

# The role of the Kenya Agricultural Research Institute (KARI) in the attainment of household food security in Kenya: A policy and organizational review

Maureen K. Miruka · Julius J. Okello ·  
Violet O. Kirigua · Festus M. Murithi

Received: 23 May 2012 / Accepted: 31 May 2012 / Published online: 22 June 2012  
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**Abstract** The Kenya Agricultural Research Institute (KARI) is a government organization mandated to conduct research into, among others, crop and livestock production and marketing. In 2009, it launched a new strategic plan for the period 2009–2014, together with its implementation framework. This strategic plan aims to position KARI as a facilitator of growth in the agricultural sector in order to enable an average growth rate of 7 % per year over the next 5 years, as stipulated in the Kenya Vision 2030 policy. This paper reviews KARI's new strategic plan within the context of recent policy reforms at national, regional and global levels. It specifically examines the strategy in the context of Vision 2030, the Kenya Agricultural Sector Development Strategy (ASDS), the Comprehensive Africa Agriculture Development Program (CAADP), and the Millennium Development Goals. The paper then

discusses KARI's newly adopted Agricultural Product Value Chain (APVC) approach, which is expected to position KARI strategically as a key player within the National Agricultural Research System (NARS). It also highlights progress in the implementation of the new strategic plan and APVC approach with specific emphasis on partnerships, markets and gender as key focus areas and the implications of these on food security in Kenya.

**Keywords** Public research · Government · Partnerships · Markets · Gender

## Introduction

The agricultural sector remains the mainstay of most developing country economies and provides the foundation for the development of the other sectors (Timmer 2002). In Kenya, agriculture directly contributes to about 26 % of gross domestic product (GDP) and indirectly adds a further 27 % through linkages with agro-based and associated industries (Omiti et al. 2009; Government of Kenya (GoK) 2009). Growth in the agricultural sector is closely linked to overall economic growth in Kenya (Meijerink and Roza 2007). Indeed, it is estimated that a 1 % increase in the sector's growth results in a corresponding 1.6 % growth in the overall economy. Agriculture therefore remains the engine of national economic growth in Kenya. It also heavily impacts the performance of nearly all other sectors. In spite of this, food security remains largely elusive in Kenya (Langat et al. 2011).

Food security has been defined as the situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and

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M. K. Miruka (✉)  
Socio-Economics and Applied Statistics,  
Kenya Agricultural Research Institute,  
P.O. Box 57811-00200, Nairobi, Kenya  
e-mail: maureenmiruka@gmail.com

J. J. Okello  
Department of Agricultural Economics, University of Nairobi,  
P.O. Box 29053–00625, Nairobi, Kenya  
e-mail: jjokelo@gmail.com

V. O. Kirigua  
Horticulture and Industrial Crops,  
Kenya Agricultural Research Institute,  
P.O. Box 57811-00200, Nairobi, Kenya  
e-mail: violetkirigua@yahoo.com

F. M. Murithi  
Kenya Agricultural Research Institute,  
P.O. Box 57811-00200, Nairobi, Kenya  
e-mail: fmmeme@gmail.com

healthy life (Food and Agriculture Organization (FAO 2008). Over 13 million of Kenya's 38 million people live below the poverty line of less than US\$1.5 a day. The Agricultural Sector Development Strategy (ASDS) document states that over 10 million people in Kenya suffer from chronic food insecurity and poor nutrition (GoK 2009). Other statistics indicate that about 11 million people (equivalent to 32 % of the population in Kenya) suffer from malnutrition (FAO 2008). The sustained rise in food and non-food prices is expected to exacerbate food insecurity problems among the most vulnerable livelihood groups, especially the urban, pastoral and marginal agricultural households (Okello 2009; Kenya Food Security Steering Group (KFFSG 2008)

The Kenya Agricultural Research Institute (KARI) has, since its establishment in 1986, conducted research aimed at improving agricultural productivity and hence contributing to improved food production. The organization recently (2009) adopted a new strategic plan and associated implementation framework that places it at the forefront in the fight against food insecurity in Kenya. The strategy aimed at positioning KARI as a major contributor to the rapid growth of the agricultural sector in line with the expectations of the national, regional and international development goals. Indeed, realization of rapid economic growth in Kenya will require that the agricultural sector continues to progressively play its role of food security, wealth creation, and poverty alleviation. This paper reviews KARI's new strategic plan in the context of the national, regional and international policy agenda. The paper then discusses the newly adopted Agricultural Product Value Chain (APVC) approach which is expected to position KARI strategically as a key player within the National Agricultural Research System (NARS). It also highlights progress in the implementation of the APVC approach within the new KARI Strategic Plan (KSP) framework, with specific emphasis on partnerships, markets and gender as key focal areas, and the implications of these on food security in Kenya.

### The theoretical framework

This paper draws from the induced innovation theory developed by Hayami and Ruttan (1970; 1971) and later refined by Ruttan and Hayami (1998). The theory posits that scarcity of certain factors of production will induce the kind of development that uses more of the relatively abundant factor of production while saving the relatively dear factor. In the context of an organization, the theory argues that increases in factors' prices will bring about an induced organizational innovation which results in the search for opportunities to replace the now relatively more expensive factor of production. Ruttan and Hayami (1998) argued that when there is inelastic supply of factors of production that save the relatively more expensive one(s), farmers and other

stakeholders will press public organizations to search for technical alternatives to resolving the constraint. The farmers and other value chain actors that are constrained by the lack of cheaper technical alternatives will especially "press public research organizations to develop the new technology and demand that agricultural supply firms supply modern technical inputs that substitute for the scarce factors" (Ruttan and Hayami 1998: 169). In the present context, this theory suggests that the search for new strategies to resolve the constraints to agricultural production and marketing will spur demand by value chain actors (namely farmers, traders, manufacturers, etc.) for better ways of farming. The constraints can include better technology (e.g., seed), more organized value chain, better access to market, better postharvest handling technologies, and well-defined grades and standards that facilitate trade. Theoretically, these entrepreneurs are expected to lobby the public research organizations responsible for finding the solutions to farmers' problems to search for new strategies of overcoming production and marketing constraints (De Janvry 1973).

Past authors have used the theory of induced innovation in the public sector to analyze agricultural development in many countries. De Janvry (1973) used it to analyze the drivers of agricultural development in Argentina. Burmeister (1987) used the induced organizational innovation theory to examine whether the green revolution in South Korean agriculture was induced or directed. In this paper, we use the theory to understand how constraints to agricultural development gave KARI the impetus to adopt an agricultural development strategy that resolves those constraints namely, the Agricultural Product Value Chain (APVC) approach. Interestingly, the pressure on KARI to search for this strategy emerged from public sector planners and regional development initiatives that were in turn responding to calls for new agricultural development strategies. These included Kenya's Vision 2030 and the Agricultural Sector Development Strategy and also regional development policies such as the CAADP of the New Economic Partnership for Africa's Development (NEPAD). This domestic and regional push for new strategies to the commercialization of smallholder agriculture is, in turn, a response to the failure of previous strategies to facilitate transition of agriculture to market oriented production. Below, we first review the history of KARI followed by a review of some of the initiatives that spurred the induced innovation in KARI before delving into the APVC development strategy that it adopted.

### The Kenya agricultural research institute: a historical perspective

KARI was established through an Act of Parliament (Cap 250, revised 1979) and became operational in 1986. Its

fundamental role is research and knowledge generation with an evolving research agenda to address the changing government policy directions. KARI accounts for more than half of the total research and development (R&D) expenditure in Kenya and is responsible for research on crops (except research on coffee, tea and sugarcane), livestock, and land and water resources. It has a network of national commodity and factor research centres responsible for generating knowledge and technology, and also regional centres responsible for applied and adaptive research in respective regions. KARI centres are categorized into adaptive research centres with district/regional mandates and/or R&D centres with national mandates. There are also several sub-centres which are used as testing/experimental sites during the development of technologies. KARI's current focus is the development of value chains of priority agricultural product commodities/factors in different regions of the country. It currently has a staff capacity of 2,930 at the time of writing this paper, with 543 being researchers and the rest support staff.

Between 1988 and 2002, the Institute developed Medium Term Plans I and II for implementing the first and the second phases of the National Agricultural Research Programme (NARP I and II) (KARI 2003a) which focused mainly on supporting infrastructural and human capacity development, institutional reforms and adaptive research. Thereafter, the third medium-term plan (MTP III) (2003–2008) was developed to operationalize the first Strategic Plan (KARI 2000). The MTP III emphasised the commodity and factor approach to research and development. During this period, KARI generated improved technologies and information in response to the challenges of the agricultural sector. These included improved crop varieties, livestock breeds and natural resource technologies suited for small-holder farmers in different agro-ecological zones (AEZ). This work was supported by the Government of Kenya and a number of development partners including the European Union and the United States Agency for International Development (USAID). The latter supported the Agriculture/livestock Research Support Programme (ARSP II) and Strategic Objective 7 (SO7) in crops and livestock respectively (KARI 2009b). The World Bank, in turn, supported the Western Kenya Integrated Ecosystem Management Project (WKIEMP), the Desert Margins Project (DMP), and the first phase of the Kenya Agricultural Productivity Project (KAPP I) (KARI 2009b). Implementation of the plan was carried out in collaboration with other research organisations.

During MTP III, the Institute tremendously increased its efficiency and effectiveness, made significant advances in biosciences, and broadened its mandate through the merger of KARI with the Kenya Trypanosomiasis Research Institute (KETRI). KARI produced even more outputs in the form of crop and livestock technologies, information, and knowledge.

Several technological packages were released and/or recommended for commercialisation. These included 25 varieties of grain legumes, 18 varieties of maize, 14 varieties of flowers, 13 varieties of rape seed, 9 varieties of wheat, 6 varieties of sweet potato, 4 varieties each of millet/sorghum and Irish potato, 3 varieties each of sunflower, cassava and groundnuts. Other achievements included conducting priority setting for all KARI centres, operationalization of the Planning Monitoring and Evaluation unit, enhanced capacity through post graduate training of scientists, and equipping laboratories. At the same time, application of knowledge of biotechnology to hasten technology generation earned KARI more sustainable sources of funding and led to development of a service charter and to capacity development in quality assurance.

Several challenges and constraints were, however, encountered during implementation of MTP III. These included low impact of research-generated technologies on farmers and other clientele; inadequate human and physical skills; inadequate funding; emerging issues such as climate change and new livestock/crop diseases, low use of information and communication technologies (ICTs); and socio-political issues such as HIV/AIDS, increasing poverty levels and political violence. These factors had a negative impact on the generation, dissemination and adoption of new technologies. The achievements, challenges and lessons learnt during the implementations of MTP III formed the basis of the development of KARI's 2010–2014 strategic plan and its implementation framework. In addition, as part of the search for the new strategy, the Institute also undertook two external programme reviews in 2003 and 2007 whose recommendations were taken into consideration in the preparation of the new strategic plan (KARI 2003b; KARI 2009b). In particular, recommendations relating to shortcomings in the administration and implementation of various programmes were used in formulating the new plan. Thus the KARI Strategic Plan (KSP) 2009–2014 was developed taking cognizance of these recommendations and in line with the policy and development alignments at international, regional and national levels (KARI 2009a). We will start by outlining these alignments in the next two sections of the paper.

### International and regional policy priorities

Regional and international development policies, strategies and priorities have changed over the last two decades. Consequently, Kenya's agricultural sector has had to change in tandem with these regional and international trends. At the international level, the agriculture sector is expected to deliver global commitments such as the achievement of the first Millennium Development Goal (MDG) 1 on poverty and hunger by 2015 (GoK 2005). At the regional levels as

well, agriculture has regained prominence in African policy agenda over the last decade. At the core of this renewed focus on agriculture in Africa is the New Economic Partnership for Africa's Development (NEPAD) which is an integrated socio-economic development framework for Africa (GoK 2010a). NEPAD has agriculture as one of the priority sectors for policy reforms and increased investments in Africa. In order to foster development of the sector, NEPAD launched the Comprehensive Africa Agriculture Development Program (CAADP) that provides an overarching framework for agricultural development in Africa (Kibaara et al. 2009; GoK 2010a). Among the resolutions formulated and signed by African Ministers under the CAADP framework was that African countries should devote 2 % of GDP to agricultural research and development. Kenya is one of the African countries that subscribed to the CAADP process and, as a result of the Maputo Declaration, the government of Kenya committed itself to increase the budget allocation to the agricultural sector from 4.5 % in 2008/09 to 8 % (Kibaara et al. 2009; GoK 2010a). These recommendations also form part of the government's national commitments as contained in the Strategy for Revitalising Agriculture (SRA), the Agricultural Sector Development Strategy (ASDS) and Vision 2030 as discussed in other sections in this paper. They also informed the design of KARI's new strategic plan. Overall, the CAADP, by promoting R&D and the overall investment in agriculture, aims to promote agricultural production as a way of tackling the food insecurity problem.

Under the CAADP framework, two regional organizations, the Forum for Agricultural Research in Africa (FARA) and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), have provided a platform for KARI and other stakeholders to create and sustain strategic partnerships. FARA is responsible for promoting CAADP Pillar IV of improving agriculture research, technology dissemination and adoption. FARA also has five networking support functions, namely: advocacy and resource mobilisation; empowering researchers and end users through access to information, learning opportunities, and new technologies; promoting and facilitating policy analyses and market research; strengthening human and institutional capacity both public and private; and fostering partnerships and strategic alliances that will create the capacity for agricultural innovation (see [www.fara-africa.org](http://www.fara-africa.org)). FARA works with the sub-regional organizations such as ASARECA in delivering on this mandate. ASARECA is responsible for providing leadership in the implementation of CAADP Pillar IV in the region (see [www.asareca.org](http://www.asareca.org)). In addition to this responsibility, the overall mandate of ASARECA as a sub-regional organization is to serve the national agricultural research and extension systems (NARES) of the ten member countries in eastern and

central Africa, by adding value to nationally coordinated programmes, pooling resources for shared objectives and promoting efficiency through attainment of economies of scope and scale. ASARECA, through its Regional Competitive Grant System, has provided an avenue for collaboration among the NARS of member countries; and FARA, through continental events such as the November 2011 international conference: "Innovations in Extension and Advisory services: Linking knowledge to Policy and Action for Food and Livelihoods," that was jointly convened by KARI and international partners such as FARA, the Technical Centre for Agricultural and Rural Cooperation (CTA) and NEPAD (<http://extensionconference2011.cta.int/about>). Overall, KARI is expected take advantage of such partnership opportunities to provide the vehicle by which Kenya can improve household incomes and food security status, and thus reduce poverty and hunger. It is especially expected to engage in research partnerships that enhance the productivity and commercialisation of agriculture, hence its competitiveness regionally and globally.

### National policy environment

To facilitate the transformation of Kenya's smallholder agriculture from subsistence to commercial farming, the agricultural sector has undergone several reforms in the last decade. For instance, the Economic Recovery Strategy (ERS) for wealth and employment creation (GoK 2010a) emphasized economic growth and the creation of wealth and employment as a means of eradicating poverty and achieving food security. As a follow up to this strategy, the government published the Strategy for Revitalising Agriculture (SRA) (GoK 2004) which was the agriculture sector's response and contribution to the attainment of the goals of the ERS. The SRA set out to transform Kenya's agriculture from subsistence production to a profitable, commercially-oriented economic activity. The SRA set the target of agricultural growth at an average annual rate of 3.1 % during 2003–2007, to reach over 5 % by 2007. Implementation of this strategy was quite successful. Indeed, by 2006, agricultural sector growth had surpassed the SRA target: it grew at an average of 5.2 %, reaching a high of 6.4 % in 2007.

Following the expiry of the ERS, the government formulated the Vision 2030 (GoK 2007) as the new long term development strategy for transforming Kenya into a globally competitive and prosperous country with a high quality of life by the year 2030. Vision 2030 is anchored on three pillars, namely, economic, social and political. It identifies agriculture as a key sector to deliver the 10 % annual economic growth rate envisaged in the economic pillar. The government, through Vision 2030, expects the agricultural sector to achieve an average growth rate of 7 % per year over 5 years by increasing crop and livestock

productivity based on the recommendations from the national agricultural research organizations. These expectations are premised on the strategy that seeks to improve productivity by i) transforming land use by utilising idle land for productive agricultural production, and ii) developing arid and semi-arid lands (ASALs). Vision 2030 therefore proposes intensified application of Science, Technology and Innovations (STI) to raise productivity and efficiency across the three pillars and recognises the critical role played by research and development in accelerating economic development. As part of the implementation of Vision 2030, more resources have been devoted to scientific research and the building of technical capacities of the workforce. Indeed the government has facilitated the development of an STI policy.

To contribute to the attainment of the objectives of the Vision 2030, the agricultural sector-related ministries together with the private sector formulated the Agriculture Sector Development Strategy (ASDS) to succeed the SRA and build on its achievements (GoK 2010b). The ASDS guides public and private sectors in addressing major development challenges facing the agricultural sector. Moreover, it is expected to position the agricultural sector as a key driver in achieving the 10 % annual economic growth rate envisaged under the economic pillar of Vision 2030. Besides ensuring food and nutritional security for all Kenyans, the strategy aims at generating higher incomes as well as employment, especially in the rural areas. Although much was achieved during the SRA period, the challenges of food security, poverty reduction and transforming agriculture from subsistence to farming as a business (i.e., agribusiness-oriented, transparent markets, efficient use of inputs and agricultural credit) still remain. It advocates the strengthening of research, extension and training to “ensure demand-driven research and effective application of research technologies on the farm” (Bolo and Makini 2011). Like the SRA, the ASDS calls for pluralism in delivery of extension services to ensure that technologies are taken up at the farm level. Indeed, the Government of Kenya, as a result of these policy changes, changed the National Agricultural Extension Policy (NAEP) to the National Agricultural Sector Extension policy. The NASEP focuses on commercialization and privatization of extension services, and the regulation, coordination and monitoring and evaluation of extension systems and structures for resource mobilisation (Bolo and Makini 2011).

In addition, there are other agriculture and health sector policy developments that are crucial for the promotion of food security. One of these is the new Food Security and Nutrition Policy (FSNP) that is in an advanced stage of being developed and is supposed to provide an overarching framework covering the multiple dimensions of food security and nutrition improvement (GOK 2009). It is based on the premise that all Kenyans, should, throughout their life-cycle enjoy at all times

safe food in sufficient quantity and quality to satisfy their nutritional needs for optimal health. The objectives of the FSNP are: (i) to achieve good nutrition for optimum health of all Kenyans; (ii) to increase the quantity and quality of food available, accessible and affordable to all Kenyans at all times; and (iii) to protect vulnerable populations using innovative and cost-effective safety nets linked to long-term development. The FSNP addresses associated issues of chronic, poverty-based food insecurity and malnutrition, as well as the perpetuation of acute food insecurity and malnutrition associated with frequent and recurring emergencies, and the critical linkages among these phenomena. These issues include food availability and access; food safety and quality control; nutrition improvement; school nutrition and nutrition awareness; food security and nutrition information and the implementation arrangements that go with these.

In the light of all these policy developments, Kenya needs effective country-based strategies to sustain a long-term growth rate and ensure food security, poverty reduction and sustainable development. Agricultural research was identified as one of the strategies to increase agricultural productivity and KARI is expected to play a leading role in this respect. The KARI Strategic Plan 2009–2014 was therefore intended to align KARI’s goals to current, new and evolving policies and institutions while taking advantage of emerging opportunities to meet Kenya’s development goals and objectives.

### **The KARI strategic plan 2009–2014**

In line with the induced innovation theory, KARI developed the new strategic plan (KSP) 2009–2014 in response to the policy and development alignments at national, regional and international levels (KARI 2009a). The plan was intended to align KARI to current, new and evolving policies and institutions while taking advantage of emerging opportunities to meet Kenya’s development goals and objectives. The plan aims to position KARI strategically as a key driver in facilitating the agricultural sector to achieve an average growth rate of 7 % per year over 5 years as stipulated in Vision 2030. It is also designed to contribute significantly to resolving the four challenges outlined by the ASDS and Vision 2030 as some of the main causes of food insecurity in Kenya. These include low productivity, under-utilisation of land, poor markets and lack of value addition. In the new strategic plan, KARI envisions a commercially-oriented and competitive agricultural sector propelled by science, technology and innovation. Indeed, KARI’s new mission is to contribute to increased productivity, commercialisation and competitiveness of the agricultural sector through generation and promotion of knowledge, information and technologies that respond to clients’ demands and opportunities (KARI 2009a). The new strategic plan

adopted the Agricultural Product Value Chain (APVC) approach to research for development which is a major shift from earlier focus on commodities/factors to focusing on differentiated agricultural products and markets.

To achieve this mission, five institutional-level goals focusing on sustainable agricultural product value chains have been identified. These are: i) generating and promoting technologies and innovations; ii) developing and promoting markets and marketing strategies; iii) facilitating and advocating policy options; iv) strengthening capacity for value chain research; and v) enhancing availability of knowledge, information and technologies. These goals are to be achieved by pursuing six thematic research areas of intervention, namely: crops; livestock; integrated natural resource management; biotechnology and genetic resources management; socio-economic and applied statistics; and adaptive research, outreach and partnerships. These thematic areas have been rationalised to deliver on the five key institutional goals. A schematic arrangement of the relationship through each thematic area to the overall goal and impacts is shown in Fig. 1.

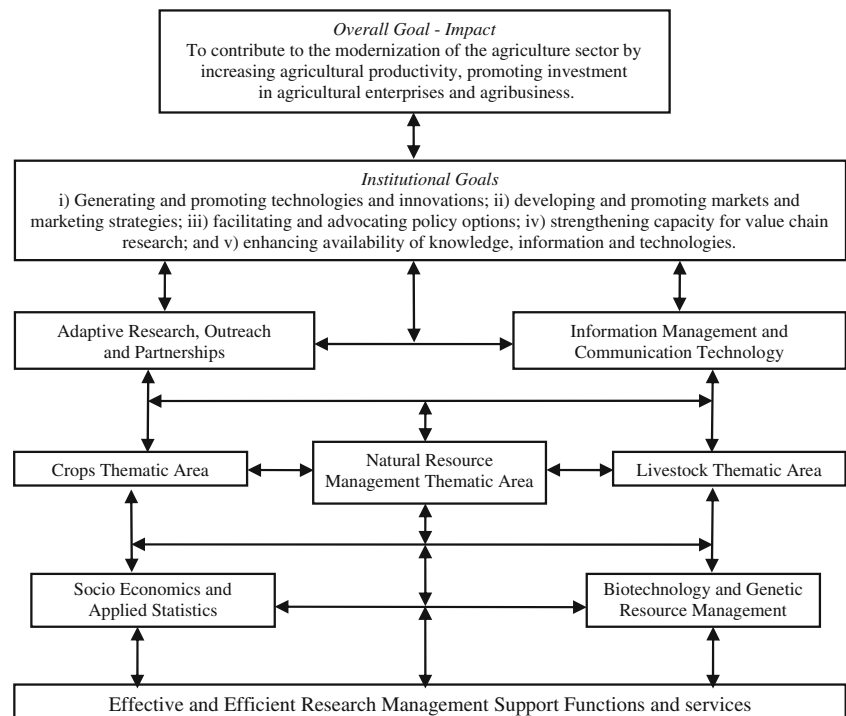
To operationalize the strategic plan, KARI has also designed an implementation framework covering the same period (KARI 2009b). The KSP recognises that successful implementation of the institutional level results will depend, to a large extent, on the corporate support functions and has identified the capacities and competencies that are required to achieve its goals. These include: human resource and physical development and management; procurement and supplies services; planning, monitoring and evaluation; internal financial and assets

audit; corporate and legal services; information management and communication technology (KARI 2009a). KARI is required to comply with government regulations in all of these areas to ensure that administrative feasibility is improved. It is also required to reduce complexity in key areas that can hinder scientists from implementing projects and programs effectively. For example, the procurement and supplies service is one area that determines timely and effective implementation of projects and programs through provision of equipment and services for conducting research.

### The agricultural product value chain approach

A value chain has been defined variously by different authors. Kaplinsky and Morris (2001) defined value chain as the full range of activities that are required to bring a product (or a service) from conception, through the different phases of production, up to delivery to the final consumers and disposal after use. Simons et al. (2008), on the other hand, define value chain as a tool for analyzing the nature and source of value within a supply chain. A value chain fosters synergies among value chain actors. It facilitates the provision of information needed to coordinate and optimize activities across and among firms (Dekker 2003). A value chain is therefore said to exist when all the stakeholders in the chain operate in such a way as to maximize the generation of value along the chain (SIDA 2007). In the context of agriculture, a value chain includes what is grown, how it is grown, and what happens to it from production through the

**Fig. 1** Thematic areas of research aligned to institutional results and impact. Adapted from KARI 2009a



market to consumption, including all the points along the chain where value is added. It entails planting, fertilizing, producing, processing, milling, storing, and transporting. It also encompasses all the people and systems involved in moving the product from farm to market, including traders, intermediaries, wholesalers, shops, retailers, and restaurants. As a value chain does not exist in isolation, the background context (including policies, consumer choices, and gender issues) must also be taken into consideration (Academy for Education Development (AED) & FAO 2011).

KARI's interest in the value chain approach stems from the fact that it has been singled out as one of the paths out of poverty (von Braun and Pandya-Lorch 2007). The approach has the potential to facilitate the transition from subsistence farming to increased market-oriented production. Omiti et al. (2009) in explaining the rationale for agricultural commercialisation stated that market-oriented production entails modernization of the agricultural value chains, which depends heavily upon the intensification of production processes, adoption of new technology and farm mechanization. They emphasize the importance of agricultural value chains by stating that as the marketed share of agricultural output increases, input utilization decisions and output combinations are progressively guided by profit maximization objectives of the value chain actors. This implies that agricultural commercialization is driven by the systematic substitution of non-traded inputs with purchased inputs, the gradual decline of integrated farming systems, and the emergence of specialized high-value farm enterprises, all within an integrated value chain (Nambiro et al. 2007). Indeed, previous authors suggest that value chains tend to be highly coordinated and integrated (Dolan and Humphrey 2000; Okello and Swinton 2007). This, in turn, suggests that spurring commercialization of agriculture should necessarily target the development of the value chains of the major commodities.

Developing the value chains for the production and marketing of agricultural commodities is especially necessitated by the need to feed a growing population with decreasing size of farms (mainly due to land fragmentation brought about by population pressure), as is the case in Kenya. Indeed, improving the production and marketing under the value chain framework are the two major aspects singled out as being key to improving food supply (Brüschweiler et al. 2007). In an ideal setting, stimulated by growing demand and attractive prices, producers invest in new technologies, which, in turn, increase production and raise household incomes. Improvements in household income then contribute to food security by enhancing the ability of such households to purchase food (Okello et al. 2011; FAO 2011). It can also lead to increased supply of quality food especially where the chain is integrated and closely coordinated as in the case of high value export chains (Dolan and Humphrey 2000; Narrod et al. 2009).

Moreover, improvement in value chain results in the creation of new jobs along the value chain continuum at local level and can especially be useful in targeting women's employment in certain subsectors of agriculture (Bariantos et al. 2003). The establishment of value chains thus contributes not only to the food security of participating households and generation of profits for producers and intermediaries, but also guarantees employment and a more reliable supply of food for urban populations in terms of both quantity and quality (von Braun and Pandya-Lorch 2007; AED & FAO 2011).

These advantages of the value chain approach and the desire to contribute to achieving national food security were instrumental in informing KARI's decision to adopt the APVC approach in the implementation of its research programs and projects. However, turning the strategic decision into action can be challenging and warrants caution. This is because of the human and technical imbalances between researchers dealing with production-boosting research and those addressing post-harvest systems, marketing, and product-value chains analysis in general. That is, the efforts aimed at generating new technologies for improving crop yields may not be matched with those targeting the improvement in post-farm value chain activities. At the same time, complex organizational and coordination issues, as well as the strategies and power relations of the different actors in the chain, can severely undermine the effectiveness of efforts targeted at developing agricultural value chains. In addition, there is evidence that as some value chains become more organized, women and youths can easily be left behind unless gender is mainstreamed in the design, implementation and impact assessment during the value chain development, and strategies to prevent women and youths from being side-lined are clearly designed and implemented (Laven et al. 2009). Indeed, Okello et al. (2011) found that under a closely coordinated value chain, food safety and market standards tend to exclude asset-poor farmers, the majority of whom are women and children.

The foregoing indicates that KARI had to necessarily identify, build and sustain effective and efficient strategic partnerships in order to implement successful value chains and achieve its goals. Such partnerships must strive to develop pro-poor agricultural value chains to ensure that value chain development does not leave poor households more food insecure. Indeed, food security depends mainly on efficient organization and close collaboration between local communities, civil society, decentralized administrative units and governmental services such as research and extension (Brüschweiler et al. 2007; Narrod et al. 2009). Below, we discuss partnerships, market linkages and gender as key components of value chains that are often overlooked in the pursuit of food security and in the KSP. This is not to imply that all the issues and functions identified in the KSP are less important, but it is based on

observations and past experiences relating to the perceived understanding of these three areas and progress made in implementation of the APVC approach by KARI. First, though, we briefly discuss the APVC implementation process.

### The APVC implementation process in KARI

The KARI APVC process was categorised into three subsectors: food crops, horticulture and industrial crops, and livestock. This categorization was based on the fact that these subsectors hold the commodities with greatest potential for contributing to food security while at the same time providing employment to poor smallholder farmers including women and youths. At the same time, it is the need to increase production (hence improve household food security) that induced the search for new model agricultural development as proposed by the induced innovation theory. The other programs such as natural resource management, biotechnology and genetic resource management, socioeconomics and adaptive research, outreach and partnerships are cross-cutting in nature. As part of the APVC implementation process, subsector review teams were constituted and their capacity built following the eight steps that form the APVC implementation approach/process (see Fig. 2). Each step of this process was designed as a deliverable milestone towards the overall outcome. The first step involves an extensive review of the sub-sectors to identify the status quo. The next step is the selection of specific focal/priority value chains.

To identify the priority value chains, the commodities within each of the sub-sectors were subjected to predetermined selection criteria developed through extensive consultations within KARI and externally. The criteria used for the selection of priority value chains and their respective weights were: competitiveness potential-25, impact potential-20, contribution to agricultural GDP-15, opportunities for intervention-15, contribution to quality of environment-15 and social welfare-20. Following this process, commodity chains for each of the crop subsectors were selected. Various

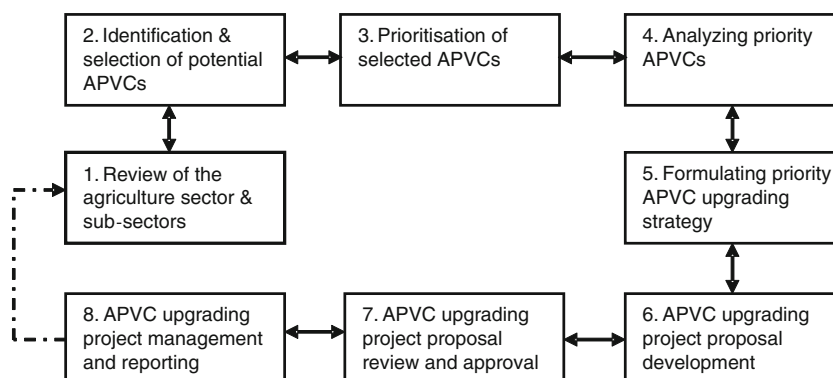
priority values chains were identified for each of the broad commodity groups of fruits, vegetables, flowers and medicinal and aromatic plants (for horticulture); oil crops, nuts, fibre crops and botanicals (for industrial crops); and cereals, root and tuber crops, grain legumes (for food crops). In the case of livestock, fourteen value chains covering ruminants, non-ruminants and others such as the honey bee and emerging livestock were also subjected to this selection.

As the next step, the findings of the value chain analysis were shared with stakeholders for validation of the priority values and challenges, and formulation of value chain upgrading strategies. The process identified those strategies that should be taken up by KARI to unlock the potential of the respective value chains. Once these intervention areas were identified, this was followed by calls for proposals by multi-disciplinary teams, proposal development, review and approval. This process ensured that the best teams were selected to address the researchable issues identified in the respective value chains. The last steps were the project management and reporting which is not an end in itself since the APVC research cycle continues, as represented by the dotted arrow in Fig. 2. These steps are on-going and are at different stages of implementation. The speed and success of the implementation of APVC will depend a great deal on the management and the extent to which the scientific and support staff are committed to embracing the KSP. There are sufficient resources already allocated by the KARI management to facilitate this process, and with rigorous planning, this should speed up the implementation process of the KSP.

### Partnerships

Partnerships have been defined in various ways. Boddy et al. (2000) defined partnerships as a situation in which there is an attempt to build close, long-term links between organizations that remain distinct but which choose to work together. Hocdé et al. (2009) defined them as a set of formalized linkages established among actors in a given

**Fig. 2** Steps for implementation of the APVC approach in KARI. Source KARI 2009a





territory to federate means (material and immaterial) around projects or programmes constructed jointly to achieve shared objectives. In broad terms, partnerships are inter-organizational working relationships characterized by several features (Casey 2007), which include an emphasis on shared vision and decision-making among other attributes. The ASDS states that, with the responsibilities of the agricultural sector currently spread across 10 ministries, partnerships are key and emphasizes the need for collaboration with several other ministries and stakeholders. Thus, the implementation of ASDS requires strong partnerships among government agencies, the private sector, development partners and other non-State actors (GoK 2010b). A sector-wide approach and strong coordination mechanisms will be instrumental in the success of the strategy. The KSP also recognises that impact orientation requires a continuous negotiation of new partnerships and renegotiation of services demanded by partners and/or clients and their adaptation. Therefore, active partnerships need to be cultivated to ensure that the concerted efforts are geared towards one common purpose namely, to create impact on food security. KARI has thus recently created the Directorate of Outreach and Partnerships to ensure that the organisation's initiatives involve multiple sectors and partners along the APVC. This department aims to adapt technologies to the users' environments, and promote and catalyse their uptake in partnership with diverse actors in the APVCs. Strengthening old partnerships and developing new ones is intended to harness the synergies of various partners currently working on promoting agricultural development to spur greater improvement in agricultural productivity and hence food security. However, in order to strengthen partnerships, KARI will need to take a number of issues into consideration.

First, KARI does recognize that the private sector is a critical partner in advancing research and development goals. However, the private sector should be involved systematically and early in the development of projects and programs. Engaging the private sector in planning and execution of plans and strategies can enhance the overall effort and in many cases improve the rate of success in achieving desired outcomes (Hall et al. 2004; AED & FAO 2011). Early involvement of the private sector creates opportunities for expanding markets for agricultural goods and services (AED & FAO 2011). These markets in turn generate jobs, improve labour standards, and raise incomes; all of which have a direct and positive impact on household food security. Thus, there should be a clear linkage between the private sector, researchers, extension service providers (ESPs) and farmers. This makes ESPs, both public and private, key implementing partners for KARI. Muyanga and Jayne (2008) and Bolo and Makini (2011), for instance,

argue that the quality of advisory services by the different ESPs is dependent on the ability to interpret the latest technological developments and innovations and to emphasize the need for partnership. At the same time, the ASDS states that effective adoption of technology packages will require a participatory approach to extension, which involves a multiplicity of actors (GoK 2010b). Successful research and development initiatives inevitably involve multiple sectors and require mutual respect among all parties involved.

Second, partnership commitment (trust and reciprocity, accountability and adherence to timelines) has been cited as one of the key elements to successful partnerships (Wildridge et al. 2004). For KARI to take on board new and strategic partnerships, the process of drawing contracts between partners should take priority within the outreach and partnerships division with critical input from the corporate and legal services. Lastly, KARI needs to design mechanisms for effective communication, conflict resolution and reflective evaluation (Sanginga et al. 2007) amongst partners because any concerns about stakeholder motives must be resolved or they could jeopardize desired outcomes. Indeed Hodge et al. (2009) state that providing or negotiating enough time for partnerships to evolve is critical to enhance mutual knowledge and learning by individuals and institutions in order for them to adjust to each other's vision and behaviour. This can be achieved if they are given time to periodically re-visit their strategic aspects such as objectives, modes of operation, roles and responsibilities of each partner.

## Markets

Markets are arguably the main motivating factor for producers, traders, carriers/transporters, and service and processing enterprises to organize effective value chains which, in turn, are needed to promote food security. Food-insecure people neither consistently produce enough food for themselves nor have the purchasing power to buy food from other producers. Therefore, strengthening and restructuring markets and market linkages is central to attaining food security (Olwande and Mathenge 2010). Fafchamps and Hill (2005) and Omiti et al. (2009) argue that most farmers in rural areas do not participate effectively in efficient value chains with better paying markets that offer them opportunities to increase their incomes. For such farmers, especially the smallholders, markets for agricultural products and essential services such as credit, technical advice and agricultural insurance tend to be thin, fragmented and undeveloped (Okello et al. 2010). Doing business in such markets entails high transaction costs which impede agricultural exchange (Barrett 2006). As postulated by the induced innovation hypothesis, it is the demand by the public sector (agriculture ministry) strategies

that will make markets work better for smallholder farmers which drove KARI to look for more efficient alternative marketing strategies that embrace the value chain approach. KARI therefore plans to promote efficient value chains by fostering stronger linkages by farmers to better and more efficient markets. It especially seeks to pursue the strategies outlined in Vision 2030 which advocates improving existing markets, creating new ones, and increasing Kenya's bargaining power in regional and international agricultural markets.

Given that smallholder farmers are KARI's main clients, the Institute's focus is on pro-poor agro-enterprise development and the generation of market-preferred technologies that aim to improve yield while also addressing the other non-yield attributes that farmers and consumers value. Such attributes include taste, cooking ability, shelf life, pest and disease resistance and price fetched in the market (Otieno et al. 2011). KARI also promotes marketing strategies that resolve some of the constraints that farmers face, namely the high transaction costs (Fafchamps and Gabre Madhin 2006). It plans to achieve this by, among others, partnering with producer organizations and building their social capital (by fostering closer relationships and networks) to facilitate their participation in markets. KARI intends to do this in two ways: First, by pursuing appropriate approaches for linking smallholder farmers to efficient markets and, second, by partnering with organizations that have the comparative expertise in mobilizing smallholders into effective marketing units.

The participatory market chain approach has proved effective for strengthening innovation capacity of smallholder farmers and for developing market chain innovations that benefit such farmers as well as other market chain actors in other countries (e.g., Uganda) (Horton 2008). Borrowing from these positive experiences, KARI, through the projects named 'Pro-poor agro-enterprise development for sustainable rural livelihoods', 'Making agri-food systems work for the rural poor in Eastern and Southern Africa' and, the newly launched initiative, 'Innovating for resilient farming systems in semi-arid Kenya', is partnering with pro-market development agencies that have the comparative advantage in Participatory Market Systems Development (PMSD). The main aim of these partnerships is to develop the knowledge, attitudes, skills, and social capital that are potentially valuable assets for stimulating future innovations in market chains and strengthening the position of poor farmers (including women) in agricultural value chains. In order to achieve these goals, KARI has been building partnerships and bridges with other organizations. PMSD is based on the premise that markets are complex and dynamic and that it is necessary to adopt a systematic approach to pro-poor market development that entails taking critical account of actors, the relationships among them and the context that influences how they behave and interact in the market (USAID 2008). These contextual

factors include formal and informal institutions, infrastructure and natural resources. It is envisaged that this partnership will provide useful inputs to the implementation of the institutional level result of developing and promoting markets and marketing strategies for APVCs.

## Gender

Gender differences, arising from the socially constructed relationship between men and women, affect the distribution of resources between them and cause many disparities in development outcomes. In the agriculture sector, gender inequalities in access to and control over resources, which are defined by culturally specific roles, continue to undermine a sustainable and inclusive development of the sector (World Bank, FAO & IFAD 2009; Meizen-Dick et al. 2011). Evidence suggests that households do not act in a unitary manner when making decisions or allocating resources (Alderman et al. 1995; Haddad et al. 1997). This means that the extent to which rural men and women are able to take up innovations from research is dependent on gender relations and power dynamics that differentially limit or facilitate their access, control, and ownership of the five capital assets - human, physical, financial, natural and social (Meizen-Dick et al. 2011). However, rural women are often constrained by unequal access to productive resources and services, even though evidence has shown that when women control income, they spend more of it on food, health, clothing and education for their children than men do (FAO 2011). The limitations women face in turn impose huge social, economic, and environmental costs on society as a whole and rural development in particular including lags in agricultural productivity (Hill 2011).

It has been demonstrated that giving women the same access to productive resources, technologies and services, as men, could increase agricultural productivity and ultimately, household food security and general welfare (Quisumbing and McClafferty 2006; Morrison et al. 2007). Studies in Kenya by the World Bank (2005a) indicated that giving women farmers the same inputs and education as men could increase yields by more than 20 %. Similarly, Quisumbing (1996) found that if women farmers in Kenya had the same access to farm inputs, education, and experience as their men counterparts, their yields for maize, beans, and cowpeas could increase by as much as 22 %. Also, the World Bank (2007) found evidence in Burkina Faso, Kenya, and Tanzania that providing women producers and entrepreneurs with the same inputs and education as men could increase their output and incomes by an estimated 10–20 %. Worldwide data further indicate that if women had the same access to productive resources as men,

they could increase yields on their farms by 20–30 % (FAO 2011). This could raise total agricultural output in developing countries by 2.5–4 % (FAO 2011). These studies demonstrate the need for integrating gender concerns into commodity value chains. However, doing so requires that a clear focus be put on changing/redesigning programs likely to exacerbate gender inequalities while encouraging programs with the best prospects for reducing gender inequalities and gender related vulnerability. Further, programs should aim at addressing cases where gender relations might constrain access to markets or reduce the benefits of participating in agricultural value chains (Bolwig et al. 2008).

Njenga et al. (2011) argued that achieving gender equality requires change not only in research targeting, system mapping, and diagnosis and intervention, but also in the institutional culture of the research organizations, to ensure that both men and women have a voice in shaping research and development in their societies. However, entrenching gender mainstreaming in policies and organizations such as KARI and their research agendas remains a challenge (Njenga et al. 2011). For instance, recent studies stress that women's representation and gender integration into national plans and agricultural sector strategies remain a challenge (World Bank 2005b). For example, in Africa, when NEPAD urged African governments to increase spending on agriculture by 10 % of their national budgets, the discussions neglected to commit to women farmers the resources to strengthen their roles in the agricultural economy (Mehra and Rojas 2008). This neglect is evident also in the KSP because it lacks a strategy for mainstreaming gender in the Institute and in research programs (KARI 2009a, 2009b). To overcome this requires political will, accountability, a change in organizational culture, and technical capacity as no organization is gender neutral. There is also a need to integrate gender in key areas such as technology design, development, packaging and transfer, and planning, monitoring and evaluation (PM&E). KARI should therefore re-focus and factor in gender in the implementation of KARI's programs by upgrading its current efforts on gender institutionalization with a clear mainstreaming strategy that encompasses the following: reinforcing the awareness and capacity of staff on gender mainstreaming; integrating gender as a transversal theme in programmes and projects; implementing gender specific programmes; promoting equal opportunities internally and holding all staff accountable to gender integration in their research activities.

## Summary and conclusions

The primary objective of this paper was to review KARI's new strategic plan developed to steer its programs from

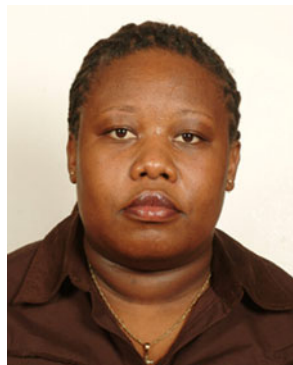
2009 to 2014. The paper draws from induced organizational innovation theory to discuss the strategic plan in the context of the national, regional, and global development goals. It then discusses the agricultural product value chain approach currently being implemented by KARI in pursuit of its primary objective of promoting agricultural growth and hence food security in Kenya. To realize its goals under the new strategic plan, KARI will need to build strategic partnerships that enable it to harness synergies and take advantage of strengths of its partners in realizing its goal of food security improvement. The value chain approach provides an opportunity to identify and resolve the idiosyncratic failures faced by smallholder farmers, who form the bulk of KARI's clients. KARI will also need to refocus attention in mainstreaming gender into its programs. Studies indicate that availing similar amounts of resources to women can greatly enhance agricultural productivity. Hence failing to mainstream gender into programs cuts out a group with the greatest potential to spur greater commercialization of the sector, and thereby weakens the drive towards the achievement of KARI's overall objectives in this regard. Given the nature of agriculture in Kenya, the primary incentive for effective and timely implementation of the new KARI strategic plan and other government policies should be to implement pro-poor and gender inclusive small farm growth strategies that specifically target the smallholder farmers. This will, in turn, require improving access by such farmers to improved technology and complementary resources, good institutional and policy environment and well-functioning markets.

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**Dr. Maureen K. Miruka** is a Senior Social Research Scientist at the Kenya Agricultural Research Institute. She holds a PhD in Natural Resources from the University of Greenwich, London, UK. Her current research interests are based on socio-economic issues and their effect on agricultural development and poverty reduction. Specifically, she is involved in livelihoods based research focusing on gender, social organization, building partnerships and local capacity for integrated natural resource management.

She is the team leader of two projects on i) Pro-poor Agro-enterprise development for sustainable rural livelihoods and ii) Mainstreaming Agricultural Agrobiodiversity for improved nutrition and well-being. Her other commitments are: co-team leader in a project on 'Making Agri-food systems work for the rural poor in Eastern and Southern Africa', Kenya component; KARI's coordinator responsible for institutional and research gender mainstreaming; and gender stream leader for three other projects. In addition, she sits on three policy making committees on Medicinal Plants, Urban Agriculture and HIV/AIDS, representing KARI and the Ministry of Agriculture.



**Dr. Julius Juma Okello** is a Senior Lecturer and the Coordinator of the Agribusiness Management Program in the Department of Agricultural Economics, University of Nairobi, Kenya, and also a World Bank and Food and Agriculture Organization (FAO) consultant. He earned his PhD in Agricultural Economics from Michigan State University with specializations in international agricultural development, agricultural marketing and resource and environmental economics. His current research focuses on the

role of ICT in linking smallholder farmers to high value domestic and international markets, food safety and risk and sustainable management of natural resources. Some of his publications include "From circle of poison to circle of virtue: Pesticides, export standards and Kenya's green

bean farmers”, *Journal of Agricultural Economics* (2010); “The role of ICT-based market information services in spatial food market integration: The case of Malawi Agricultural Commodity Exchange”, *International Journal of ICT Research and Development in Africa* (2011). Dr. Okello is currently coordinating an IDRC funded Africa-wide project on effectiveness of ICT on promoting smallholder farmer commercialization and household food security. He also coordinates a project that is using Participatory Geographical Information System (P-GIS) to promote sustainable management of natural forests. He has, in the past, worked for various other international organizations including Oxfam (America), International Livestock Research Institute and International Food Policy Research Institute as a consultant. Dr. Okello is also a member of the Agricultural Sector Coordination Unit, a Government of Kenya advisory think tank.



**Ms. Violet Kirigua** is a Programme Officer attached to the Horticulture and Industrial Crops Division at KARI Headquarters in charge of the Horticultural Crops Research Programme. Her educational qualifications include: Diploma in Horticulture and a Masters Degree in Food Industry Management and Marketing. Her responsibilities in KARI include co-ordination, planning and monitoring of the national horticultural crops research programme. In addition, she is involved

in Strategic Management and has been instrumental in the development of Strategic Plans for various research institutions. She is a member of the Inter-Ministerial Committee on Traditional Medicine and Medicinal Plants whose terms of reference include

development of proposals for policy guidelines; Task Force member of Prolinnova Kenya; and a Member of the Horticulture Research Fund Steering Committee that reviews and recommends research proposals aimed at facilitating trade in the horticultural industry. She is currently pursuing a PhD in Agribusiness and Trade at Kenyatta University.



**Dr. Festus M. Murithi** is an Agricultural Economist employed by the Kenya Agricultural Research Institute (KARI). He obtained his BSc (Agriculture) and MSc (Agricultural Economics) degrees in 1985 and 1990, respectively from the University of Nairobi and his PhD in Agricultural Economics from Reading University in 1998. He was employed by KARI in 1985 and has been an Assistant Director in charge of the Socio-economics and Applied

Statistics Programme since 2000. His current responsibilities include coordination of socio-economics and applied statistics research activities in the Institute. These include: agricultural product value chain analysis and priority setting, economic and social assessments of technologies, adoption and impact assessments, market research, policy analysis, and provision of statistical inputs. He is also involved in issues of institutional development and management including sourcing and allocation of financial resources; monitoring and evaluation; staff management; and establishment of appropriate partnerships.