh. 90,000 per week.

Besides acquiring a piece of land, she also bought a dairy cow that gives her milk which she also sells at the local market. From her earnings, she has moved into dairy, piggery and goat rearing as a business. But she still retains indigenous birds.
Making markets work for citrus farmers in Kwale

Samuel Maiko, KAPP Kwale

Farmers of citrus fruits in Kwale County used to experience a decline in citrus production. This was due to high disease prevalence, high incidences of fruit flies which led to premature dropping off of citrus fruits, poor agronomic practices including use of non-certified seedlings by the farmers, low prices, poor market structures and lack of market. As a result of these problems, the farmers could not venture into agribusiness enterprise. Some of them even neglected the crop.

A survey done by KAPP and the Ministry of Agriculture, Livestock and Fisheries in 2010 singled out citrus as the best agribusiness enterprise for the County. This would only be so after the problems have been addressed. The climate and soils of parts of Matuga, Msambweni and Lungalunga sub counties were found to be favourable to citrus fruit production. A well managed citrus tree, according to a report by KALRO Matuga, could produce up to 1200 mature fruits.

Bringing the partners together

After recruiting Misamu Agrovet consortium as the service provider to build the capacity of farmers, KAPP convened a planning meeting where the targeted farmers, service providers, the implementing agencies, local leaders and NGOs discussed and agreed on areas of intervention. Most of the farmers were willing to come together and work with all stakeholders involved in the citrus value chain development. This project ran from 2010 to 2015.
Partners in the project

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>Beneficiaries/production of citrus fruits</td>
</tr>
<tr>
<td>KALRO – Matuga</td>
<td>Providing clean planting material</td>
</tr>
<tr>
<td>KAPP, Ministry of Agriculture, Service provider</td>
<td>Capacity building and extension services</td>
</tr>
<tr>
<td>MESPT, Farmers, Service Provider</td>
<td>Development of better marketing structures</td>
</tr>
<tr>
<td>Ministry of Co-operative and trade, KAPP, Service provider</td>
<td>Organizing farmers into co-operatives</td>
</tr>
<tr>
<td>KENAFF, KAPP and Service Provider</td>
<td>Advocacy, lobbying and negotiating for better prices</td>
</tr>
<tr>
<td>Misamu Agrovet</td>
<td>Service provider/ Market linkages</td>
</tr>
</tbody>
</table>

KAPP worked with the partners to mobilise farmers in the citrus value chain. Farmers at the location level were grouped into 4 zones, each zone comprising one common working group (CWG). Three farmer representatives in each of the four zones were elected to serve at the location level. Another 3 representatives were elected at the locational level to sit at the sub-county committee. Each sub-county also elected 3 officials to serve at the county committee. The county committee represented the farmers and signed a contract with the service provider after agreeing on what interventions were to be undertaken. Sales data from each farmer were submitted by consortium leaders to KAPP county service unit. This data determined whether the benchmark had been met before paying the service provider. KAPP gave this project grants in two phases totaling Ksh. 4,098,960.

Building the capacity of farmers: The service provider hired grassroots partners who were deployed to locations where citrus is grown. This team ensured that farmers’ challenges were addressed. After organizing farmers into the common working groups, they were sensitized on the importance of selling their produce in standardized bags. Most of the farmers had been selling their fruits packed in non-standardized bags, which led to loss in income.

Linking farmers to markets: The farmer common working groups were then linked to buyers from other regions including Mombasa, Nairobi, Nakuru, Thika, Eldoret and Kisii.

Tackling diseases and pests: For the control of pests and diseases, KAPP assisted the farmers, through their groups, in purchasing the right insecticides and fungicides. The farmers were also given technical advice on how they could control pests and diseases. The project gave fertilizer rations to the citrus farmers to boost soil fertility. In each location, centrally placed farmers were used to host demonstrations for best practices. The skills learnt from such demonstrations were then applied by each individual farmer.
Harvesting the fruits

**Better prices:** Before the intervention a 30 kg bag of citrus fruit sold at between Ksh. 80 and Ksh. 150. As a result of the project, the same bag goes for between Ksh. 300 and Ksh. 400. This means improved income to the farmers. The total income of 1,460 farmers (1020 males, 440 females) increased significantly from Ksh. 5,185,230 to Ksh. 18,144,600 in the third year. The return to investment index calculated for the citrus farmers was 2.27, an indication that for each shilling spent by farmers there was Ksh. 2.27 realized.

**Improved production:** As a result of the interventions, farmers’ yields per tree increased from 350 to 500 fruits per tree per year. Fruit production per year increased from 33,243 bags (30 kg bag) in 2012 to 55,625 bags in 2014 for 1,460 (1020 males, 440 females) farmers.

Mr. Isaac Ndivo, a member of one of the CWGs in Lukore location increased the number of his citrus trees from 100 to 400. In addition, he earned Ksh. 30,000 from the sale of citrus seedlings and Ksh. 65,500 from sale of citrus fruits in 2014. From the earnings, he purchased two oxen at Ksh. 36,000 and a water tank at Ksh. 16,000. He uses the oxen to plough his farm. This has enabled him to increase the acreage under citrus cultivation from 2 to 4 acres. He anticipates to earn over Ksh. 150,000 in the subsequent seasons.

**Formation of co-operative society:** Farmers in the common working groups came together, through the support of KAPP, and formed a Community Based Organization (CBO). The CBO has since converted into Kwale Citrus Farmers’ Co-operative Society Limited. Through the co-operative, farmers contribute shares and sell their fruit collectively, hence securing better prices. The co-operative has 1065 (238 women and 827 men) members. Also, the co-operative model attracted the interest of different stakeholders. For example, MSEPT assisted farmers in the construction of collection centers.

**Challenges**

1. The initial high investment in citrus fruit production hampered the uptake of the crop.
2. Poor infrastructure, especially the impassible roads during the rainy season was a challenge while delivering produce to the market.
3. There are strong cartels that don’t allow farmers’ produce to reach the markets.

**The impact**

The contracted service provider model created job opportunities for unemployed youth who have graduated from agricultural institutions. It also encouraged the public private participation (PPP).

Farmers’ empowerment transformed the communities’ way of thinking in respect to their development agenda. They now understand better that they hold a lot of power and can do
without the middlemen. They can also engage the services of an expert on their own without having to depend on handouts from government and NGOs.

**Recommendations**

- The co-operative society should be strengthened and given the necessary support by the county government.
- Farmers need to be encouraged to increase their share capital in the co-operative.
- Upcoming projects should assess the capacity of the co-operatives in terms of skills, knowledge and assets before undertaking any high value addition venture.

**Conclusion**

Citrus farming is an enterprise that can improve the economy of Kwale County through creation of employment opportunities. It can also raise the living standards of the communities.
Changing lives through local poultry in Kwale

Samuel Maiko, KAPP Kwale

Farmers in Kwale County have for a long time kept local poultry in small scale, just for domestic consumption. They instead concentrated on cattle, goats, and crop farming. But even the few existing stocks of local poultry were constantly threatened by high prevalence of diseases and predators. The marketing system was disorganized and quality of the breeds was low. In addition, these farmers did not have the capacity to commercialise local poultry.

Intervention

From 2008 to 2015, KAPP worked with the farmers in Kwale County to improve productivity and incomes from local poultry enterprise.

Mobilising farmers: Working through Proactive Solutions Consultancy- a contracted private service provider, KAPP mobilized farmers in locations who came together and formed 86 groups. The Ministry of Agriculture, Livestock and Fisheries, KENAFF, chiefs and religious leaders also participated in the mobilization. Each location was divided into four zones and each zone elected its leaders who acted as linkages between the Common Interest Group and development partners providing services.
Building the capacity of farmers: The service provider prepared an extension package which it distributed to the leadership of the CIGs who unpacked them for members. Demonstration sites were also identified where farmers learnt local poultry production skills. The farmers were also trained on diverse areas. To benchmark with their successful colleagues elsewhere, KAPP and the service provider took leaders of the farmer groups to 4 learning tours within Kwale County and one to Makueni County. A total of 240 farmers participated in these tours.

On marketing, the CIG members were sensitized on importance of collective marketing to increase their bargaining power. With this realization, farmers formed a community-based organization (CBO) that brought together 30 CIGs with 7264 (3,350 men, 3,914 women) members. The CBO was transformed into a co-operative society.

Linking farmers to markets: This project also linked farmers to markets such as Kongowea market in Mombasa, Kilifi, beach hotels in Ukunda, and the local markets within the County.

‘Counting the chicks as they hatched’

Reduced mortality rate: More birds survived after farmers vaccinated chicks. This reduced the mortality rate from over 45 per cent to below 10 per cent.

More birds: At the beginning of the project, the farmers had 26,785 birds. This number increased to 82,587 birds in 2014, with the average number of birds sold by each farmer increasing from 20 to 80. This was as a result of the interventions.

Better prices: The price of market weight chicken increased from Ksh.150 in 2008 to Ksh. 400 in 2014 per bird.

- The good returns inspired other farmers to enlist as members of the CIG. A total of 2,664 farmers have registered as members of this society with a share contribution of Ksh 656,300/=
- The success of the co-operative and potential role in local economic development attracted the interest and support of other development partners. For example:
  - The County Government purchased 3000 birds which it distributed to the groups.
  - KAPAP and Agriculture Sector Development Support Project (ASDSP) developed a memorandum of working together. As a result of this, ASDSP started capacity building of members and some of the groups which were not covered by KAPP have contributed to the shares.

Challenges

- Many projects that gave support to farmers in the county were giving handouts. To change the mindset of the community off the hadout culture took long.
- Farmers had no access to affordable credit to expand their poultry enterprise
- High level of illiteracy within the community hampered the implementation process at the start.
Impact

• Farmers were enthusiastic to join the groups after learning the benefits accrued from the project.
• Higher farmer yields and incomes realised encouraged more investment in this enterprise.
• The project created employment. More farmers have began poultry farming to improve their livelihood.

Recommendations

• There is a high potential of local poultry in Kwale. The transformation of common interest groups into Co-operative need to be nurtured and supported by the County Government.

Jangaa’s local poultry begets fortune

Beatrice Malombo Jangaa, a member of Zone C Makamini location, Kwale County, recently finished constructing a 13-room rental house. She is a happy woman enjoying the fruits of her poultry farming. Before, she used to sell just 2 birds per month on average at Ksh. 150 per bird. She never considered it a stable income business.

In 2011, she joined KAPP project with just 5 hens and 1 cock. After attending KAPP trainings, she decided to increase the number and expanded the housing capacity. Through the links provided by the co-operative society to markets in Kongowea in Mombasa, Kilifi, beach hotels in Ukunda and the local markets within the County, she managed to sell birds worth Ksh.100,000 in 2014. She found this enterprise very profitable. She constructed more housing capacity for the birds.

Besides the rental house, Jangaa has also opened and stocked two shops. Also, she has purchased 6 goats, and 2 bulls for ploughing her farm. She also ploughs neighbours’ farms at a fee. Currently, she has 49 mature birds, 15 goats and 2 bulls. She plans to increase the housing unit to accommodate 10,000 birds.
Turning ‘a boys’ hobby’
into a farmer’s fortune in Nyeri County

Wambeti Titus Mwangi, Greentree Ltd.

Poor breeds, inadequate capacity on modern management practices and lack of markets are among the key challenges facing rabbit farmers in Nyeri County. This was also confirmed by a survey done in the area in 2010 by KAPP. Yet rabbit farming is ideal for the bare and dry highland areas within the county such as Kieni. The Ministry of Livestock (currently merged into the Ministry of Agriculture, Livestock and Fisheries), had promoted rabbit farming as emerging livestock. But this resulted in over 50,000 mature rabbits with the farmers that lacked a market outlet. This state of affairs, together with the perceptions within the community that rabbit keeping is a boy’s hobby, frustrated the farmers’ efforts to increase production.
Working with Greentree Limited

In 2010, KAPP, while undertaking a five-year rabbit meat value chain project in the County, picked on Greentree Limited as a service provider to build the capacity of the rabbit farmers. Greentree Limited worked as a consortium, engaging the locally available technical services to deliver its mandate.

Greentree Limited developed an enterprise development plan to help link the rabbit farmers in the county with potential markets, and to offer extension services for increased production. The following interventions were then undertaken:

- **Enlisting interested farmers**: KAPP, through its CSU, facilitated a meeting of all farmers at the location level. At the meetings (usually referred to as *barazas*), Greentree Limited sensitised the farmers on the economic benefits of rabbit farming. As a result, four common working groups (CWGs) were formed in each of the 24 locations, totaling to 96 CWGs. But only 57 groups sustained their interest while the rest dropped out due to unmet expectations of cash hand-outs. Some of the groups became too small and were merged. In 2013 and 2014, Greentree Limited held further farmer sensitizations. This led to the formation of 21 new groups in Kieni East and Mukurweini sub-counties. In total, 78 groups took up the enterprise.

- **Farmer mapping**: The consortium visited all the groups to map out their actual locations and plan their meeting schedules. Training needs and challenges of the groups were also assessed during these visits. The farmer grant management structure was also established. The groups were then formalized through the registration with the Department of Culture and Social Services.

- **Market linkage**: As a result of the rabbit market surveys conducted in hotels within and outside Nyeri, market linkages were made with buyers and prices negotiated. For example, rabbits weighing 4 kg were bought at Ksh. 300 per kilogram. Those between 2.5-3.5 kg were bought between Ksh. 200-250. Eating of rabbit meat was also promoted in boarding schools within Nyeri County. A total of 30 live rabbits bought from the farmers were slaughtered in the schools with the help of the students. This was meant to help them appreciate and learn the slaughtering process. A nutritionist guided the recipe for cooking, and the rabbit meal was served to the students. A questionnaire was then distributed to all the students, teachers and board members who participated in the meat eating, to gauge the reception of rabbit meat.

- **Establishing rabbit collection centres**: To facilitate the purchase of the rabbits from the farmers by different buyers, collection centres were established near the CWGs’ locations. The buyers would come with their trucks, weigh the rabbits and pay on the spot the agreed price.

- **Business planning**: After getting trained by KAPP on business planning process, the service provider facilitated the farmer groups in developing 2 business plans each; one on establishing a rabbit breeding centre and the other on a slaughterhouse with its accompanying facilities including a cold chain.

- **Formation of co-operative**: Greentree Limited facilitated the CIGs to come together and form the Nyeri County Rabbit Farmers Co-operative Society. This was after each CIG had elected representatives who went to the district level where another committee was formed and which subsequently elected the County office bearers. The County office bearers then
registered the County co-operative. Through the CIGs, Greentree consortium sensitized the rabbit farmers to join the co-operative and buy shares.

- **Sourcing and procurement of breeding stock:** Having identified the breeding depression in rabbit farming as the biggest constraint, Greentree Limited embarked on a mission to identify possible sources of quality superior rabbit breeds to procure and use as breeding stock in the breeding centre.

### Results of the interventions

As the interventions took root in the groups, the following results were realized:

**Improved production:** Enlisting of the farmers brought together the farmers who had an interest in rabbit farming to learn and share experiences. This led to improved production and increased growth rate. A mean weight of 2.5 kg was attained within 5 months by majority of the farmers. Mortality rates also dropped significantly due to improved disease control and proper housing.

**Better income:** The farmers recorded a cumulative income of Ksh. 6.7 million during the first KAPP grant and Ksh. 13.3 million in the second grant. Consumption of rabbit meat also increased.

![Income trends](image.png)

*Figure 18. Trend in earnings from rabbit sales from 2011/12 - 2014/15*

**Markets established:** Market linkages were established with buyers in Nairobi and hotels in Nyeri town. However, niche markets identified with the UNHCR and Angolan supermarkets could not be met due to the high volumes required, lack of a slaughter house and a cold chain system. UNHCR had demanded a supply of 500 kgs per month, while the order for Angolan supermarkets was 20 metric tones of frozen rabbit meat.

Demonstrations on rabbit meat eating in Chinga Boys’ High School registered a 95 per cent preference of rabbit meat to beef, two times a week.
Formation of co-operative: Nyeri County Rabbit Farmers’ Co-operative Society was formed in 2013 with a current membership of 2,488 (1,113 men and 1,378 women).

Business planning: This resulted in the implementation of one of the 2 business plans using the Ksh. 5 million co-financing from KAPP to develop the breeding centre. The co-operative procured 100 superior breeds mainly New Zealand white, California white Chincilla and Flemish earlope from reputable institutions (University of Nairobi, ILRI, Egerton University, Baraka College of Agriculture in Nakuru County and Ngong National Rabbit Breeding Station).

Lessons learnt and recommendations

- The interventions in the rabbit value chain have made rabbit farming a viable and vibrant enterprise.
- Enrollment of youth, women and people with disability with co-operative clearly demonstrates that rabbit farming is an alternative source of livelihood. It is also environmental friendly.
- There is a huge demand for rabbit meat nationally and internationally as indicated by the unmet orders for the boarding schools, UNHCR and Angola.
- The approach has complemented the extension work of the department of livestock to promote rabbit farming to create wealth and improve food security to many households with limited land sizes.
- There is also a potential market for pelt and it would be prudent to invest in a tannery. This will open a new business line.

A modern rabbit house in a farmer’s farm in Kieni East Sub county
Siaya groundnuts lead the way

Phoebe Muchele, Joseph Agunda Aloo, KAPP Siaya

Most soils in Siaya County are unable to produce without the use of either organic, inorganic or, in most cases, both types of fertilizers. But these soils have been found to favour groundnut production, with some fertilizer of course. Farmers in Siaya have for many years recorded low production. For example, they produced only 3-90 kg bags per acre of shelled groundnuts, compared to 6-90 kg bags per acre, its potential- according to a baseline study by KAPP in 2010. Even though the County experiences bi-modal rainfall, which ranges between 800 mm to 2000 mm, the production was low because these farmers did not practice improved crop husbandry. They also lacked certified, high yielding and disease tolerant seed varieties. They instead recycled seeds from harvested grains. More so, the groundnut harvested was sold raw. The farmers did little transformation in terms of value addition to the crop. But even if they wanted to produce more, the average area under production per farmer was small. It ranged between one quarter to 2 acres. This was not ideal for agribusiness.

Awareness creation: KAPP, from 2010 to 2015, implemented a project in the county to address some of these problems. Through its County Service Unit (CSU) for Siaya, KAPP first created awareness among the implementing agencies at the county and sub-county levels on the way the Contracted Extension Service Delivery model worked in line with the National Agriculture Sector Extension Policy.
Identification of service provider: The next step was to engage an institution that would provide the service of building the capacity of farmers. KAPP, through its CSU, other implementing agencies, the County Agriculture Sector Projects Steering Committee (composed of ministry officials at the county level) and other stakeholders, engaged the services of EASTCOM. The other relevant stakeholder who participated in this process was KENAFF, the farmers’ voice. The service provider was expected to have the capacity to steer the community to adopt groundnut as an agribusiness.

Farmer mobilization: The CSU then started mobilizing farmers in 20 locations out of 54 in the County. The 20 locations were singled out after they ranked groundnut as a priority value chain during the community resource assessment. The 20 had also registered the highest number of farmers enlisting in the project. This led to the formation of a common interest group (CIG) of farmers in each of the 20 locations.

Each farmer group democratically elected its leaders from the grassroots to the location level. The CIGs, with the support of the service provider, developed enterprise development plans, in which they included a schedule of activities to be implemented. The CIGs eventually came together and transformed into the Siaya County Groundnut Value Chain Development, community based organization (CBO). The CBO got registered in December 2011. Initially, the CBO had 1376 (579 males, 797 females) members, recruited from the 20 locations. To realize their objectives KAPP supported the farmers, through the CIGs, to “purchase” extension services.

Capacity building: Through its CSU and the service provider, KAPP trained the farmers on crop management, value addition and processing and on cross-cutting concerns such as environment, group dynamics, gender and HIV/AIDS. Scope of training covered crop management, improved clean planting material multiplication and bulking. To increase the volume of seed, exemplary farmers were identified to engage in bulking seed which they then sold to their peers. Clean planting material was sourced from KALRO Kakamega and ICRISAT.

Value Addition: This value chain had a head start after KAPP purchased a peanut processing equipment for Rajenya CIG. This was to help the group produce other peanut products for sale.

Counting the gains

More groundnuts, improved earnings: As a result of the interventions, productivity has since increased to 330 tonnes, up from 42.1 tonnes. This reflected an increment from 0.25 acre per member to 1 acre in cultivation, and improvement in yields from 150 kgs to 450 kgs per acre. Farmer earnings went up to Ksh. 58.95 million from Ksh. 2.02 million.

More market outlets: Siaya nuts purchases raw nuts from its members and other farmers in and outside the county and processes it into delicious Queens Peanut butter. This butter has hit the market with a bang. Alongside peanut butter the society has developed a range of other
products which are also popular in the market. These include Roasted Nut Bite, Roasted Peanut flour, Raw Peanut flour, Raw Nuts and approved clean planting materials, all of which appeal to different market segments. The Queens Peanut Butter has found its way into a special market segment which gives it an edge over its competitors. The weekly supply of the 50 pieces of its 400g pack to a leading hotel in Kisumu is an indicator of the high quality standards maintained by the processing team.

Lessons learnt

The project addressed expressed community needs. This greatly facilitated fast adoption of its interventions.

The process largely worked due to enhanced linkages with consortiums, collaborators and partners. This helped in strengthening research-extension-farmer linkages and interactions.

Challenges

- Inadequate seed supply;
- Lack of viable equipment to facilitate post-harvest operations;
- The area of coverage by respective consortium was too vast for guaranteed efficiency.
- Low attendance in meetings due to inefficient packaging of service provision information.

Recommendations

The Siaya Nut Co-operative Society requires additional support to produce quality products. There is need for enhanced research and extension services on certified seed production and groundnut as an oil crop.

There is need to increase the number of consortia in a specific value chain so as to serve each catchment area effectively and efficiently while enhancing awareness creation among farmers on the importance of co-owning and accounting for grants. Projects should encourage the use of Returns to Investment index as an import tool to measure achievement or under performance.

There is need for increased oversight, backstopping and monitoring to ensure effective implementation by the service providers.
Taita-Taveta County is one among the 23 counties in Kenya classified as being in the Arid and Semi Arid Lands (ASAL). The county is endowed with adequate natural resources, some of which have already been exploited and are contributing to the county’s economy. But there are the un-exploited ones. These include the aloe plant. For centuries people in this county have been used to seeing the aloe plant in the wild. It has the advantage of promoting conservation and improving biodiversity. At times herbalists could harvest a leaf or two for use as human and animal medicine. Perhaps cultivating aloe in their farms could be one way of reducing chances of relying on aloe from the wild. This is the realization that farmers in Taita Taveta came to, especially after a community resource assessment (CRA) was conducted in the county by KAPP in 2010. Aloe is a rich resource with immense potential to transform lives, not only in Taita-Taveta County, but in the whole of Kenya and beyond. But, as a resource, it is yet to be properly explored and utilized to levels meaningful to the communities. Taita Taveta County provides ideal conditions for aloe value chain, since the crop is also not prone to wild animals like other food crops. Various initiatives on aloe promotion through cultivation exist. However, the challenge has been lack of awareness among farmers on its economic benefits, lack of skills and knowledge on value addition, and lack of market excess. Even the upcoming micro and small enterprises were characterized by informal supply chain systems and gross inefficiencies. From 2006 to 2015, KAPP undertook a project in this county to address these challenges. The aim was to make aloe value chain more competitive.
The partners

<table>
<thead>
<tr>
<th>Partners name</th>
<th>Role and responsibility</th>
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</thead>
<tbody>
<tr>
<td>KAPP/CSU</td>
<td>Coordination, funding and grant allocation</td>
</tr>
<tr>
<td>County Government</td>
<td>Financial support and policy support</td>
</tr>
<tr>
<td>Implementing agencies (Ministries of Agriculture, Livestock, Co-operatives, KENAFF)</td>
<td>Oversight role, recruitment of service provider, vetting of proposals.</td>
</tr>
<tr>
<td>Abizaid</td>
<td>Service provider</td>
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Propagating aloe plant

**Farmer mobilization:** KAPP mobilized various actors and engaged a service provider, Abizaid, with technical expertise to address the challenges of aloe production and marketing in Taita Taveta County. Abizaid, a private capacity building firm, was contracted to help mobilise and build the capacity of farmers. KAPP identified Marungu location in Voi sub-county as the target area for a pilot phase of the project.

The service provider flagged the opportunities in aloe plant upon which 55 farmers enlisted to take part in the project. This led to the formation of the first common interest group (CIG) in Marungu in 2006. Members of the CIG had expressed interest in aloe production, conservation, management of aloe plant, reducing animal conflict, and in conserving and sustaining environment. Subsequently, the CIG was divided into 4 working groups (CWGs). The project then supported the CIG to transform into a co-operative society. Up to 1200 farmers registered as shareholders of the MASAKA (Marungu, Sagalla and Kasighau) and MWAKIBU Aloe Farmers co-operative societies.

This is how the project worked: Farmers, through the CWGs, prepared enterprise development plans, which together with the service provider and Nguo Mlambo Development Trust, a local NGO, they implemented. They also managed the funds as an intermediary implementing organization.

**Awareness meetings** (barazas) were held in each of the 8 locations of the county. These were organized by the local administration (chiefs and assistant chiefs) and the CSU to sensitize the community on the economic value of aloe.

**Building the capacity of farmers:**
The service provider organized farmers into groups/clusters to install group cohesion through training on group dynamics, aspects of leadership, good governance and value addition skills. Farmers were trained on seed collection, farm cultivation and management, nursery establishment and seedlings transplanting, harvesting and post-harvesting handling, processing and value
addition. Farmers were trained on the production of beauty products like creams, lotions, soap, hair shampoo and cleaning detergents, product development and marketing.

Also, they were trained on aspects of gender as well as creating awareness on the benefits arising from farmers working as a group to access markets. The Kenya Wildlife Service provided the farmers with the right aloe species (seeds) while guiding them through policy regulations.

**Networking:** Aloe farmer groups were networked with each other and with other organizations. For example, Act!, an NGO funded by USAID partnered with MWAKIBU (Mwatate, Kishushe and Bura) Aloe Co-operative Society and provided them with a processing equipment. Jomo Kenyatta University of Agriculture and Technology (JKUAT) trained the groups on product development, while Kenya Bureau of Standard (KEBS) provided guidelines on product testing and certification. The Agriculture Sector Coordination Unit (ASCU) sponsored the Marungu Aloe common interest group for awareness campaigns, packaging containers, and product certification. University of Nairobi’s School of Design supported the product branding, while Kenya Coastal Development Project trained the CIG on aloe farming for bio-diversity conservation. Export Promotion Council was brought in to support the development of markets for aloe products. It then sponsored leaders of the County CIG to attend the 18th Addis Chamber International Trade, in Ethiopia, and the 17th Kigali International Trade fair in Rwanda.

A group member explains some of the benefits of Mwakibu beauty products at an office run by Mwakibu Co-operative Society.
**Results**

**New aloe products, new markets:** MASAKA Co-operative farmers have been able to sell aloe sap to a soap manufacturer in Mombasa registering an income of Ksh. 50,000. The two co-operatives have also reached an understanding to do business together. So far, they have jointly procured raw materials for making aloe juice. About 80 percent of the co-operative members acknowledge how the trainings and market linkages have helped them know the economic value of aloe. Having been equipped with aloe value addition skills, the CIG members are now capable of making a variety of beauty products from aloe which they not only use at home but also sell to earn income. The farmers, through their two co-operatives, have set up a processing unit and an outlet shop for the beauty products at Maungu town, along Nairobi-Mombasa road.

**Propagation of more aloe:** More farmers are engaged in growing aloe as a business. A total 1511 (618 males, 893 females) farmers have increased the population of aloe plants, from an initial 80,000 to the current 350,000 mature plants. A further 100,000 have been established in nurseries. Farmers are using the skills gained and have cultivated more aloe plants, from which they are realizing more harvest and making more value added products for increased income.

![Aloe vera products](image-url)
Analysis
This technology best suits the area since it promotes sustainable livelihood engagements in a community who lives in an environment where drought has become a permanent feature. This venture provided the youth and women with a means of production in which they also learnt new skills and technologies.

Recommendations/way forward
There is need to establish further distribution and retail outlets in targeted locations to expand markets.

There is need to establish model cottage processing units (cottage industry) for commercializing aloe products.

There is need to intensify local market size and presence for aloe and its products, and to enhance aloe value chain business.

School fees from the aloe sap
Mrs. Celestine Mghanga took up germinating and selling aloe secundiflora seedlings. She also sold aloe sap at the nearby Maungu town to the processors of beauty products. Her first born son dropped out of school because of lack of school fees. She had two other children following each other in primary school. This was before the project. However, from the proceeds of her aloe business, she managed to take back her first born son to school. She also managed to get two of her other children to secondary school. Another beneficiary of the aloe project, Mama Florence Mwasigwa, took her grandson to college to pursue a course in IT. But the benefits are not only restricted to education and household budgets. According to the local elder, Mzee Watee, domestic disagreements have reduced considerably in the area. “They (families) are too preoccupied with aloe business to find time to argue about family issues,” Mzee Watee says. Most families have also opted to growing aloe which they find easier than burning charcoal. “This helps a great deal in conserving the environment,” he adds.
Capitalising on the golden grains of Butere-Mumias

Felix Mwala Shiundu, TEACONS Ltd.

Groundnuts and soybeans are a priority grains value chain with highest potential to increase the incomes and impact livelihoods of smallholder farmers in Butere-Mumias, within Kakamega County of western Kenya. This is according to a survey done by KAPP in 2011 in this region. This region, with a population of 601,796 (Kenya Population Census, 2009) has 71 per cent of land which is arable and groundnut and soybean farming is a potential economic activity in 6 out of the 10 divisions.

But only 1,200 farm households (52 per cent men and 48 per cent women) cultivated groundnut and soybean, according to a KAPP baseline study. This number was very low compared to 107,444 farm households in the region. The farmers considered grains as second season crops which could not compete with maize as the main enterprise. A small size of land, averagely a quarter an acre, was allocated to this enterprise. For those who cultivated the two crops, they did not even use certified seeds when planting. This is because the seeds were out of reach. Inadequate crop husbandry techniques also affected the quality of crop and yields. The farmers also lacked post-harvest handling equipment and value addition techniques. This resulted to post-harvest losses amounting to 30 per cent of the total harvest. In most cases, the grains were sold raw and this fetched little money, an average of Ksh. 1,055 per farmer per season. Groundnut
and soybean was produced by farmers individually and the harvested grain was sold directly to traders in local markets. The prices in these markets fluctuated. Also, the unit of measure before sale was not standardized as traders used ‘gorogoro’ (a tin used to measure grains in western Kenya which is assumed to weigh 2 kilogrammes).

In response, KAPP, while working with a group of stakeholders including the farmers, implemented this project to address these bottlenecks. The aim was to improve productivity of these grains and farmer incomes.

**The stakeholders**

KAPP, through its County Service Unit in Butere-Mumias together with farmers and other stakeholders, began by contracting the services of Tech-Forum Agricultural and Economic Consultants (TAECONS) as a service provider. The role of TAECONS was to facilitate the project by building the capacity of the farmers. Together with the farmers, TAECONS developed an enterprise development plan which was implemented through a value chain approach. The Kenya National Farmers Federation assisted in preliminary mobilization and capacity building of the farmers, especially on group dynamics and management.

**Tackling the problems in groundnuts and soybeans production**

This project undertook the following interventions

**Mobilization and sensitization:** KAPP collaborated with KENAFF to mobilize farmers in 34 locations and arranged for meetings at which TAECONS flagged off the two grains as profitable enterprise. This attracted farmers who were interested to form a common interest group (CIG) in each location. Farmers were encouraged to consider planting grains during the first season and increasing the size of the land allocated to the two grains. Women and youth were encouraged to engage directly in production or in off-farm activities, for example marketing. A third gender rule applied when electing group leaders at all levels.

**Trainings and demonstrations:** The CIGs held meetings continuously in each location, during which KAPP and the service provider trained 3,744 farmers (1,773 men and 1,971 women). Demonstrations were also held to build farmer production capacity. The farmers were trained on group dynamics, principles of collective action, record keeping, seed variety selection and management, crop husbandry and pre-harvest handling, value addition, grain marketing and diseases, pest and weed control. Demonstrations were set up on seed selection and inoculation, planting procedure, spacing, fertilizer application, scouting for pests and diseases and spraying. The service provider also organized focus group discussions for farmers to address gender issues in the value chain.
Imparting value addition techniques and acquiring equipment: After training farmers on various value addition methods which included sorting and grading, packaging and roasting, TAECONS initiated the process of making high value products which included peanut butter, roasted peanut, soybean beverage, soybean flour and soybean nuts. Through KAPP funding, the farmers procured a range of equipment for value addition in soybean and groundnut. These included an electric peanut butter processing machine, electric groundnut sheller, thresher, electric peanut roaster, electric decorticator, soybean mill machine, soybean milk extractor, a large capacity cooler, a motorbike and a motor van.

Linking farmers to input suppliers and markets: Certified seed and other input suppliers were identified and linked to farmers. These included KALRO Kakamega. Major markets were also identified and farmers facilitated to acquire supply contracts. These included supermarkets in Kakamega and Mumias towns and grain stores at Luanda market.

Formation of groundnut and soybean farmer co-operative: Farmers who came together to form the CIGs transformed their groups into sub-branches of a bigger co-operative for Butere-Mumias. Through these sub-branches farmers registered with the co-operative by each paying Ksh. 100 as membership fee and Ksh. 1,200 as share contribution.

Reporting the gains

Improved marketing: As a result of farmer mobilization, 5,145 farmers showed interest in groundnut and soybean production as an enterprise. A fully operational Butere-Mumias Groundnut/Soya Co-operative Society was formed and formally registered. A total of 3,073 farmers (56.7 per cent of them women and 14 per cent youth) registered with the co-operative by the end of December 2014, and farmers use the co-operative to market their produce as a group. The co-operative set up collection centers in 3 locations where farmers deliver 18 tonnes of harvested soybean and groundnut. The collected grains are then taken for processing at the cottage plant at Eshirombe in Khwisero sub-County. This has created several job opportunities including production team leaders, marketers, collection center assistants, drivers and casual labourers. The co-operative sells 1,500 kg of processed products from the grains every month, earning a profit of Ksh. 105,000. This initiative attracted partnerships from public entities. A result, a small cottage industry was constructed at Eshirombe, through funds from the Constituency Development Fund (CDF).

Increased production: Average acreage under groundnut and soybean per farmer increased from 0.25 of an acre to 0.5 of an acre. The two crops are competing for space with other major crops in the region. This led to increased yields, from 67,467 kg in the year 2011 to 276,512 kg in 2015. This translated to an income of Ksh. 3,241,806 in 2011 and Ksh. 18,537,700 in 2015 for the farmers.
The impact

The project activities contributed in improving the livelihoods of the farmers and other beneficiaries. An increase of Ksh. 8,264,014 in farmer earnings reflected in improved standards of living with some households reporting easier acquisition of basic needs like food and clothing. One beneficiary, Joseph Tito, from Eshirombe location reported an average earning of Ksh. 40,000 every year. He acquired a dairy cow to supplement his farming business.

“I love this enterprise very much. Earning 54,000 shillings from the sale of 21 bags of unshelled groundnuts harvested in my one acre farm in just four months in 2014 is unbelievable,” says Mr. Tito who is a progressive farmer and a member of Eshirombe location CIG. “Before the KAPP project, I used to harvest 3 bags of groundnuts from an intercrop of maize for subsistence purposes. I keenly followed the trainings and demonstrations and I have realized tremendous results. In 2013, I got 36,000 shillings from selling groundnuts which I used to buy one dairy animal. My plan is to double my production in 2015 by increasing the land size to two acres. I am a member of Butere-Mumias Ground/Soya Co-operative Society and I am assured of the market. I want to buy a motorbike so that I can a start a ‘bodaboda’ (motorbike) transport business. I also want to open a small shop at Mundeku market for my wife,” he adds.

Lesson

Public Private Partnership is important in building synergy. This was evident in the involvement of the Constituency Development Fund in constructing the cottage industry. Such partnerships should be highly encouraged.

Recommendations

It would be better to separate soybeans and groundnuts and treat each as separate value chain because divergence points exist in terms of prices and levels of value addition.

Farmers should put in mechanisms to sustain the increased production of grains to avoid diminishing returns in the long run. They should seek support from the Ministry of Agriculture to this effect.

Farmers should work closely with other stakeholders to fast track standardization of the products from the grains, an aspect that is affecting marketing of the products.
Rallying Nyandarua dairy farmers for improved livelihoods

Stephen Ndung’u Gicheru, KAPP

The dairy farming is ranked top of the enterprises farmers in Mairo-inya, Kiriita, Leshau and Pondo wards of Nyandarua County in Central Kenya engage in. This area enjoys good amount of rain and good soils, given its location on the northern parts of the perennially wet Aberdare ranges. But nothing tells the story of these dairy farmers more than Umoja Dairy Co-operative Society.

The dairy farmers had for a long time faced challenges. These included low productivity due to poor management practices, poor breeding systems due to insufficient AI services, inadequate and inappropriate feeds, fodder conservation and lack of formal marketing structures. An earlier assessment by the National Agricultural and Livestock Extension Program (NALEP) confirmed the same problems existed. The farmers, through the support of phase one of KAPP project, decided to come together to form the Umoja Dairy Co-operative Society to mitigate the challenges. But low earnings from agricultural activities could not sustain the newly formed co-operative. A stable and a reliable source of income was all they desired to keep them afloat and to raise their standard of living. This desire coincided with the rolling out of phase two of a KAPP project, which was implemented from 2014 to 2015 in the county.
Intervening in the dairy sector

After identifying the needs of the community through a broad-based survey, KAPP engaged the services of JETSPAN Consultants, as a service provider, who worked with grassroots partners to address the identified gaps in the dairy value chain.

The partners in the project

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
</tr>
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<tbody>
<tr>
<td>KENAFF</td>
<td>Farmer mobilization, and market research.</td>
</tr>
<tr>
<td>Co-op Bank, Kenya Union of Savings and Credit Organisation (KUSCO)</td>
<td>Capacity building on financial management, record keeping.</td>
</tr>
<tr>
<td>Kenya Dairy Farmers Federation (KDFF)</td>
<td>Development of a software, advocacy, animal registration.</td>
</tr>
<tr>
<td>Co-operative Insurance Services CIS</td>
<td>Animal insurance.</td>
</tr>
<tr>
<td>Digital Feeds, County Focus</td>
<td>Animal nutrition, supply of feeds and raw materials.</td>
</tr>
<tr>
<td>Brookside, New KCC</td>
<td>Quality assurance, marketing strategies</td>
</tr>
<tr>
<td>Ministry of Co-operatives and Trade</td>
<td>Formation of co-operatives and capacity building.</td>
</tr>
<tr>
<td>Farmers</td>
<td>Beneficiaries.</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, capacity building.</td>
</tr>
</tbody>
</table>

KAPP used the Public Private Partnership approach to implement this project, which focused on the dairy value chain. Groups from the first phase of the KAPP project were also empowered to participate in the second phase. After the service provider flagged the opportunities, farmers followed suit by enlisting to form common interest groups (CIGs), at the location level, and common working groups (CWGs) at the sub-location level. This was to accommodate new entrants, since some groups had already been formed in the first phase.

Providing farmers with skills: The service provider built the capacity of the CWGs by training them on the gaps identified. The training focused on farmers’ rights within the institution and at individual level. In total, 172 (96 males, 76 females) farmers were trained and this prepared them to form a legal business entity to facilitate the marketing of their produce. KAPP, together with the service provider, Digital Feeds and County Focus trained the farmers on milk and fodder production technologies, including fodder establishment and bulking. In order to reduce spillage and waste of farmers’ valuable time, the farmers were also trained on the importance of milk grading at collection points and at farm gate. Milk processors, Brookside Dairies and New KCC, who buy raw milk guided farmers on how to ensure quality in milk products.
The Co-operative Bank of Kenya and the Kenya Union of Saving and Credit Co-operatives (KUSCO) trained the farmers and their groups on financial management. Record keeping at farm level would help the farmers keep track of their farming activities. A 5-year strategic plan was also put in place to guide the operations of Umoja Dairies Co-operative Society.

**Tackling the informal milk market:** Informal milk market was thriving and many farmers got entrapped by incentives the traders offered. For example, milk could be collected at the farm gate and payments made to the farmer fortnightly. This denied Umoja Dairies Co-operative Society monthly savings. To engage the informal trader and beat them at their own game, the co-operative had to do business differently. It embarked on value addition by making yoghurt, even though it had no modern equipment for the job. Instead, firewood or charcoal was used to bring milk to boil compromising the taste of the yoghurt. This was also labour intensive. As a result, only limited amount (100 litres per session) of yoghurt could be made.

**Milking the benefits**

**Increased bargaining power:** The initial increased milk collection from 111 kg to 1350 kg in the first year of this project inspired the CWGs to transform themselves into Umoja Dairies Co-operative Society. This increased their bargaining power. The membership of the co-operative has continued to grow, from the initial 650 (463 males, 187 females) of which 70 were youths to the current 930 members (581 males, 349 females) who collectively supplied 3000 kg of milk per day to the dairy co-operative.

**Mr. Cyrus Mwangi, a farmer at Umoja Dairies, started with 2 cows. He could only get 8 kg of milk per day from his two cows. After interventions on nutrition and housing, the same cows are producing 32 kg per day. He had this to say: “I attribute my success to practicing what I was taught. Earlier, I was reluctant to chop my maize crop to make silage for my cows. But after doing some calculations, I realized I could make more money from milk than grain maize. Dry season is no longer a challenge to me.”**

**Increased milk production and incomes:** Milk production went up from 7 kg per cow per day on average to 13 kg and above per day per cow. The dairy co-operative provided an assured market for the farmers’ milk. This, coupled with better prices, from Ksh. 22 per kg to Ksh. 34 per kg of raw milk, has boosted the morale of farmers. More farmers, including the youth out of school, are venturing into dairy business. In the year 2012/2013, the co-operative paid out to its 930 members a total of Ksh. 12,375,301 with a dividend of 7 per cent per share and a bonus of 30 cents per kilogramme of milk delivered. The payout increased in the year 2013/2014 to Ksh. 13.9 million although no other subsidiary payment was made.
**Stable co-operative:** Pooling together of their produce enhanced cohesiveness among the farmers. Increased earnings by the farmers reduced the disparities in the contributions to the co-operatives, a feature that had threatened its stability. Farmers can save and access credit from the co-operative. The availability of credit is evident in the mushrooming of small businesses owned by members, and number of transfers of their children to better schools.

**Value addition products:** The amount of yoghurt made increased from 100 kg per day to 500 kg per day. This was after the co-operative acquired a pasteurizer. The taste of the yoghurt, and the hygiene and safety of handlers have been enhanced. Because of increased production of yoghurt, the business attracted the support of KAPP, which gave the co-operative funds to purchase a three-wheeler vehicle, for yoghurt distribution. It also received a donation of a 300-litre cooler from the County government. Also, the registration with Kenya Stud Book resulted in improved market value of the herd held by the co-operative members. Up to 140 animals at different levels were registered in the Kenya Stud Book.

Two yoghurt flavours - vanilla and strawberry - are now sold in the local supermarkets and shops. The co-operative has opened two outlets, in Mairo-inya and in Nyahururu town, to sell their products. Yoghurt shelf life increased from 5 days 14 days.

**Challenges**

- The dairy experiences frequent power surges. This at times affects the coolers.
- Implementation of the 5 years strategic plan is yet to be operationalized fully due to limited funds. The Dairy poses a risk to the environment due to its location in a residential area.

**Lessons**

Farmers remain confident and loyal to their organizations if benefits accruing to them from the organization are clearly stipulated and distributed.

**Recommendations**

- To serve the community better, the co-operative should work closely with the Kenya Dairy Board to sensitize consumers on the importance of consuming hygienically produced milk products. This will not only ensure safety, but wider acceptance of the products. Procurement of own milk dispensers which are then placed strategically will enhance accessibility of pasteurized milk.
Transforming lives through
dairy enterprise in Taita Taveta

Albert Mulwa, KAPP Taita Taveta

Smallholder dairy farmers in the hilly masses of Taita Taveta county keep between one and two cross breed cows on average with an average milk yield of 5 kg per cow per day. A handful of these farmers, however, keep exotic breeds which on average yield about 15 kg of milk per cow per day.

But dairy industry in this county has over the years experienced a number of challenges, key among them low income from milk sales. Farmers who sell their milk through informal markets end up being exploited by middlemen. Poor access to inputs and credit facilities and poor access to AI services complicate the situation. Also, quality feeds is not adequate as farmers grapple with poor access to technical advisory services.

From 2010, KAPP implemented a project in the county in which it worked with the dairy farmers to improve productivity and incomes from dairy enterprise. The project ended in 2015. In the project, KAPP, through its County Service Unit (CSU) for Taita Taveta County and Maziwa Taita Trust (MTT)- which was engaged as a service provider to build farmer capacities, worked with partners to strengthen the dairy value chain and make it more competitive.
The partners

<table>
<thead>
<tr>
<th>Partner</th>
<th>Roles</th>
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</thead>
<tbody>
<tr>
<td>KAPP</td>
<td>Co-ordination, funding</td>
</tr>
<tr>
<td>Implementing agencies (Ministry of Agriculture, Livestock and Fisheries, KENAFF, Ministry of Co-operatives.)</td>
<td>Forming the County Agriculture Programme Steering Committee (CASPSC).</td>
</tr>
<tr>
<td>Maziwa Taita Trust (MTT)</td>
<td>Service provider</td>
</tr>
<tr>
<td>Kenya Commercial Bank</td>
<td>Capacity building on finance</td>
</tr>
<tr>
<td>Brookside Dairies Ltd.</td>
<td>Providing market for milk, capacity building</td>
</tr>
</tbody>
</table>

Interventions

Once MTT was contracted by KAPP as a service provider, it immediately bonded with animal production experts from the Department of Livestock Production and the private sector with which it formed a consortium. The consortium was mandated to help in mobilising and building the capacity of farmers and their groups in the county.

Flagging of opportunities: The service provider, together with the divisional technical team (composed of members from implementing agency at the divisional level), conducted a community resource assessment (CRA) in all the 9 locations where dairy farming was actively practiced. As a result, a community integrated action plan (CIP) was developed. The CIP was presented to farmers in barazas (public meetings) organised in collaboration with the locational chiefs and their assistants in all the 9 locations. Dairy enterprise opportunities were flagged during these barazas and interested farmers enlisted. The interested farmers came together and formed a common interest groups (CIGs) and 30 common working groups (CWGs).

Capacity building: The 9 CIGs were transformed into marketing groups. Through them the dairy farmers started bulking milk for transportation to the Brookside Dairies (BDL) Ltd cooling plant in Wumingu location. Farmers, through their CIGs, were trained on milk production including feeds and feeding, housing, selection and breeding, disease and parasite control, clean milk production and milk handling.

Linkages: The project also linked farmers and their groups with financial institutions, input suppliers and development organisations such as USAID and Kenya Agricultural Value Chain Enterprises (KAVES). A total of 1,206 farmers (643 males, 563 females) from the 3 sub-counties of Taita, Mwatate and Voi benefited from these linkages.

More milk, more money

Extra income: As a result of bulking of milk, farmers were able to get an extra Ksh. 2 for every litre of milk delivered as compared to other farmers who were delivering individually. This extra
amount made it possible for each of the CIG members to start saving Ksh. 1 in their group accounts. One of the groups, Mwafugha, has put up a feeds store that earns it Ksh.3000 per month in rent. Furthermore, its members are able to borrow from the group coffers, money which they pay back with interest.

**Increased milk volumes and earnings:** The daily milk volumes went up from 5 litres on average per cow per day to 12 litres per cow per day. The CIGs have increased their milk production from 500 kg to 5000 kg per day on average, with an increase in earnings from Ksh. 3.5 million to Ksh. 4.5 million per month.

**Enhanced access to services:** The Maziwa Taita Dairy Co-operative Society (MTDCS), through its share capital, has put in place an agro vet store from which farmers can buy inputs.

Shareholders are also able to borrow money at an interest rate of 15 per cent on reducing balance. Also, the co-operative provides AI services to its members. This has led to the reduction of AI cost, from Ksh. 3,500 to Ksh. 1600 per insemination. Farmers can also access the AI services in form of a loan.

**Analysis**

- Formation of the marketing groups and subsequent transformation into a co-operative society has given the dairy farmers a bargaining edge.
- The saving culture has enabled the farmers to develop the enterprise at both individual and group levels.
- Coming together to form a co-operative has opened up investment opportunities in the community such as farmers being able to access farm inputs and AI services on check-off arrangement.
- Shareholding of the co-operative has led to increased ownership leading to sustainability.

**Conclusions and recommendations**

- Strengthening of the dairy co-operative will significantly shape the future for the dairy enterprise in the Taita-Taveta County.
- The co-financing grant support by KAPAP will help boost the co-operative towards implementing the business plan leading to a more vibrant farmer organisation.
Banana is an important value chain in Kisii County for food security and income generation. The County has traditionally been referred to as the land of banana. The value chain is ranked as the second most important in the County after dairy (Kenya Institute of Policy Research and Analysis [KIPPRA], 2014). The main varieties are the cooking types which occupy about 80 per cent of the area. Average orchard sizes range from 0.125- 0.5 acres. On average, the commercial banana farmers own an orchard sizes with at least 100 stools and harvests over 300 bunches in a year.

But this production of banana is low compared to the existing potential for the value chain in the county.

The marketing of bananas is done on individual basis with over 85 per cent of the harvested bunches sold at farm-gate to brokers and middlemen at a price of Ksh.150-200 per bunch. A community resource assessment conducted by KAPP confirmed this. Another survey carried out in September 2011 revealed that a banana bunch at the market in Kisii town sold at between
Ksh.300-400, while at Wakulima market in Nairobi the same went for Ksh.500-600. The main constraint by the banana farmers is marketing. The low prices hinder them from reaping maximum benefits from the enterprise. Farmers also face other challenges in accessing clean planting material, knowledge on orchard management and post-harvest handling. Panama disease (fusarium wilt) is a major threat to production in the region of “apple” banana, whose population has reduced by 60 per cent across the County over a period of 10 years.

**Service delivery to improve banana marketing**

In this four-year project, KAPP enlisted the services of Elgik Consortium to provide capacity building services to the banana farmers. The consortium was to mobilize and recruit 4,000 farmers into 36 common interest groups (CIGs). This led to the mobilization of 4,315 (2,484 males and 1,831 females) farmers in the 36 locations. It also worked with KAPP, KENAFF, the Ministry of Co-operative and the Department of Social Services to form a banana marketing co-operative, besides setting up 9 banana collection sheds for bulk marketing. Farmers were given market information and information on appropriate technologies for improving yields. They were also guided on implementing the banana business plan, which they had developed with the assistance of the service provider and KAPP. All these were done only after setting up a county steering committee to oversee project implementation.

The Consortium collaborated with the Ministry of Agriculture for backstopping of interventions: KALRO for information on banana technologies; KENAFF for farmer empowerment and advocacy; Kenya Industrial Research Development Institute (KIRDI) for information on value addition technologies; Africa Harvest for infrastructure development and capacity building; Wakenya Pamoja Sacco for provision of credit; Kenya Achievers Sacco for credit provision and Equity Bank for capacity building and credit provision. The Department of Social Services registered the farmer groups.

**A bunch of results**

**Adoption of technologies:** Up to 60 per cent of the farmers adopted orchard management technologies, especially on manure application and pruning. Farmers also accessed clean planting materials. The sizes of orchards expanded by about 20 per cent on average, mainly established using tissue culture bananas of the Cavendish group effectively addressing the spread of fusarium wilt disease in the County.

**Increased yields:** The yields increased by 40 per cent. Farmers started obtaining bigger and quality bunches weighing between 13-35 kg as opposed to the small bunches weighing between 10-20 kg before the interventions. The bunches of bananas sold by CIG members increased drastically from 556,947 per year, before interventions, to 775,963 four years later.
More earnings: A total of 56 farmer common working groups, at the sub-location level, registered as banana production and marketing groups and embraced marketing as a group. This pushed banana prices from Ksh.150-250 per bunch on average to Ksh. 200-350 per bunch on average within a period of one year. This could be attributed to establishment of market linkages, marketing as a group and farmer empowerment. This increased average earnings for CIG members with orchard size of 50 stools to Ksh.30,917 from Ksh. 16,233 on average.

Considering the average annual earnings by CIG members and the cost of service delivery, a return to investment of 14.82 was obtained indicating that 1 shilling spent on service delivery led to a creation of Ksh.14.82 as income to farmers.

Increased market outlets: Six modern horticultural market centers have been established through the Smallholder Horticulture Marketing Programme (SHoMaP) which can effectively serve as market outlets for banana. The sites are in Kiamokama, Riombongi, Rioma, Riosiri, Mosocho and Kenyenya. A variety of supermarket chains operating within Kisii town also stock banana value added products such as banana crisps and flour.

Nyangechi Tirmba of Bassi chache Location participated in the farmer learning tour to Meru and was impressed with performance of Cavendish varieties of banana. He even came home with 4 suckers which he planted in his orchard. He later bought 200 tissue culture plantlets of the Cavendish varieties from KALRO, Kisii and expanded his orchard. He has a well managed orchard of 600 stools and earns an average of Ksh. 50,000 monthly from the orchard. He also bought 4 suckers of “Gerald Tucker”, a variety developed at KALRO Kisii, which resembles “apple” banana and is resistant to fusarium wilt. KALRO Kisii collects materials from his orchard regularly for propagation in tissue culture laboratories.

Lessons learnt

Participation in farmer tours exposes farmers to new technologies and ideas. For example, the groups in Kisii visited Embu, Muranga and Meru from where they increasingly established dessert varieties of the Cavendish group of bananas.

Conclusion and recommendation

• The use of private consortia firms in extension service delivery with the necessary structures for efficient monitoring and evaluation systems and adoption of group marketing resulted in increased yields and incomes to banana smallholder farmers
• The banana marketing groups in the County and the Co-operative should adopt the selling of bananas on weight basis. This will ensure that farmers are not exploited and incomes from banana stabilised.
• The County government should undertake to establish banana collection centres to act as marketing outlets for banana.
Mr. Charles Gondi Mbwa, the Homabay County Value Chain Chairman, working on his groundnut farm.

Farming for the magical nuts of Homa bay

Odengi Martin Otieno, KAPP Homabay

Groundnut production is one of the most popular enterprises in Homa bay County among small scale farmers. The soils are ideal for groundnut production. However, farmers who engage in this enterprise are faced with a myriad of challenges. These include lack of organized marketing system, poor agronomic practices, low use of fertilizers, low productivity and diseases. This is according to a community resources assessment (CRA) done in 42 locations within the county in 2010 by KAPP in collaboration with KENAFF and the state departments of Agriculture, Fisheries and Livestock.

From 2010 to 2015 KAPP, through its County Service Unit (CSU) for Homa bay, worked with 1051 (565 males, 486 females) farmers, County Agricultural Sector Programmes Steering Committee (CASPSC) and a private service provider to confront these challenges.

KAPP engaged RUSODEV as the service provider. This was after a vetting exercise to pick a firm that had the capacity to address the challenges. To kick off its work, RUSODEV, with the help of the local administration identified the 1051 farmers in 42 locations of Homa bay County. Using the chief barazas (meetings), the service provider sensitized the farmers on the benefits of working as a group. Two farmer sensitization barazas were held in each location. Out of the exercise, 77 common interest working groups (CWGs) were formed, four in each location. The groups elected their leaders, who helped RUSODEV and KAPP’s CSU in organizing training meetings for farmers and in reporting on the progress of each and every farmer.
Interventions

The Service provider helped the farmers to form a co-operative society which would focus on establishing collection centers for groundnuts at each sub-county level; setting up a processing plant and establishing a marketing infrastructure. Other interventions included improved agronomic husbandry such as use of certified seeds, fertilizers use and application and diseases and pests control, in order to achieve the desired results.

Partners in the work

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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</thead>
<tbody>
<tr>
<td>KENAFF</td>
<td>Mobilization of farmers, capacity building, lobbying and advocacy, monitoring and evaluation.</td>
</tr>
<tr>
<td>RUSODEV</td>
<td>Capacity building, market linkage, co-operative formation.</td>
</tr>
<tr>
<td>County Government of Homa bay</td>
<td>Policy guidelines and regulations, extension services.</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, monitoring and evaluation, coordination.</td>
</tr>
<tr>
<td>Equity bank</td>
<td>Credit facility, capacity building.</td>
</tr>
<tr>
<td>Farmers</td>
<td>Groundnut production, grant management.</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Implementing Agency</td>
</tr>
<tr>
<td>Ministry of Co-operatives and Industrialization</td>
<td>Implementing Agency</td>
</tr>
<tr>
<td>County Agricultural Sector Programmes Steering Committee</td>
<td>Implementing Agency</td>
</tr>
</tbody>
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Trainings: Each of the 77 groups was trained 10 times on co-operative formation and management, diseases control, good agronomic practices, marketing strategies, group dynamics, pests management and other cross-cutting issues such as gender and HIV/Aids and its effects on agricultural production. They were also trained in record-keeping and report writing.

Setting up grant management committee: The farmers formed a grant management committee, which helped farmers to manage their affairs. The committee ensured farmers get value for their money by being involved in the accounting process, e.g., compilation of reports at the common interest group level, and onward transmission to the CSU. To form the committee, three officials were elected right from each of the common interest groups to the County level. The county officials managed the grant on behalf of the farmers. They also signed the extension services delivery contract with BENAHIM. The officials worked as the signatories to the grant account and also aggregated the reports from the field before any fee is paid to the service provider.
The results

Co-operative: As a result of the group formation efforts, Homa bay Peanut Farmers Co-operative was formed. Farmers market their groundnuts and groundnut products through the co-operative with collection centers established at the level of each sub-county. Also, 8 small marketing groups, one from each sub-county, have been organized and have joined the co-operative society.

The co-operative has started a processing plant and has acquired the Kenya Bureau of Standards (KEBS) certification and bar codes. The collection centers have helped reduce the cost of delivering the produce to the processing plant, a donation from an NGO before this project. The produce is being sold locally and in the local supermarkets in Migori and Homa bay Counties.

Improved earnings: Group marketing has improved the prices per kilogramme of groundnuts, from Ksh. 200 per kg to Ksh. 700 per kg, especially after value addition of processing and packaging. The processed peanut, produced by Homa bay Peanut Farmers Co-operative, is being sold under the trade name ‘Kipingi’.

Farmers’ adoption of improved agronomical practices, learnt from the trainings, led to increased productivity of groundnuts, from 300 kg to 500 kg per acre.

Analysis

The group approach played a great role in the information and technology transfer. It kindled the spirit of competition among the farmers themselves and farmer groups. This led to faster adoption of the technologies passed to them during the training meetings. It also helped in tapping the enormous market and sustaining it through increased production and group marketing and networking.
Marketing groups played a great role in the formation of the co-operative society because of the gains farmers realized when they marketed as a group. This encouraged farmers who wanted to maintain their identity to participate.

This approach worked well since many groups were in existence at the village level and it was easier to use them as entry points.

**Conclusions and way forward**

The group approach model can be sustained by strengthening the co-operative society. The co-operative needs to engage the services of a field staff to carry on with the training and mobilization of the farmers. Members of the groups and the co-operative society need constant training to sustain the production.

The co-operative society needs to establish collection centers in every sub-county to motivate more farmers to produce more to sustain the production of the processed products in order to capture reliable and more sustainable markets.

**Mbwa’s dream is to farm large**

Charles Gondi Mbwa is a groundnut farmer from Homa bay County who is a proud owner of a motorbike which he bought using money from his groundnut farming. Mbwa had been planting groundnuts for years, harvesting only 200 kg per acre on average, which he could sell at 200 per kilogramme. But things have so far changed since KAPP started working with farmers in the area in 2010.

Mbwa is one of the farmers who got trained by KAPP and the service provider on groundnut production and marketing. He belongs to Homa bay Peanut Farmers Co-operative, which started a value addition and packaging centre for the groundnuts. The co-operative now produces and packages ‘Kipingi’ peanut. He had joined the farmers’ co-operative to access trainings and to get links to markets.

After incorporating the agronomic practices learnt during the trainings, Mbwa harvested 800 kg per acre of groundnuts. He prefers to take his produce for value addition and packaging. This is because he could sell the ‘Kipingi’ peanut at Ksh. 700.

From his earnings, he bought processing machines, which he uses to process produce from other farmers as well as his own. The motorbike helps him to supervise the processor machines since they are located in different locations. He has purchased four oxen and an oxen plough, which he uses to plough his land in time. He also uses part of the money to pay school fees for his children. These positive results have given Mbwa bigger plans: To lease land and venture into large groundnut farming.
Mango is Makueni’s cash cow

Esther Mueni Wambua, KAPP Makueni

Joseph Maweu, a mango farmer from Kanzokoea sub location in Kathonzweni, Makueni County, has greatly benefited from growing mangoes, his only source of income. Before 2011, he had 18 mango trees which were not doing well due to poor methods of farming. Like many other mango farmers in his area his mango fruits were of low quality. Furthermore, the mango farmers were not organized into producer and marketing groups. This led to exploitation by middle men. The farmers sold the mangoes fresh (unprocessed) which resulted to very low incomes earned. Their problems were compounded by the fact that the harvesting season comes once in a year in the period between December and March for all the farmers. This resulted in mangoes flooding the market during this time, while farmers had nothing to sell during off-season.

The KAPP project helped Maweu and his fellow mango farmers in Makueni to form a group and to consolidate his income from the crop. He joined the Kanzokea farmers common interest group (CIG) and the Makueni Mango Farmers’ Co-operative Society and benefited from a series of training on disease and pest control, orchard management and post-harvest management. He planted more mango trees on his idle land and improved the 18 trees that already existed in his farm. He also applied the technology he had acquired from the training on disease management. He increased his crop to 170 mango trees. He also established links with other value chain actors including exporters, pesticide dealers and mango processing firms. Through the Co-operative, he sold mangoes worth Ksh. 121,000 in a single season. He is among the 851 farmers who have bought shares worth Kshs. 1.49 million from Co-operative, which was registered in July 2014. He has also been able to pay school fees for his school going children with ease. His vision is to gradually increase his mango trees to 600 and reap more from the mango agribusiness.
Mango enterprise in the arid and semi-arid Makueni County is largely carried out by smallholder farmers like Maweu. KAPP has been working in the area since 2011. During this time, it worked with the smallholder mango farmers and other partners to improve productivity and incomes of the farmers from mango enterprise.

**The partners**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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<tbody>
<tr>
<td>County Government of Makueni</td>
<td>Co-financing and development of infrastructure.</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries, Makueni county</td>
<td>Technical backstopping.</td>
</tr>
<tr>
<td>Department of Co-operative</td>
<td>Formation and capacity development of the Co-operatives</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, coordination, monitoring and evaluation.</td>
</tr>
<tr>
<td>KENAFF</td>
<td>Farmer mobilization</td>
</tr>
<tr>
<td>KALRO</td>
<td>Collaborative research</td>
</tr>
<tr>
<td>Springnet Development Services</td>
<td>Service provider</td>
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</table>

**Working with the partners**

KAPP contracted Springnet Development Services, the service provider, through a competitive bidding process, to help in building the capacity of the smallholder mango farmers and to offer value chain services. The service provider did this work through a consortium which it formed with local technical experts.

Through the consortium, the service provider brought together stakeholders for a planning workshop in which a comprehensive plan detailing the interventions required to address the challenges were made. The stakeholders included farmer leaders, the service provider, the Kenya National Farmers Federation (KENAFF) and KAPP team.

**Community mobilization:** Community members in six sub-counties were mobilised to take up mango enterprise as a viable business in the county. Farmers responded by forming 26 farmer common interest groups (with 2306 members) and leadership structures to manage project grants on behalf of the rest of the group members. The groups came together to form Makueni Fruits Value Chain Development Group. Its members were trained on disease control and post-harvest handling. They were also linked to markets.

**Formation of co-operative society:** To enhance agribusiness skills, the project assisted the Makueni Fruits Value Chain Development Group to develop a five year business plan. The business plan promoted the concept of co-operatives and processing, and was publicized across
a 26 locations working with KAPP. Farmers were recruited and this culminated in the registration of Makueni Fruit Value Chain Investment Co-operative Society. The business plan was shared with the County Government since it emphasized partnership.

**Capacity building:** Trainings on leadership skills and group dynamics were conducted jointly with KENAFF. The farmers were trained on disease and pest control, orchard management and post-harvest management. The service provider linked farmers to other value chain actors including exporters and pesticide dealers. Farmers were taken to two learning tours to mango processing firms in Thika (Kevian) and Kitui (Kyuluni). Because KAPP also undertook collaborative research projects in other sites, technologies emanating from these research activities were also passed on to the service provider for sharing with farmers. The Makueni farmers participated in a research work by KALRO Thika on integrated crop and Pest management (ICPM). Through this, the group learned skills on control of Mango weevil and Fruit fly.

**A boost for the mango**

**Reduced incidences of pests and diseases:** As a result of the trainings and farmer empowerment, 1187 farmers (504 males, 683 females) reported reduced incidences of pests and diseases and post-harvest losses.
**Increased mango sales:** The farmers established links with mango exporters- Keitt, Aloha and Wagash. This linkage led to the sale of 11,229,424 mango pieces that earned farmers Ksh. 59,807,152. This was up from a baseline earning of Ksh11, 185,368 from the sale of 2,374,704 mango pieces.

**Co-operative society:** The existing 26 CIGs transformed into a single Co-operative Society, The Makueni Mango Farmers’ Co-operative Society, with a share contribution of Ksh. 1,492,700 by 851 members (487 males, 364 females). This helps members to save and access credit.

**Analysis**

Private Extension Service provision, as outlined in this case, was largely responsible for the gains. This approach is in line with the National Agricultural Sector Extension Policy (NASEP) that advocates for public private partnership.

**Lessons learnt**

Group approach at every value chain level is an important tool for commercializing the value chain.

Linkages with other value chain actors served an important role and need to be sustained.

With strong community institution like the established co-operative society, the farmers can influence development and make the government and other development agencies mobilize resources.

**Recommendations and conclusion**

- Linkages with other value chain actors need be strengthened and sustained, particularly post production actors.
- There is need to formulate a county mango value chain forum with clearly defined terms of reference to regularly bring together key stakeholders to address constraints and opportunities as they arise.
- There is need to review the business plan regularly to reflect the current situation.
It is more mangoes for Tana River farmers

Milton Sunguti Munialo, KAPP Tana River

Tana River is another semi-arid and arid land where mango thrives as the single major cash crop for the riverine farmers. Farmers here grow mainly the ngowe, apple, dodo and local varieties.

But the quality of mango fruits in the county has remained relatively poor. This is according to a baseline survey conducted by KAPP in 2010, and which was confirmed by the ministry of agriculture in an earlier study in 2008. Since farmers need income, they at times harvest immature mango fruits during the onset of the harvesting season, which occurs during late October to early January. The minor season occurs in June-July period which coincides with rainy seasons. The impassable roads and the frequent floods make it difficult for the farmers to deliver their produce to the market. This scenario is aggravated by poor harvesting skills, poor post-harvest handling and general lack of organized fruit marketing that ensures high standards are maintained at all times. The farmers have been selling individually and have not seen the need of coming together. As a result, fruit prices, particularly for ngowe variety which is most common, has remained stagnant at an average price of Ksh.2 for long.

Promoting collective marketing

No doubt promotion of collective marketing would help in improving post-harvest handling of fruits, improved prices and coordinated marketing. This project was therefore designed to address the above problems. In this project, KAPP worked with partners including the mango farmers.
The partners

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Extension technical advice</td>
</tr>
<tr>
<td>Tana River County Government</td>
<td>Regulation of mango marketing</td>
</tr>
<tr>
<td>Ministry of Co-operative</td>
<td>Sensitization and facilitation of co-operative movement</td>
</tr>
<tr>
<td>Mango farmers</td>
<td>Beneficiaries</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, capacity building</td>
</tr>
</tbody>
</table>

Intervening in the issues

Workshops were conducted at both the location and divisional level out of which a community integrated action plan (CIAP) was developed. KAPP mobilised the farmers to form the grant management committee at the county level. KAPP then worked with the farmers to identify and contract the services of Kipini Agro Technical Experts (KATE), a service provider.

Farmer mobilisation: Farmers who were mobilised formed common interest groups (CIGs), which came together to form the Tana River Mango Marketing Co-operative Society Limited. A total of 1578 mango farmers registered with the co-operative.

Promotion of mango marketing: The Co-operative established a management structure with a sub-committee of three members whose role was to carry out mango sales. Once a market is secured, the sub-committee would sign contracts with buyers on behalf of the farmers. The co-operative members deliver mature mangoes which are weighed, sorted, graded and records kept for payment in one weeks’ time. The co-operative also established mango collection centres, which aid in proper fruit handling and storage before transportation.

Market linkages: With the help of KAPP, the KATE consortium organised the CIGs, carried out demonstrations, trained them and, through the co-operative, linked them to markets. A total of 70 demonstrations and 90 trainings on good agronomic practices, were held, and this benefited 2348 farmers.

Results of the interventions

Business plan: The development of the five-year business plan facilitated the formation of the co-operative society.

Reduced fruit wastage and losses: The 7 permanent collection centres established and funded by Galole Constituency Development Fund, and the 87 designated collection centres across the
county were used to aggregate fresh mangoes for trading and transportation to markets. Initially, collection centres were non-existent. As a result, fruit wastage and losses have reduced from 50 per cent to 20 per cent.

**More markets, more income:** The co-operative society was linked and entered into contract with All Fruits EPZ Mombasa, a processing plant, to supply 2000 tonnes of quality fresh ngowe or Apple mangoes between December 2014 and February 2015 at a price of KSh. 13 per kilogramme. This was a great improvement from the initial price of Ksh. 2 per kilogramme.

**New policy:** The county government is discussing a legislation on immature mango harvesting, which was drafted through the support of KAPP.

**Analysis**
Organizing farmers into CIGs followed by registration of mango co-operative helped address the problem of immature fruit harvesting.

In addition, the construction of the 7 collection centres by the Constituency Development Fund showed great faith the stakeholder had in the idea of having collection points for the farmers.

Return to investment for this project is 1.67.

**Challenges**
Despite the co-operative having entered into a contractual agreement with ALL Fruit EPZ, it was unable to supply the volumes as agreed. This was due to low mango grower enrolment in the co-operative.

Some mango growers still have negative attitude towards the co-operative movement due to negative past experience.

Transport costs are high and many roads are impassable during harvesting seasons.

**Conclusion and recommendations**
- The co-operative should endeavour to register more members. This will strengthen its share capital.
• The co-operative should motivate its members by establishing a soft loan system to help needy members and then recover the advanced cash when the produce is delivered.
• The co-operative should strongly lobby the County government for improved road network.
• The co-operative should consider investing in mango value addition plants to create job opportunities within the county.

Lucy Jarha’s new lease of life

Together with other mango farmers from her village in Chewani location, Tana River County, Lucy Hamada Jarha has benefited from trainings offered by KAPP on mango farming. Before the KAPP project, mango as an enterprise was not doing well in the county. Its production was low, and the farmers had poor harvesting and poor post-harvest handling skills. There were no markets for the fruit. Jahra and her fellow mango farmers had to depend on other sources of income that were also not so stable.

She was among the farmers mobilised to form a common interest group. She later joined the Tana River Mango Marketing Co-operative Society Limited in 2014. Through the co-operative, Jahra learnt some agronomic practices, especially on proper harvesting and post-harvest handling, which she found very useful. As a member of the co-operative, all she had to do was to take her mango produce to one of the collection centres near her village. She left the rest to the co-operative. The co-operative marketed Jahra’s mangoes together with those from other farmers. This fetched a good price, at Ksh. 13 per kilogramme as opposed to the Ksh. 2 per kilogramme offered by the middlemen.

Through the co-operative, Jahra sold 2,500 pieces of mangoes at Ksh. 6 per piece. This gave her joy and motivation to continue with the farming.

With the money earned, she sent her children to a private school. Also, she bought two goats, besides purchasing shares from the co-operative. She plans to increase her mango trees.
Living off the bees in Tana River

Milton Sunguti Munialo, KAPP Tana River

In Tana River, beekeeping is mainly carried out by the riverine communities as an alternative livelihood. It supplements mango crop as an immediate source of income. The beekeepers lacked adequate skills on bee management. This is according to a survey by KAPP in 2010. They did not know how to handle hive products due to inadequate training and lack of extension service support. They mainly use log hives whose yields are variable and low, at 10 kg harvested per year. These beekeepers had more problems: Market network for hive products was underdeveloped and they lacked organized marketing strategies. In many instances, they used the traditional honey harvesting methods which lower honey quality as fire is used. As a result, the bees are burnt and the harvested honey is a mixture of smoke, ash, larvae and bee body parts. Such honey is downgraded and fetches low market price. The bee keepers sold their honey to brokers individually at an average price of Ksh. 100 to Ksh. 150 per kg of semi processed honey. The farmers could not add any value to the product apart from limited semi processing at individual level. This was not until KAPP implemented a project in the county, from 2010 to 2015, to improve productivity and income from beekeeping enterprise. KAPP worked in partnership with various institutions and bee keepers.
### Partners

<table>
<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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</thead>
<tbody>
<tr>
<td>Tana River Agribusiness Development Association (TRADE)</td>
<td>Service provider; capacity building</td>
</tr>
<tr>
<td>County Government of Tana River</td>
<td>Capacity building, funding</td>
</tr>
<tr>
<td>Ministry of Co-operative</td>
<td>Mobilisation and co-operative establishment</td>
</tr>
<tr>
<td>Ministry of Agriculture, Livestock and Fisheries</td>
<td>Technical guidance, backstopping</td>
</tr>
<tr>
<td>KAPP</td>
<td>Funding, capacity building</td>
</tr>
<tr>
<td>Beekeepers</td>
<td>Beneficiaries</td>
</tr>
</tbody>
</table>

The County Government provided Ksh. 2.3 million for beekeepers capacity building.

### Contracting the services

Working with the beekeepers, KAPP identified and contracted the services of TRADE. TRADE’s role was to identify the existing opportunities and to build the capacity of the beneficiaries to improve productivity and income of smallholder farmers. TRADE worked with the farmers and flagged beekeeping as an enterprise with great potential in the county.

In collaboration with KAPP and the local administration, the service provider helped mobilize beekeepers who formed themselves into common interest groups (CIGs). These were farmers who had expressed interest in beekeeping. The CIGs came together and elected representatives at the county level to manage, on behalf of the other beekeepers in the CIGs, the beekeeping value chain grant account. Environmental and social safeguards, including gender mainstreaming, were incorporated in all the activities undertaken in this project.

### How this work was done

**Mobilisation:** Once on board, TRADE assisted the CIGs in developing a beekeeping business plan worth Ksh. 45,113,810. The business plan prioritized the transformation of the CIG into a legal business entity. To achieve this, TRADE, KAPP and the implementing agencies mobilized the CIG members to form the Tana River Beekeepers Marketing Co-operative Society Limited in 2014. The co-operative draw its members from beekeepers within the county. As a result, 1,452 beekeepers registered as members of the co-operative.

**Capacity building:** Members of the co-operative were trained on its principles, challenges and its benefits. Also, 11 officials of the co-operative and 12 active members were sponsored by KAPP for a learning tour in Mwingi County. Up to 1,500 farmers benefited from trainings and demonstrations on value addition of honey and honey products, wax molding, packaging, honey storage and marketing.
Value addition: KAPP gave a Ksh.5million grant to the co-operative. This was used to purchase modern processing equipment and packaging materials. Also, queen excluder was introduced in the traditional log hives to mimic modern hives, which improved honey quality in the county. Three collection and processing centres were set up, one in each sub county.

Counting the gains

Improved marketing: The existence of the co-operative has enhanced prices through co-ordinated marketing. Three collection and processing centres have been established, and the Co-operative has acquired standardization certification and bar codes for its products. This has enhanced product quality and market portfolio.

Queen excluder technology has been adopted whereby with 420 beekeepers incorporating it in their hives. A total of 670 hives have queen excluder incorporated.

Increased production and high quality honey: The honey harvested from hives using queen excluder technology is clean and bees are not burnt as is the case with traditional hives. This has seen honey yield from log hives increase from 10 kg per hive to 15 kg per hive per year. The quantity of honey from log hives increased from 14,500 kg 21,750 kg. The total quantity of honey from all types of hives combined increased from 19,780 kg worth Ksh. 2,967,000 to 29,700 kg worth Ksh.10,395,000 per year.

Improved earnings: Honey is refined and processed in three collection centres. The packaged honey is sold in Hola, Bura, Garrisa and Mombasa. The price of honey has increased from Ksh.150 to Ksh.300 per kilogramme.

An exhibition of honey produced by the group
Analysis

Formation of a co-operative has provided a platform for lobbying with county government for financial support and other services. The co-operative is an assurance of a reliable market to honey farmers. Diversification is still low as the farmers have not initiated the production of wax and wax products and propolis.

Impact

This project recorded a return to investment of 0.26.

Challenges

Honey marketing is basically undertaken locally in Tana River county due to low volume of honey stocked by the co-operative.

There is low beekeepers enrolment in the co-operative resulting in low shares contributed. This is partly due to some beekeepers having negative attitude towards the co-operative movement.

There is low adoption of modern hives and equipments in the county. The high initial cost involved is prohibitive. Most beekeepers have traditional log hives and the integration of queen excluder is yet to cover all of them.

There is need for the co-operative to recruit more members to make it stronger and vibrant.

The co-operative should explore a wider market and establish a stable and reliable market linkage for the processed honey.

The co-operative needs to set up a technical wing to assist it in all its technical operations.

Using bees to buy pigs

Maurice Kadenge from Ngao location in Tana Delta Sub-County is one of the youths who has joined beekeeping enterprise. In 2014, he sold 100 kg of honey to the Tana River Beekeepers Marketing Co-operative Society Limited, earning him Ksh. 50,000.00. He bought four piglets using Ksh. 7000.00 from the income. He has increased the number of piglets to 12, opening a new chapter of business in his farming activities. He intends to be selling pork at Ksh. 400 per kilogramme. Using earnings from his beekeeping business, he has built a 16 iron sheet semi-permanent house. He bought the iron sheets at Ksh.9,800. He also paid Ksh. 23,000.00 school fees for his daughter who joined Ngao Girls Secondary School in 2015. He used the remaining Ksh. 10, 000.00 to meet his family needs. “This is a viable enterprise,” he says, while advising other youth to join beekeeping and the co-operative.
Some members of Machoge Borabu dairy CIG learning lessons on fodder conservation by making silage

Kenyenya dairy farmers add value for change

Gideon Mwagi, KAPP Kisii

Dairy value chain is an important undertaking in Kisii County. It is ranked first in terms of importance (Agricultural Sector Development Support Programme [ASDSP] – 2003). For the farmers living in this county, the value chain is important for food security, income generation and for improvement of livelihoods of smallholder farmers in the County (Kenya Institute of Policy Research and Analysis [KIPPRA], 2014). It can be turned into a lucrative commercial business due to high demand for milk.

A community resource assessment (CRA) carried out by KAPP and the Kenyenya Divisional Technical Team in 2011 in Kenyenya Division of Kisii County revealed that even though dairy is an economic mainstay in the Division, farmers face huge challenges in breeding, housing, feeding, disease control, production, fodder management and marketing. This led to production of 3 to 5 litres of milk per cow per day, far below the expected 8.5 litres. Over 70 per cent of the dairy cows were kept in make-shift structures lacking important technical specifications. The cows fed on inadequate fodder and this lowered productivity. These problems did not end there. Most dairy farmers in the division hawked the milk within the sub-county. This means some farmers sold the produce at a throw-away price after failing to get buyers.
Improving production, marketing through service delivery

**Farmer mobilisation:** In this project which was implemented from 2011 to 2015, Motion Agri-consulting firm was recruited as a service provider to help in addressing the gaps in dairy production and marketing. The firm, through a consortium of local expertise, mobilized farmers in Machoge Borabu and Machoge Masaba locations after flagging dairy cow investment as an opportunity. The flagging result indicated that a farmer could earn Ksh. 70,800 per cow per year by adopting recommended production practices and accessing good market outlets. This attracted 800 farmers who enlisted as members of the dairy common interest groups (CIGs) in the two locations.

**Training and linkages:** The farmers, through their CIGs, were trained on recommended dairy technologies, after which they were linked to market outlets. They were also linked to reliable AI service providers, and to Juhudi Kilimo for affordable credit to purchase breeding stock. They were also trained on how they could form a co-operative to undertake milk marketing.

**Results of the interventions**

**Increased milk production:** Two dairy CIGs with a total of 567 members were formed as a result of mobilization. Farmers who embraced the improved dairy management practices experienced increase in milk yields. Through credit from Juhudi Kilimo farmers purchased 415 dairy cows for breeding at a cost of Ksh. 15,366,873 from Uasin Gishu, Lessos, Molo and Kitale. These cows produced between 10-20 litres per cow per day. The old breed improved from 3-5 litres to 5-8 litres per day as a result of improved feeding and management.

**Improved marketing and value addition:** The CIGs came together and formed the Kenyenya Dairy Co-operative Society, with a membership of 500 farmers. The co-operative collected the milk, processed it and marketed it. It also sold inputs to members at subsidized prices. The co-operative purchased milk handling equipments worth Ksh. 600,000. At inception, the co-operative handled 300 litres of milk purchased from farmers at Ksh. 40 per litre and then sold to consumers at Ksh. 50 per litre. This means improved income to farmers. Currently, the co-operative also processes fermented milk and yoghurt which it sells through its outlet in Kenyenya town.

**Challenges**

- High cost of purchasing dairy cows. The farmers also experienced frequent power outages in Kenyenya town, leading to milk spoilage. There was also low adoption of fodder conservation technologies, hence challenges in feeding during dry spells. The co-operative has inadequate milk processing equipment. Also, the co-operative is experiencing high cost in milk collection since it relies on the services of private motorcycle operators.
Lessons learnt

• The provision of grants to farmers to access services from private service providers facilitates fast adoption of technologies.
• There is fast adoption of technologies when farmers are trained as groups because farmers have a higher opportunity to share experiences and to motivate each other.
• Flagging opportunities through the use of realistic situations motivates the farmers to join in and participate effectively.

Conclusion and recommendation

• Formation of dairy cow CIG and effective linkage of farmers to appropriate micro-credit institutions contributes to successful implementation of service delivery contracts
• The dairy co-operative should be closely monitored by the County Government to ensure sustainability and growth.

Reference

KIPRA, (2014) : Kisii County Household Baseline Survey. Un-Published
Improving livelihoods
through potato farming in Meru County

Muthee Mwoga, KAPP Meru

Potato ranks second after maize as the most important food crop in Kenya with a per capita consumption of around 25 kg annually. In Meru County, potato occupies a prime position as it contributes to food security, poverty eradication and economic development. Yet its production declined from 15 tons to below 5 tons per acre as at 2006 while area under the crop also decreased from 0.5 to 0.25 acres per household. This is because of escalating disease and pest incidences resulting from diseased seeds. The soils have also reacted negatively due to bracket application of fertilizers. Farmers in Meru Country planted own-saved seed from previous harvests or seed sourced from unreliable markets or neighbours. Such seed was of poor quality. This was due to the latent infections by *Ralstonia solanacearum* (the bacteria that causes wilt), viruses and other tuber-borne pathogens. Certified and disease-free seed account for less than 5 per cent of the whole potato seed market in Kenya. Also, the potato farmers in Meru did not make much money from the crop. The common practice was sale on harvest and packaging at the harvested field by the buying agents instead of the farmer. This widened the loopholes for manipulating the package to an average of 180 kg (extended bag) instead of the 110 kg farmer requirement or the current legal standards of 50 kg per bag.

Tackling the problems

In order to tackle these problems and to improve the productivity and income of the smallholder farmers, KAPP undertook a project in this County in 2012 to 2015. It used a number of interventions to do this work.
Mobilization: Kilimo Biashara Promoters Limited, as a service provider, was contracted to provide extension services to the farmers in the potato value chain. The contracted firm then packaged and flagged the potato value chain as a viable undertaking in the 12 locations where KAPP implemented the project. Posters were placed at strategic positions to interest farmers in the value chain. Through the help of the provincial administration, KAPP and Kilimo Biashara Promoters Limited held barazas (public meetings) to sensitise the farmers. Those farmers who were interested enlisted for the enterprise and formed groups.

Technology transfer: There were concerted efforts between extension and research to strengthen linkages. The Ministry of Agriculture through the Department of Agriculture, Kenya Potato Council, Farm Concern International and the service provider sourced technologies from KALRO. These technologies were disseminated to the group members through structured trainings and demonstration. Kisima Farm, a commercial seed producer, collaborated with KALRO and the Kenya Plant Health Inspectorate Services (KEPHIS) to improve accessibility of basic and certified seed. The service provider also linked farmers to National Agriculture Research Laboratories (NARL) and Mea Crop Nutrition Limited.

Lobbying and advocacy: At the inception of the project, KAPP facilitated the formation and registration of the Mount Kenya North Farm Produce Market Organization (PMO). This body was led and managed by producers. It collaborated with KENAFF to empower the potato common interest groups. It used the barazas to reach the farmers and lobbied local authorities for regulatory standards and policies for potatoes.

Formation of potato co-operative: The Kilimo Biashara Promoters jointly with the farmers developed a business plan with the objective of forming a co-operative society. The co-operative would take up the processing and marketing functions with a target of Ksh. 0.3 million as profit at the end of its first year of operation. The co-operative board members, sub-county co-operative officers and extension agents steered the co-operative registration process and share drive campaigns at all levels. A farmer was required to pay Ksh. 1000 to become a member and a minimum of 3 shares valued at Ksh. 1000 each. The co-operative worked with the PMO and individual seed producers to enhance seed supply to the members.

Reaping the benefits

Enhanced clean seed supply: As a result of the interventions, there was increased availability of clean seed: Nine out of the 12 CIGs undertake collective seed bulking for their members and the surplus is sold to other farmers. The PMO has set up 3 sites for clean seed production from which it supplies its members. It sold 22.5 tonnes of surplus clean seed to neighboring counties and western Kenya.
**Increased yields and income:** Average yield improved from 4 to 6 tons per acre where these technologies were adopted. The lobbying by the PMO and partners influenced the national government to develop a regulation specifying the packaging of produce at a maximum of 50 kg. Implementation of this requirement improved earnings from potato by 75 per cent. Prior to this, an extended bag sold at Ksh. 1500 at harvest, or Ksh. 8 per kg. This has increased to Ksh. 14 per kg. Also, farmers learnt that storage of the potato for 1 to 2 months after harvest increases price by 228.5 per cent. For instance, a 50 kg bag at farm gate sold at Ksh. 700. Six weeks later the same quantity sold at Ksh. 2300. This prompted 80 per cent of the CIGs to store their potatoes during glut to attract better prices.

**Adoption of soil testing practice:** The farmers adopted soil testing as a practice, especially after interacting with KALRO. They demanded for soil testing services from NARL and Mea Crop Nutrition Ltd. before applying fertilizer. The farmers took remedial measures as recommended in the soil analysis.

**Group marketing for better prices:** The two farmer organizations- Meru Potato Processing and Marketing Co-operative Society and the Mount Kenya North Farmers’ Produce Marketing Organization enabled the farmers to bulk and collectively market their produce. The co-operative attracted support from the County government through a grant of Ksh.1 million to set up its infrastructure and a 4 acre piece of land. The national government, through the Abothuguchi West assistant county commissioner, offered office space to the co-operative.

**Lessons**

- Organized informal community seed systems complement formal seed efforts and can mitigate the impact of diseases on the overall yields.
- Smallholder farmers’ organizations can be effective in lobbying, advocating and attaining market standardization. Such standard enhances trust, transparency and prices of produce.
- There are gains in investing in soil testing and analysis. The results of soil analysis and the prescriptions are critical for appropriate soil treatment for increased yields.

**Recommendations and conclusion**

- There is need to scale up the community-based seed production into a business enterprise to meet the growing demand of potato seed in other counties.
- There is need to integrate soil testing and analysis services in the farmer organization for accessibility.
- There is need for active beneficiary participation in steering all stages of project development.
Moving markets for livestock pastoralists in Garissa

Jelle A. Ibrahim, KAPP Garissa

Livestock marketing has been a major challenge for the pastoral communities, especially in Garissa because of lack of organized market infrastructure. Also, farmers in this area are faced with high incidences of diseases due to free movement of livestock from the neighbouring Somalia. Due to high frequency of drought, animals also move freely in search of pasture and water. This brings them into contact with infected animals. The drought also kills many animals. The farmers have difficulties in selling the animals due to lack of market. More so, due to lack of organized co-operatives farmers are unable to sell the animals as individuals before the onset of drought. The farmers cannot access extension services because the government, for a while, had put a freeze on employing extension staff. A community resources assessment (CRA) facilitated by KAPP also confirmed these problems. To confront these challenges, KAPP, in partnership with stakeholders including livestock keepers, implemented a project in this area aimed at improving the production and incomes of the farmers.
Who was involved?

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<thead>
<tr>
<th>Institution</th>
<th>Role</th>
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</thead>
<tbody>
<tr>
<td>KAPP</td>
<td>Funding, co-ordination, supervision, monitoring and evaluation.</td>
</tr>
<tr>
<td>Small Medium Enterprise Agricultural Development (SMEAD)</td>
<td>A service provider which provided market linkages and trainings to farmers.</td>
</tr>
<tr>
<td>Small holder livestock keepers</td>
<td>Beneficiaries.</td>
</tr>
<tr>
<td>County Agricultural Sector Project Steering Committee (CASPSC)</td>
<td>Oversight role and approving community micro-projects.</td>
</tr>
<tr>
<td>County Government</td>
<td>Provision of technical backstopping.</td>
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Interventions

KAPP first contracted the Small Medium Enterprise Agricultural Development (SMEAD), a consultancy firm with interests in agricultural value chain development, to work with 18 local communities in 18 locations in Garissa County.

A meeting was organized that brought together Ministries of Agriculture, Co-operatives and the KALRO, Kenya Federation of Agricultural Producers, and the local administration, to map out the County and to identify needy communities.

Formation of CIGs: The flagging of opportunities by the community led to the formation of one common interest group (CIG) in each of the 18 locations. During the baraza, community members interested in a particular enterprise were listed into respective value chain groups as per their interest. In Garissa, three value chains- fruits and vegetable, meat, and dairy- were identified. Those listed came together and elected interim officials who were mandated to provide leadership, arrange for venues for meetings, and coordinate groups for trainings. At this point, SMEAD recorded baseline information from individual members of the group.

Development of enterprise plan: SMEAD worked with the other stakeholders to develop an enterprise plan for each location. The plan highlights the problems, opportunities, strategies, schedule of activities and responsibilities, including the project cost and other resource requirements. The farmers organized themselves and formed the Garissa County Livestock Marketing Co-operative Society.

Trainings: SMEAD held five training sessions for each of the 18 CIGs. In total, 1200 farmers (839 males, 361 females) were trained in entrepreneurship, co-operative education, group dynamics and leadership, gender mainstreaming, environmental and social safeguards. They were also trained on value addition to meat, identification and management of diseases, hygiene practices, certification standards and marketing of products.
Taking stock of the results

More markets: The Co-operative has acquired a contract to supply 2000 goat carcasses weekly for one year to a meat exporter in Nairobi.

Increased earnings: The 1,200 members of CIGs have generated gross revenue of Ksh. 1.7 billion over 2 years through the sale of meat products during the second phase of the KAPP project (KAPAP). This was against the projected gross earning of Ksh. 599.4 million per year, according to the baseline. This has translated into increased income for individual farmers and households. The average annual sales of livestock in Garissa county has also gone up.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales in Kenya shillings</th>
</tr>
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<tbody>
<tr>
<td>2012</td>
<td>1,672,975,000</td>
</tr>
<tr>
<td>2013</td>
<td>3,132,800,000</td>
</tr>
<tr>
<td>2014</td>
<td>3,804,550,000</td>
</tr>
</tbody>
</table>

Source (Garissa County Directorate of Livestock Production)

Farmer empowerment: Vibrant farmer structures (CIGs) that are able to sustain the project have been established. These structures continue to provide services to farmers while influencing policy direction both at the county and at the national level.

Challenges

- Low technological absorption by farmers due to low levels of literacy.
- Dependency syndrome because the area has been receiving famine relief food for a long time.
- Recurrent drought and adverse climatic effects.
- Insufficient skills of the service providers in terms of knowledge in agriculture.
- Negative attitude among farmers due to a bad past history of co-operative movement.

Recommendations

1. The co-operative should be encouraged to recruit more members. This will help in raising the revenue base.
2. There is need to encourage the County authorities to adopt the KAPP model of contractual service delivery, since it is cost-effective. This will ensure project sustainability and ownership as well as resource and skills mobilization.
Lessons from improving extension services cases

This area of work aimed at improving production and incomes of smallholder farmers through meats; dairy; grains; fruits, nuts and vegetables; and natural resource management value chains. It focused on delivering extension services in 19 counties in Kenya.

KAPP used the contracted service delivery model to deliver extension messages to farmers. This work focused on three main areas namely; capacity building, value addition and market linkages. The work used various approaches such as market-led business approach, participatory and multi stakeholder approach, and the group approach which involved: flagging of existing opportunities and formation of common interest groups and co-operatives, farmer sensitization, beneficiary involvement and linkages to market.

The model emphasized on public private partnerships, integration of gender and collection of gender disaggregated data, business advisory, market-led business approach, formation of legal business entities, and holistic value chain preposition development.

Mitigation measures to ensure accountability and transparency include, Management Information Systems, backstopping and regular monitoring of all project activities. This also included adherence to environmental and social safeguards.

The work incorporated linkage to output markets, including processors, and building the capacity of the smallholder farmers and other stakeholders. It also included influencing policy.

Education and training was conducted through demonstrations, field days, exhibitions, farmer exchange programs and learning and bench-marking tours.

Policy issues were influenced through gender mainstreaming, empowerment of farmers to influence policy direction and encouraging public private partnership collaboration and formation of legal business entities.

Why was this area of work important?

This work addressed the problem of inadequate extension services due to declining numbers of extension workers. It sought to enhance service delivery through the public private partnership approach.

The value chains identified had economic importance in the specific areas in line with the Vision 2013, NASEP and ASDS 2010- 2020. It aimed at improving community livelihoods.

Interventions in this area of work addressed specific felt needs and challenges in specific areas, for example marketing, technology transfer and adoption, inadequate value addition, low production and productivity and access to markets. Farmers were already cultivating the crops
or keeping the animals. In some cases the land sizes favoured the enterprise, e.g., dairy farming (case: Rallying Nyandarua dairy farmers for improved livelihoods) and rabbit farming (case: Turning ‘a boys’ hobby’ into a fortune in Nyeri County).

Communities were already familiar with the value chains, hence they easily took it up. This area of work also aimed at relieving pressure on environmental degradation as an alternative source of livelihood.

This area of work had the potential to empower gender (women and youth) since a big chunk of smallholder farming is done by women. It also aimed at building economic viability of the farmer enterprises.

Some of the projects also answered to the nutritional needs and food security, in line with Vision 2030 of Kenya. The approaches used in this work encouraged economy of space (keeping rabbits and chicken require small space) since it also dealt with small land parcels. It addressed health issues by promoting white meat (chicken, rabbit and fish). Some of the enterprises promoted could easily be integrated with others, e.g., chicken and fish, and are quick in generating income. They were culturally acceptable and required low initial investment cost.

This work was important because it addressed the following problems: low productivity- as a result of pests and diseases, breeding; low income and poverty; poor housing for breeds- including inbreeding depression; acceptability for rabbit meat; food insecurity; low market demands; and lack of organized marketing.

**What was done about it?**

This work involved a community resource assessment, which helped in identifying needs, problems and opportunities of the beneficiaries. This established entry points to address specifics needs. The service provider facilitated the farmers to realize the objectives. The projects worked through organized farmer groups and business units, market linkages and co-operatives, and strengthening research and extension-farmer linkages. There was also collection, packaging and sharing of information, e.g., through information hubs, provision of extension materials (booklets and brochures), radio, TV, access to internet and KAPP’s Management Information System.

The work involved commercialising smallholder farmer agricultural production. It linked the farmers to the market, built their capacity as well as strengthening their groups as a means of empowerment. Gender was also mainstreamed besides integrating social and environmental safeguards. The farmers were also linked to research institutions such as KALRO.

**What worked well and why?**

Public private partnerships worked well by attracting county governments and other stakeholders into the projects. This was because the contracts spelt out responsibilities and agreed benchmarks, which put specific demand on performance on farmers and KAPP.
The service provider contracting process worked well due to its transparent and competitive nature. Its structured process enhanced farmer capacities in business planning, production, processing and marketing. This led to improved production and successful market linkages, for example Siaya group selling vegetables to Uchumi supermarkets, Homa bay groundnut farmers selling peanut butter to supermarkets in Kisii, and Busia farmers supplying indigenous vegetable to a restaurant in Nairobi. The contracted services model holds the service provider accountable to the farmers and KAPP on outcomes. It puts farmers in control of service delivery. During implementation, the participatory approach gave the co-ordination units and committees a sense of responsibility and ownership.

The business plans provided a structured roadmap for enterprise development in the value chains.

Group dynamics worked well leading to the formation of the farmer common interest groups (CIGs) and co-operatives. This was because farmers had a say on what they want. Farmers can learn through their groups and peers as they adopt and apply the new technologies aimed at improving their production and income. The group formation resulted in dependable groups such as CIGs and co-operatives, and farmers could pool together their resources for group investment and also bargain as a group for better prices and services. For example, farmers in Nyandarua opened milk bars through their co-operatives (see case: Rallying Nyandarua dairy farmers for improved livelihoods).

The co-operative approach was successful because it worked with committed farmers who had expressed interest and demand in the value chain. Smallholder farmers can earn more when they market their produce as a group. Agricultural cooperatives are a pillar for agricultural development and food security. There is need to raise awareness on their roles and assist the development of strong and vibrant cooperatives including sensitization of stakeholders on the Cooperative Societies Act.

The community resource assessment was instrumental in identifying community needs, problems and opportunities. This helped the project to establish entry points. The participatory approach used by the project created a sense of ownership among the stakeholders.

Monitoring and evaluation provided the project with a means of verification. This also facilitated the task of tracking performance to ensure accountability.

Gender mainstreaming was a success because it encouraged more women and youth to join the projects. KAPP used the inclusion approach, where both men and women are included in the interventions. (See case: Milk cementing marriages in West Pokot, and Milking money from dairy farming in West Pokot). The model provided guidance even in reporting and evaluation.

Capacity building: The initial basic training on group dynamics, production approaches and on value addition and entrepreneurship worked well since they were practical. The extension approaches used such as farmer-to-farmer extension, field days, demonstrations and learning
tours, encouraged peer learning, acceptance and fast adoption of technologies. Continuous field visits, monitoring, coaching and technical support to partners helped in imparting necessary skills and knowledge.

The value chain approach integrated up-take of the technologies, and this helped in improving production since farmers could readily see the benefits at every segment of the value chain in terms of enhanced earnings, and, hence, improved incomes.

Enhanced linkages with markets and service providers help in improving income. This is because the farmers can access affordable inputs and credits as a group. They can also negotiate for better prices for their produce. Enhanced market linkages through the co-operatives encouraged bulking, input acquisition, credit facilities, legal issues, ownership and sustainability of the work. The linkages opened new opportunities for farmers who sometimes lacked market for their produce. Linkage to markets is important in transforming farming from subsistence to commercial business entities. KAPP interventions must continue to focus on enhancement of markets for smallholder access and reinforce efforts to build sustainability through creation of strong links between market participants, capacity building of viable producer groups, and measures to improve the enabling environment. Good market linkages would raise incomes, reduce poverty and hunger.

The shortage of extension services in many African countries can be addressed through the public private partnership in service delivery, value chain and group approaches used in this work. The approach availed diverse expertise— from production to marketing— to the smallholder farmers. Farmers learnt by doing, and this made it practical and effective.

The new technologies elicited excitement while at the same solving farmer problems. Indigenous knowledge was effectively integrated with modern technologies. This, for example, led to the development of improved and affordable local hives (see case: Tapping from a cultural heritage: The story of bees and the liquid gold of the Ogieks).

Acquisition of tools and equipment increased the capacity of the farmers to engage in value addition.

Development of information booklets, technical handbooks, pamphlets, field demonstrations, exhibitions, learning tours, and a reasonably populated website enhanced farmer access to critical information.

Integrating environmental and social safeguards in projects of such nature guarantees best practices and wider acceptance by the community. These include cultural considerations.

What did not work well and why?

Technology adoption was slow as farmers were risk averse. There was also a problem with availability and the cost. For example, adoption of on-farm feed mixing was slow because most of the raw materials were not locally available. Use of commercial feeds for rabbits was not well received because of its high cost.
Cultural influence: In some projects, desired change was not achieved because of perception problems and conservative cultures. For example, farmers in West Pokot could not abandon pastoralist way of conducting business to adopt commercial dairy husbandry. They believe in big numbers of livestock and letting that go just for one or two dairy cows was a tough sell for the project. Coupled with low literacy level, this affected the rate of technology transfer (see case: Milking money from dairy farming in West Pokot). In Nyeri county, rabbit uptake was resisted by adults who considered it a boy’s hobby (see case: Turning ‘a boys’ hobby’ into a fortune in Nyeri County).

In Nyandarua, it is a tradition that every household must have at least one cow. This affected the quality of production since the existing cows competed for resources with those introduced as a result of the interventions (Rallying Nyandarua dairy farmers for improved livelihoods).

Accessing niche market for value added products did not work well. Demand was not satisfactorily met due to lack of capacity, and markets could not be sustained in some instances.

The professional fee offered was not competitive enough to motivate and retain the consortium.

The resources for exposure or for learning tours were limited. This affected farmer exposure to agribusiness skills.

The area of coverage by respective consortium was too vast for guaranteed efficiency.

The slow collection, aggregation, capture and transmission of performance data slowed down the utilization of grants. Ineffective management of data by the grant management committee can lead to data backlog.

In some projects, co-operatives did not work well due to farmers’ negative experience in the past. For example, farmers in Homa bay were hesitant after they lost savings in co-operatives that had either collapsed or had become insolvent (see case: Farming for the magical nuts of Homa bay).

What should be done differently?

Sensitise farmers, right from the beginning, to build their trust on the value chain and to make them appreciate its benefits.

Exposure visits and learning tours play a critical role in changing the perceptions of smallholder farmers. This should be enhanced with more funds and time. To enhance farmer learning and exposure, such projects should consider establishing model farms within the location.

Also, Assuring farmers of a stable market can go a long way in enhancing production. Project work should therefore also focus on supporting sustainable and stable markets.
The number of consortia in a specific value chain can be increased so that each serves a particular catchment area. This could help in creating a bigger impact.

What remains to be done?

There is need to further strengthen research–extension–farmer linkages. There is need to intensify capacity building of farmers to measure to the demands of markets and the value chain.

Continuous nurturing and capacity development of the co-operatives would ensure they are fully operational. This could be taken up by implementers in collaboration, especially the county and national governments. Training on financial management should be up-scaled. Co-operative forums can also be formed to facilitate information exchange.

Developing a transition strategy that would facilitate the handing over of this work from KAPP to the county governments is another task remaining to be done.

There is need for enhanced ICT use to facilitate better information exchange and learning.

Value addition should be emphasized for maximum benefits for the farmers.

Mainstreaming sustainable land management and up-scaling gender equity model to other project locations remains key aspects of what remains to be done. Farmers’ knowledge should also be deepened on financial management and on nutrition.

1. There is value for effective co-ordination and engagement of all the agricultural sector stakeholders and programmes involving agricultural sector development.
2. Agricultural interventions take a long time to produce impact. Therefore, project design should use a long-term sector approach if impact is to be realized. In addition, a clear exit strategy should be incorporated during project design.

Lessons learnt from using the Contracting Services model

- Assurance of results: The payment for service delivery is pegged on quantifiable outcomes and achievements agreed upon between the service provider and the beneficiaries as demonstrated in the application of the projects. The pegging of payment for the services to the earning by the beneficiaries not only ensures accountability but it also ensures farmers get value for money for their grants.
- Contracting process require thorough planning to ensure the process is anchored on realistic implementation process. This entails identification of smart planning and implementation indicators that are the hallmark of practical monitoring and evaluation function. The model provides an opportunity for results-oriented project planning.
The contracting model opens up job opportunities for not only the unemployed trained agriculturists, including youth and women, but also other private stakeholders – as they enlist in different consortia either as grassroots partners or as value chain actors. The model provides an opportunity to actualize the Private Public Partnerships.

The model provides an excellent platform for operationalizing the Value Chain Continuum because the formation of the Service Provider consortium is informed by the need for varied and relevant specialists/stakeholders. The teaming up of various professionals to address the advertised value chain problem statement provides a platform for utilizing the varied professional capacities and synergies amongst the agricultural professionals.

The design of the model ensures the Consortium targets its interventions to the most limiting chain in the value chain map out of the necessity that for the consortium to earn the service fees, farmers have to put money in their pockets first. The Consortium is kept on its toes to deliver and therefore there is no room for ‘business as usual’ kind of extension.

The model provides an opportunity for estimation of the Return on Investment index of the extension resources, i.e, the amount of wealth created for every amount of extension funds spent. The index is for now a criteria or yardstick for costing agricultural services which was previously unknown. The index can also be used to compare the efficiency of different consortia and different value chains – useful for further planning and service provider recruitment.

The members of the consortium are not salaried staff. The engagement of the service provider consortium will last as long as the contracts are in place – or for as long as the funds are available. The salary will apply only to the secretariat unit who plans and provides the oversight of the process.

Consortia are not confined to a particular county – they are free to look for similar jobs in other counties provided they are able to get sufficient grassroots partners.

The farmer empowerment strategies in the model ensure sustainability of interventions after the exit of the grant.

The experienced gained ensures transformation of producer groups to higher level agribusiness institutions and entities such as Co-operatives.
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Fruits of our toil
Increasing agricultural productivity and incomes of smallholder farmers in Kenya

Smallholder farmers represent the backbone of Africa’s agricultural sector. Their importance derives from their numbers, their role in economic development of a country and the concentration of poverty in rural areas. As much as agriculture provides decent livelihood and source of income for rural households, smallholder farmers in Africa lack access to adaptable and productive technologies, means of production and favourable markets for their produce. They also have difficulties in accessing research and extension services among others.

Fruits of our toil stands up for the sustainable and enhanced production and beneficial use of agricultural resources by smallholder farmers in Kenya for improved incomes. It shows how such smallholder farmers can successfully adopt new agricultural and agribusiness technologies to increase their household incomes and hence improved livelihoods.

The book, which is a compilation of cases from projects implemented in the KAPP’s two phases- KAPP Phase 1 and the Kenya Agricultural Productivity and Agribusiness Project (KAPAP)- in 21 counties of Kenya, shows how smallholder farmers can use research technologies to improve their production and incomes through agricultural value chains.

Also, it presents lessons on technologies and their adoption, sustainability, marketing of agricultural produce, replicability and scaling-up of successes.