

*‘Innovations in Technology, Institutional and Extension Approaches towards Sustainable Agriculture and enhanced Food and Nutrition Security in Africa’*



## **KENYA**

### **Country Report**

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<b>Country context</b>
<b>Background</b>
<p>Agriculture is the second largest contributor to gross domestic product (GDP) in Kenya after the service sector. It accounts for 65 per cent of the country's export earnings, employs over 80 per cent of the total labour force and provides 75 per cent of industrial raw materials (GoK, 2012/3). The growth in the agricultural sector is closely linked to the overall economic growth in Kenya. It is estimated that a 1 per cent increase in the sector results in a corresponding 1.6 per cent increase in GDP (GoK, 2012).</p> <p>Despite, the importance of agricultural sector, productivity has generally remained low mainly due to weak infrastructure and institutions, fragmented markets, inadequate budgetary allocation to research and development and public extension. The recent phenomena of climate change has exacerbated the situation worst as a result of frequent cycles of drought and increased prevalence of pests and diseases. Kenya, for a long period has pursued the goal for improving agricultural productivity and has implemented several development strategies and programmes.</p>
<b>InnovAfrica project</b>
<p>InnovAfrica targets at improving FNS in Kenya by integrating sustainable agriculture intensification systems (SAI), innovative institutional approaches (IIAs) with novel extension and advisory services (EASs), and by enhancing capacity building and knowledge sharing in smallholder farming through a strong EU-Africa Research and Innovation Partnership. InnovAfrica project is hoped to contribute to enhanced dissemination of SAIs, EASs, and IIAs and promote linkages and synergies among different institutions and stakeholders for increasing food production, thereby improving FNS. The project has six work packages which will be implemented in two project sites in Kenya.</p>
<b>Project sites description</b>
<p>The two project sites in Kenya are situated in Central highlands (at Kirinyaga) and Eastern midlands (at Kangundo). The main activities that will be carried out in the project sites include:</p> <p><b><i>Sustainable Agriculture Intensifications systems (SAIs)</i></b>  Brachiaria forage livestock system will be tested in the two project sites. The Brachiaria forage -feed system has been tested and found to be suitable in the Eastern midlands and hence it will be up-scaled in the region. While, the Brachiaria forage in the Central highlands will be tested first.</p> <p><b><i>Extension and Advisory Services (EASs)</i></b>  InnovAfrica will establish one pilot Village Knowledge Centre (VKC) in Kangundo. VKC are ICT digital platform linking farmers through smart phones and social media as a conduit for faster and effective information and knowledge to rural communities. Through VKC, it is expected to bridge the knowledge, gender, and digital divides and empower the rural community by fostering inclusive development and participatory communication. Others EASs include Farmer participatory research teams (FPRTs) and Farmer to Farmer Extension approach (F2FE), Nyumba Kumi (ten household) and Knowledge Hub.</p> <p><b><i>Innovative Institutional Approaches (IIAs)</i></b>  One of the IIAs interventions in Kenya is to establish one Multi Actor Platform (MAP). A MAP consisting of five members from farmer's organization, SMEs, public sectors and NGO have been established. MAP will play a key role in facilitating functional linkages between the stakeholders and help in disseminating, and scale up promising results within in and beyond the project study sites.</p> <p><b><i>Cross cutting issues</i></b>  Gender mainstreaming and youth is one of the cross cutting issue to address in the project. The participants in the kick off meeting discussed on the challenges and opportunities of mainstreaming gender and youth in the project. There is need to commence the baseline survey to characterise the farming system including understanding the role of gender in decision making on technology adoption.</p>
<b>Lessons learned</b>
<ul style="list-style-type: none"> <li>• The project need to leverage on the successes realized in the Eastern midlands.</li> <li>• Farmers in Central highlands are very innovative and willing to go extra mile despite shortage of land they face.</li> </ul>

## 1 Introduction

Agriculture is the second largest contributor to gross domestic product (GDP) in Kenya after the service sector. The agriculture sector contributes 26 per cent of the gross domestic product (GDP) annually and a further 25 per cent indirectly through linkages with agro-based and associated industries. It accounts for 65 per cent of the country's export earnings, employs over 80 per cent of the total labour force and provides 75 per cent of industrial raw materials (GoK, 2012). The agriculture sector is dominated by production of cereals (maize, wheat, sorghum and rice), traditional food crops (sorghum, millet and cassava), export crops (tea, coffee and horticultural produce) and livestock (beef, dairy, pigs, small stock and poultry). Smallholder farms ( $\leq 2$  hectares) account for over 65 percent of the total agricultural output. The overall economic growth in Kenya is closely linked to the growth of the agricultural sector. It is estimated that a 1 per cent increase in the agricultural sector results in a corresponding 1.6 per cent increase in GDP (GoK, 2012).

Despite, the importance of agricultural sector, productivity has generally remained low mainly due to weak infrastructure and institutions, fragmented markets, inadequate budgetary allocation to research and development and public extension. The recent phenomena of climate change has exacerbated the situation as a result of frequent cycles of drought and increased prevalence of pests and diseases. Kenya, for a long period has pursued the goal for improving agricultural productivity and has implemented several development strategies and programmes (Table 1).

**Table 1:** Examples of development strategies and programmes implemented in the past and present

Policy and strategies papers	Objectives
Poverty Reduction Strategy Paper (2001)	Describe the country's macroeconomic, structural, and social policies in support of growth and poverty reduction, as well as associated external financing needs and major sources of financing.
Economic Recovery Strategy (ERS) for Wealth and Employment Creation (2003-2007)	The ERS focused on the revival of agricultural institutions and investment in agricultural research and extension services.
Strategy for Revitalizing Agriculture (SRA) (2004-2014)	The SRA set out to propel growth of agricultural sector to an average of 3.1 per cent and to reach 5 per cent by 2007 and reduce the number of people who were food insecure to below 10 per cent in 2015 (GoK, 2004).  This was to be achieved through improved delivery of research, Extension and advisory services (EASs), access to quality inputs and financial services and markets.
Agriculture Sector Development Strategy (ASDS) (2010-2020)	The mission of the ASDS is to create an innovative, commercially-oriented and modern agriculture to ensure a food-secure and prosperous nation.
Kenya Vision 2030	The Vision 2030, set out to achieve an average GDP growth rate of 10 percent per year up to the year 2030 by transforming key institutions and policies in agriculture (GoK, 2003).

Although Kenya has an enormous capacity to produce enough food to meet its food needs, the country is generally food insecure. The economic review of agriculture 2007 indicated that 51 per

cent of the Kenyan population lack access to adequate food and the country is becoming increasingly dependent on food imports. The inaccessibility to food is closely linked to poverty which stands at 46 per cent (KNBS and ICF Macro 2010). Self-sufficiency in maize was achieved in a few years during the 1970s when productions exceeded consumption (Kiome, 2009). Per capita supply of the main staples has been declining since the early 1980s, and per capita supply of cereals (which provide most of the calories), declined from 140.9 kg/year (in 1979-1981) to 115.7 kg/year (in 1992- 1994) (Gitu, 2006). The average daily caloric intake availability is below the recommended level of 2100 Kcal (Kiome, 2009). About 30 per cent of the food consumed by rural households is purchased, while 70 per cent is derived from own production. On the other hand, 98 per cent of food consumed in urban areas is purchased while 2 per cent is own production (Kiome, 2009).

InnovAfrica is an ambitious research and innovation project with four year (2017-2021) duration that seeks to support innovation processes to improve food and nutritional security (FNS) in six case study countries of Africa. This will be achieved i) by promoting proven sustainable agriculture intensification (SAI) and innovative institutional approaches (IIAs) and extension and advisory services (EASs), ii) by enhancing capacity building and knowledge sharing through a strong EU-Africa Research and Innovation Partnership. It is assumed that these interventions have the potential to increase smallholders' adaptability, agricultural productivity, and profitability; while reducing negative environmental impacts, enhance FNS and sustainable agriculture in Africa. The project interventions are premised on the fact that despite the generation of new sustainable agricultural technologies from agricultural research in the region and availability of advanced production technologies from the developed world, uptake of these superior technologies by farmers remains low. This has been attributed to the lack of effective technology development and delivery systems that respond to user needs and socio-economic conditions.

InnovAfrica is organized into seven work packages:

WP1: Interdisciplinary review and mapping of most innovative SAI, IIAs & EASs

WP2: Innovative Multi-Actor Platforms (MAPs)

WP3: Farmer-led experimentations of innovative technologies

WP4: Agricultural food value chains

WP5: Agriculture policies and institutions

WP6: Innovative knowledge exchange mechanism, dissemination and impacts

WP7: Coordination of project implementation

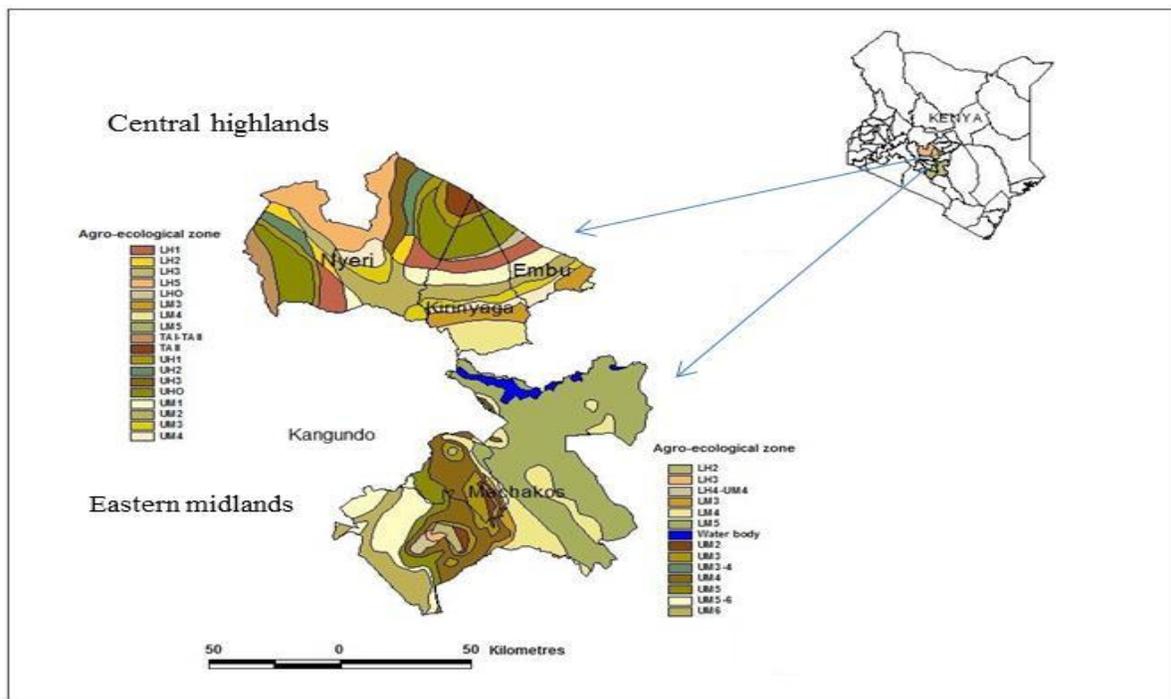
InnovAfrica seeks to test, integrate, and disseminate potential SAI systems, integrated seed delivery systems as well as EASs such as the Village Knowledge centres, (VKCs) and institutional approaches such as Multi Actor Platforms (MAPs) that will play a key role in facilitating functional linkages between smallholders, civil society, agri-business sectors, government agencies, and the scientific community and help in disseminating, and scale up promising results within in and beyond the study sites. The project is being implemented in six case countries namely Ethiopia, Kenya, Malawi, Rwanda, South Africa and Tanzania through a consortium of 16 institutions. Among the African countries to benefit is Kenya and intend to evaluate and up-scale the *Brachiaria* forage innovation through MAPs and VKCs.

## 2 Description of Project sites

The InnovAfrica project will be implemented in Central highlands and Eastern midlands of Kenya (Figure 1). It is important to note that the Brachiaria forage -livestock system has been tested and found to be suitable in the Eastern midlands and hence it will be up-scaled in the region. The project intends to evaluate Brachiaria forage in the Central highlands since the past research did not involve farmers in the evaluation.

For the description of study sites, the participants were organized into two working groups based on their expertise and experience to define the sites guided by a checklist of questions. The checklist included:

- Bio-physical, socio-economic characteristics of study sites and institutional and policy issues being implemented or promoted at the study sites
- Main environmental, climate, social and economic challenges in the sites
- Major actors/stakeholders in each study site relevant for InnovAfrica and how could they support the uptake of project results and outreach



**Figure 1:** Map of project implementation study sites in Central highlands and Eastern midlands of Kenya

Field visits were made in the two study sites namely Kangundo in Eastern midlands and Mukurweini in Central highlands. In each site, three farmers were visited. In Kangundo, farmers have already adopted the Brachiaria grass while in Mukurweini, Brachiaria grass has not yet been introduced.

**Table 2:** Some biophysical and socio-economic features of the study sites in Kangundo and Mukurwe-ini

Parameters	Kangundo	Mukurwe-ini
Altitude (m a.s.l.)	800 - 2100	1200 – 1700
Rainfall (mm)	700 - 1050	1200 – 1500
Temperature (°C)	14-34	12-27
Soils (dominant)	Luvisol, Acrisol and Ferrasols	Humic Nitisols
Natural vegetation	Acacia trees	Cleared
Cropping systems	Maize-beans	Coffee- tea,
Livestock	Local and grade cattle	European breed & crosses with local zebu
Fodder (main)	Napier grass	Napier grass
Population (total)	219103	n.a
No. of households	50822	n.a
Land holding size (ha)	1.20	0.55
Agricultural land holding size	0.75 ha/household	n.a
Major economic activity	Quarrying	Dairy, coffee and tea farming
Land tenure	Free hold	Free hold

## 2.1 Kangundo site (Eastern midlands)

The study site is found in the Eastern midlands with altitude ranging between 800 and 2100 m above sea level. The major economic activities are quarrying. A large portion of the population makes a livelihood on agriculture by growing maize and grain legumes. In addition coffee, bananas, cassava, avocados, mangoes, tomatoes, pigeon peas and sweet potatoes are also cultivated in the area. The natural vegetation which was once dominated by Acacia trees, wild sage, Sodom apple and Croton has been cleared for cultivation of food crops. .

The livestock types include local and grade cattle, indigenous and exotic poultry, sheep, goats, rabbit, pigs and bees. The main forage feed are Napier, Boma Rhodes, Brachiaria, Panicum, natural grasses, legumes such as Lucerne, Sesbania and Calliandra. In Kangundo, there are opportunities for up-scaling Brachiaria grass considering the large farm sizes and farmers’ interest following good performance of the grass on biomass production and livestock productivity.



**Figure 2:** Field visit in Kangundo, Eastern midlands of Kenya (Photo by Njarui)

## 2.2 Mukurwe-ini site (Central highlands)

The study site is found in the Central highlands with altitude ranging between 1200 and 1700 m above sea level. The main economic activity is dairy, coffee and tea farming. In Mukurwe-ini, farmers practice intensive agricultural production system due to small land sizes. They grow coffee, tea, maize, beans, potatoes, bananas and vegetables. Dairy producers have adopted feed conservation techniques such as silage making and buying hays from other parts of the country. Introduction of *Brachiaria* grass in this site would help in alleviating feed shortage but the small land holding pose a challenge (0.55 ha). It will be feasible to select farmers in the neighbouring areas who have larger land holding.

The main forage feed are Napier grass, sweet potatoes, maize, *Desmodium* and Kikuyu grass. The livestock are mainly European breed and their cross with local zebu. Most of the native vegetation has been cleared for crop production



**Figure 3:** Field visit in Mukurwe-ini, Central highlands of Kenya (Photo by Njarui)

## 3 Problem ranking

The main problems facing smallholders in Kangundo and Mukurwe-ini study sites are mentioned in Table 3.

**Table 3:** The main problems facing smallholders in Kangundo and Mukurwe-ini study sites.

Problems in Kangundo	Rank	Problems in Mukurwe-ini	Rank
Diseases	6	Small land holding size*	1
Inadequate livestock feed	1	Low youth involvement in farming	3
Climate change impacts	5	Soil and nutrient erosion	2
Expensive artificial insemination services	8	Low literacy levels	5
Poor road infrastructures	11	Drug abuse/addiction,	4
Lack of milk cooling facilities	9	Frost attack	6
Unorganized market	10	Prone to landslides	7
Inadequate extension services	12		

High cost of livestock feeds	2	
Low soil fertility	7	
Water scarcity	4	
Land pressure	14	
Poor quality livestock feed	3	
Inadequate skills	13	
Wrong perception on credit	15	
Gender based conflicts	16	

\* Average land holding size 0.55 ha/ household.

The top three problems in Kangundo are inadequate livestock feeds, high cost of feeds and poor quality livestock feeds. While, in Mukurwe-ini, small acreage, soil and nutrient erosion and low youth involvement in farming are the major problems.



**Figure 4:** Photo of participants during the group discussion (Photo by Ann Wanjugu.)

#### **4 Promising SAIs, IIAs and EASs in the project sites**

##### **4.1 Sustainable Agriculture Intensifications (SAIs)**

The InnovAfrica project aims to test and up-scale SAIs, IIAs and EASs towards realization of sustainable agriculture and enhanced food and nutrition security in Africa. This would be realized by facilitating adoption of SAIs through the use of IIAs and EASs that would generate desired impacts for smallholders including women and youth. Further, the project has adopted farmer participatory and MAPs to accelerate the SAIs. Table 2 shows the various SAIs, IIAs and EASs that will be implemented in Kenya.

Brachiaria grass is an important tropical forage of African origin with desirable attributes of agricultural and environmental significance. Dairy cattle fed Brachiaria increased milk production by about 15 to 40 percent, is adapted to drought and low fertility soils and act as a carbon sink. The grass was demonstrated in relevant field environment in Eastern midlands and thus can be validated and up-scaled in Central highlands and other parts of Kenya. Others forages include Napier grass, Rhodes grass, Panicum, Leucaena and Desmodium

**Table 4:** Advantages and disadvantages of the Brachiaria forage-livestock system

Advantages	Disadvantages/risks/limitations
<ul style="list-style-type: none"> <li>• Has led to increased fodder availability hence sustainability at farm level</li> <li>• Can be intercropped with legumes</li> <li>• Conserved as hay</li> <li>• Propagation can be by splits or seeds</li> <li>• High in protein content</li> <li>• Palatable</li> <li>• Results to increased milk and beef production</li> </ul>	<ul style="list-style-type: none"> <li>▪ Infested by red spider mites</li> <li>▪ Frost may affect the productivity.</li> <li>▪ Small land holding size can limit expansion of Brachiaria grass</li> <li>▪ Poor seed production</li> </ul>

#### 4.2 Innovative Institutional Approaches (IIAs)

The Innovative Institutional Approaches in Kenya include Multi Actor Platforms. Others iare innovative agro dealers/service providers, social media e.g. Short Message Service (SMS), WhatsApp.

*Multi Actor Platforms, MAP:* is a process of interactive learning, empowerment and collaborative governance that enables stakeholders to be collectively innovative and resilient when faced with the emerging risks, crises and opportunities of a complex and changing environment. Represents cross sector collaboration and can range from formal roundtables aiming for formal approvals of tools and technologies, to informal coordination mechanisms to manage local natural resources. Create trust-based relations that enable the empowered and active participation of all if implemented in the right spirit. MAPs have been tested successfully in India. Based on this success the approach will be applied in Central highlands and Eastern midlands region of Kenya.

**Table 5** Advantages and disadvantages of the Multi Actor Platforms

Advantages	Disadvantages/risks/limitations
<ul style="list-style-type: none"> <li>• Has proven record in other parts of the world (for e.g. Asia</li> <li>• Better organized and efficient in delivery</li> <li>• Offer opportunities for networking and partnership development</li> </ul>	<ul style="list-style-type: none"> <li>▪ Need strong commitment &amp; contribution of MAP members</li> </ul>

*KIPUS:* It is an integrated service (smart data software on traceability and analogous qualification) called enabling data integration, analysis, transparency, and value chain enhancement involving MAPs. It was tested successfully in Asia and will be applied in the two study sites in Kenya. The major actors in Eastern midlands (Kangundo site) and Central highlands (Mukurwe-ini) are farmers, consumers, traders, county government extension workers, cooperatives, researchers,

development partners (like USAID), financial institutions, farmer organizations, processors and transporters. Other actors include universities, regulatory bodies (e.g. KEBS and KEPHIS).

The MAPs in Kenya comprise of five members namely Ministry of Agriculture, Livestock and Fisheries; Kenya Seed Company; Mukurwe-ini Wakulima Dairy Cooperative; Kambusu Dairy Farmers Cooperative; and Kakuyuni Dairy Cooperative. A brief description on their background, strengths, challenges, relevance to InnovAfrica project are given below.

***i) Ministry of Agriculture, Livestock and Fisheries***

*Background:* The Ministry was formed through the Executive Order No. 2/2013 of 20<sup>th</sup> May 2013. It comprises three State Departments; (i) Agriculture; (ii) Livestock and (iii) Fisheries. The ministry is mandated to create an enabling environment and infrastructure for sustainable development and management of crops, livestock and fisheries resources to ensure the country food and nutrition security. The vision of Ministry is to achieve food secure and wealthy nation anchored on an innovative, commercially oriented and competitive sector. The mission is to improve the livelihood of Kenyans and ensure food and nutrition security through creation of an enabling environment and sustainable natural resource management.

The Ministry main function include: formulation, implementation and monitoring of agricultural legislations, regulations and policies; supporting agricultural research and promoting technology delivery; facilitation and representation of agricultural state corporations in the government; development, implementation and co-ordination of programmes in the agricultural, livestock and fisheries sectors; regulation and quality control of inputs, produce and products in the agricultural sector; management and control of trans-boundary pests, diseases and invasive species; collection, maintenance and management of information on agriculture, livestock and fisheries sectors; and promotion of sustainable resource management and utilization.

**Table 6:** Ministry of Agriculture, Livestock and Fisheries: Strengths, challenges and relevance to InnovAfrica

<i>Strengths</i>	<i>Challenges</i>	<i>Relevance to InnovAfrica</i>
<ul style="list-style-type: none"> <li>• Highly skilled manpower which support infrastructure across the country and has offices equipped with ICT.</li> <li>• Collaborates with many stakeholders and has continued to cultivate and nurture cordial working relationships to support the Ministry in delivery of its task</li> </ul>	<ul style="list-style-type: none"> <li>• Inadequate funding;</li> <li>• Low staff number due to retirement;</li> <li>• Climate change impacts,</li> <li>• Poor marketing infrastructure</li> <li>• High incidence of crops and livestock pests and diseases</li> </ul>	<ul style="list-style-type: none"> <li>• Support the project implementation by guiding on policy issues,</li> <li>• Transfer of knowledge and skills to farmers through capacity building;</li> <li>• Participate in dissemination and up-scaling of innovations and extension approaches and strengthening of farmer groups.</li> </ul>

***ii) Kenya Seed Company***

*Background:* Kenya Seed Company is a public-private company incorporated in Kenya in 1956. It was initially founded for pasture seeds production but later diversified its product portfolio to include food crops such as maize, wheat, oil crops, sorghum, millet, and horticultural crops. The main function of the company includes research and development, seed production, processing, distribution and marketing.

**Table 7: Kenya Seed Company: Strengths, challenges and relevance to InnovAfrica**

<i>Strengths</i>	<i>Challenges</i>	<i>Relevance to InnovAfrica</i>
<ul style="list-style-type: none"> <li>• Has experience in crops and pasture variety development, maintenance of parent seeds, seed production, processing, distribution and marketing.</li> </ul>	<ul style="list-style-type: none"> <li>• Erratic weather patterns caused by climate change,</li> <li>• Pests and diseases</li> <li>• Dwindling land areas for seed production</li> </ul>	<ul style="list-style-type: none"> <li>• Identification of relevant forage varieties for a given areas/AEZs and</li> <li>• Provision of product knowledge to partners/clients</li> </ul>

### *iii) Mukurwe-ini Wakulima Dairy Limited*

*Background:* Mukurwe-ini Wakulima Dairy is based in Nyeri Country in the central Region of Kenya. It was formed in 1990 as a self-help group and due to its immense growth, it was transformed to a farmers' cooperative. It has 21,000 registered members who are engaged in small scale dairy farming activities but currently 6,000 -7,000 are active members. The vision of the cooperative is to become the most efficient farmer business organization in Africa, enabling farmers to maximize their efforts and eradicate poverty. The mission is to become the preferred provider of assured quality dairy products in Kenya, East and Central Africa.

The cooperative collects milk and adds value to produce other milk products such as yoghurt and fermented milk popularly known as *mala*. It also carry out marketing function of packaged dairy products and provides artificial insemination, veterinary services and offers credit services to farmers. It aims to increase the current milk production from 35,000 litres to over 45,000 litres per day.

*Relevance and contribution to InnovAfrica:* The cooperative has experienced and qualified staff who will contribute to the realization of InnovAfrica objectives in various ways including knowledge transfer, farmers mobilization and outreach, strengthening farmer organizations, SAI up-scaling, inform policy gaps for redress and support dairy value chain development.

### *iv) Kambusu Dairy Farmers Cooperative Society Limited*

*Background:* The cooperative was started in 1996 and operates in Kangundo sub-county. It has 206 members but only 70 are active. It offers milk collection, chilling and marketing. Currently it handles close to 3000 litres of milk per day. Most of its milk is marketed raw but process limited quantity into *mala*. To ensure that the quality is not compromised, the cooperative supports members with milk quality testing services. It offers artificial insemination (AI) services and sells feed to member at subsidized price. It also conduct trainings on dairy farming in areas on feeding, housing, breeding, milk handling and hygiene in collaboration with National and County governments. The cooperative has three staff members who support daily operation and milk handling functions.

**Table 8:** Kambusu Dairy Farmers Cooperative Society Limited: Strengths, challenges and relevance to InnovAfrica

<i>Strengths</i>	<i>Challenges</i>	<i>Relevance to InnovAfrica</i>
<ul style="list-style-type: none"> <li>• Started a SACCO through which members are able to make savings and access credit services to bridge the credit gap.</li> <li>• Partnered with Kenya Commercial Bank (KCB) and Equity Bank to ensure easy access to funding.</li> </ul>	<ul style="list-style-type: none"> <li>• Climate change impacts (such as drought),</li> <li>• Limited market access due to interference by brokers particularly on pricing</li> <li>• poor road infrastructure thus affecting milk transportation and distribution,</li> <li>• Inadequate capital for expansion and</li> <li>• Capacity gaps on dairy farming</li> </ul>	<ul style="list-style-type: none"> <li>• The cooperative anticipate that their members and staff will acquire critical knowledge towards developing the dairy sector in their region through increased availability of quality forages.</li> <li>• Lead to increased milk production and higher income.</li> </ul>

**v) Kakuyuni Dairy Cooperative**

*Background:* The cooperative begun in 2008 as a self-help group and over the time it has evolved into a cooperative. It has a total membership of 70 farmers but only 35 are active.

*Experiences:* The cooperative handles approximately 600 to 800 litres of milk per day and sells locally as raw milk but process *mala* during glut period. The cooperative staff members are trained on milk value addition and have acquired the Kenya Bureau of Standards (KEBS) certification for yoghurt.

*Challenges:* The challenges faced includes poor infrastructure particularly roads thus hindering accessibility, low demand for some milk products during glut period, hawkers interference with the price stability, lack of own premises, livestock diseases and lack of milk cooling facilities.

**vi) Farmer representative**

Mr. Wamakau is a dairy farmer in Kangundo Sub-county. For over 20 years when he was working in the Cooperative movement, he was a telephone farmer but has now settled to do farming. He owns 10 dairy cows of European breed. He grows improved forages including *Brachiaria* grass in his farm. He has been involved in dairy value chain analysis through Agricultural Sector Development Support Programme (ASDSP). From his cooperative background, he understands the importance of farmers working together to benefit from economies of scale in activities such as processing and marketing of dairy products. He is a member of a dairy cooperative society which is in the process of partnering with Kenya Cooperative Creameries (KCC) and Brookside to improve their access to markets

**4.3 Extension and Advisory Services (EASs)**

*Village Knowledge Centre (VKCs)* are ICT digital platform linking farmers through smart phones and social media as a conduit for faster and effective information and knowledge to rural communities. This has been tested successfully in India (by NIBIO, partner in InnovAfrica). InnovAfrica will establish one pilot VKC in Kangundo. It bridges the knowledge, gender, and

digital divides and empower the rural community by fostering inclusive development and participatory communication

Others EASs include Farmer participatory research teams (FPRTs) and Farmer to Farmer Extension approach (F2FE), *Nyumba Kumi* (ten household) and Knowledge Hub. During the meeting participants were informed on the advantages and disadvantages of the proposed SAIs, IIAs, and EAS in the country. The results are shown below in Table 5.

**Table 9:** Advantages and disadvantages of the Farmers to Farmers extension and VKC

Advantages	Disadvantages/risks/limitations
<ul style="list-style-type: none"> <li>• Methods for effective extension</li> <li>• Previously used approaches e.g. Catchment area approach as well as <i>Nyumba kumi</i> (ten household) approach</li> </ul>	<ul style="list-style-type: none"> <li>▪ Effectiveness depend on willingness of the farmers to share the knowledge</li> <li>▪ VKC is new to Kenya therefore its effectiveness in Kenya is not known.</li> </ul>

## 5 Main value chain actors for *Brachiaria* grass

### 5.1 Value chains and actors in the project sites

Different actors involved in the *Brachiaria* value chain and their roles, challenges and opportunities are presented in Tables 10 and 11.

**Table 10:** *Brachiaria* value chain actors and their roles

Actor	Roles
Farmer	Provide land, labour, management, utilization and ownership of enterprise
Input suppliers	Provision of inputs such as fertilizers, seeds, tools, equipment. Offers extension and advisory services
Researchers	Generate technology
Farmer organizations	Networking and linkages
Extension services/Staff	Technology dissemination, Training, Mobilization
National government	Policy formulation
Milk processors traders	Value addition in milk
Transport	Transport to processing market

**Table 11:** *Brachiaria* value chain actors, challenges and opportunities

Actor	Challenges	Opportunities
Farmer	Small land size, limited skills, old age of farmer, inadequate labour, low income, unwillingness to adopt the technology	The demand for <i>Brachiaria</i> and milk is growing
Input suppliers	Low purchasing power, expensive seeds, bulkiness of <i>Brachiaria</i> hay storage (problems)	High demand of <i>Brachiaria</i> grass seeds and vegetative planting materials
Researchers	Inadequate funds, poor intake of technologies	Demand and market for <i>Brachiaria</i> is increasing Skilled researchers
Farmer organizations	Poor leadership, poor governance and inadequate funding	Have capacity for participation and lobbying

Extension services/Staff	Limited capacity of staff and low funding	Well trained extension staff Infrastructure availability on the ground
National government	Inadequate funding and poor implementation of policies	National livestock development policy available
Milk processors traders	Unhealthy competition, low storage capacity, short life product e.g. milk	Market available for milk Milk availability for processing
Transporter	Poor roads, bad terrain,, corruption price volatility	New roads networks are coming, availability of milk for transport

## 6 Policies and institutional mechanisms

The participants also deliberated on the agriculture policies relevant to the project as followings.

- The National Livestock Policy is available and the implementation of policy is in progress.
- Draft Veterinary Policy passed
- The Dairy Industry Policy and Bill written and currently in review.
- The Draft Livestock Breeding Policy – The final draft policy is complete and the sessional paper has been presented to the cabinet for approval
- Livestock Breeding Bill is currently being drafted
- Review of Animal Feeds Policy and Bill is under ways
- National Agriculture Sector Extension Policy
- National Constitution (2010) which introduced devolutions and functions at different governance levels i.e. County and national government

## 7 Gender and youth mainstreaming: challenges and opportunities

In the agricultural sector, gender inequalities exist in all areas of the value chains; from production, processing, marketing, and consumption. Gender patterns of behaviour, men's and women's roles, the distribution of resources and benefits derived from income generating activities along the value chain, and the efficiency and competitiveness of value chains in the market were discussed. The gender inequalities impact negatively on family and economy. The participants discussed on the challenges and opportunities of mainstreaming gender and youth in the project. The results are shown in Table 12 below.

**Table 12:** Challenges and opportunities in mainstreaming gender and youth in **InnovAfrica**

Challenges	Opportunities
Cultural barrier on land ownership (land is owned by men)	Laws are being enacted on the ownership of land
Drudgery of use of manual labour	Mechanization of farming operation
Overburden to female in farm activities	Use of appropriate gender friendly techniques
Un proportional sharing of the farm income between men and women (men are main beneficiaries)	Awareness and capacity building on gender mainstreaming
Youths preference for the white collar jobs	Presence of technical institutes offering training course and commercialization of enterprises.

## 8 Lessons learned and Concluding remarks

### 8.1 Lessons learned

- There is high level of crop livestock intensification in Mukurwe-ini study site (Central highlands)
- The value chain for dairy is well developed in both sites
- The input and output markets are active
- Public private partnerships are well established
- Farmers are very innovative and are willing to go an extra mile
- Farmers in Mukurwe-ini have small acreage (0.3 - 0.7 ha) and therefore they depend on external feeds sources

*It is worthwhile to note that Mukurwe-ini, site was changed to neighbouring county of Kirinyaga after it was found that the land sizes were too small for farmers to allocate to growing Brachiaria grasses. Further, farmers with relatively large parcels of land were far apart thus making it difficult to establish a cluster for monitoring. We shall use the farmers in Mukurweini during up-scaling.*

### 8.2 Concluding Remarks

- There is need to commence the baseline survey to characterise the farming system including understanding the role of gender in decision making on technology adoption
- Specific field sites need to be identified and trials designed while considering proximate to the existing output markets
- Up-scaling of Brachiaria in Mukurwe-ini area of Central highlands require critical examination to determine prospects for integrating Brachiaria forage in the farming system considering the challenge of small land holding sizes
- The project need to leverage on the successes realized in Eastern midlands.

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