

Review

Production and marketing of rice in Kenya: Challenges and opportunities

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Rice farming remains an important concern in Kenya due to its positive impact on increasing household food security, raising farmer's income as well as reducing risks in the years of poor weather conditions. Currently, the demand for rice in Kenya outstrips its production, a gap that is filled through imports. Thus, increasing rice production and productivity in Kenya requires a number of measures to be put in place such as providing improved rice varieties that are attractive to farmers and consumers, and technical support to both public and private sectors which may inform on a wide range of policy issues such as promoting investment, land and water use management, market and pricing information and extension services. In order to integrate, promote and upgrade the existing rice agribusinesses in the country; there is need for the rice entrepreneurs to have easy access to financial services that will provide sustainable affordable funds. The possible factors that constrain the rice sub-sector trading include low production, high competition from cheap rice imports, changing consumer preferences and government policy restrictions. Bearing in mind such limitations, there still exists a significant market opportunity in the sector and with the right support either from government or donor funding, Kenya's rice demand can be met.

Key words: Rice, production, imports, marketing, Kenya.

INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important agricultural food crops for more than half of the world's population. Globally, about 150 million hectares is estimated to be under rice cultivation with an annual production of 500 million metric tons. The area under rice represents 29% of the total output of grain crops worldwide with Africa accounting for about 10 to 13%

(Tsuboi, 2005; Onyango, 2006). Currently, rice is grown in over 75% of the 54 African countries and its territories, with a total population of nearly 800 million people depending on rice for their food and livelihoods (Africa Rice Centre, 2009). Rodenburg and Demont (2009) reported that rice is the fifth most important cereal in terms of acreage and fourth in production in sub-Saharan

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Africa (SSA).

The demand for rice has increased steadily in the recent decades thus, playing a major role in the strategic food security planning policies for several countries. According to FAO (2015), 741.3 million tons of paddy rice was harvested from 164 million hectares in the world in 2014 with China and India accounting for approximately 50%. In SSA, production of rice increased from 8.6 to 21.6 million tons between 1980 and 2006 (FAO, 2007). The increase in rice output is attributed to land expansion, increase in both population and incomes and due to changing of consumer preference in favor of rice in urban centers (Kijima et al., 2006; Balasubramanian et al., 2007; Africa Rice Centre, 2008). Becker and Johnson (2001) reported that nearly 90% of rice in Asia is grown under paddy field conditions; in contrast, approximately 60% of rice in SSA is grown in upland ecosystems.

In Kenya, rice demand exceeds production and the gap between production and consumption is filled through imports to meet the domestic demand at a huge cost. The current rice production is estimated at 150,000 metric tons from about 25,000 hectares of land (Kenya Bureau of Statistics, 2016). The rice output meets only about 20% of the total demand, with rice consumption projected to rise with increasing population and changes in eating habits (Atera et al., 2011). Annual rice consumption is approximated at 550,000 metric tons (Kenya Bureau of Statistics, 2016) and it is increasing at an annual rate of 12% as compared to 4% for wheat and 1% for maize, which is the main staple food (Ministry of Agriculture, 2008). The market requirement of rice is set to increase to 517.5 million ton by 2030 (Ministry of Agriculture, 2010). In order for Kenya to attain self-sufficiency in rice production by 2030, the total domestic rice production must increase at the rate of 9.3% per annum (Ministry of Agriculture, 2008). To enhance rice production and hence boost food security, Kenya's policy makers must understand the impediments that exist across the rice value chain and import process and explore the opportunities that may exist within the value chain that will benefit all the stakeholders

This paper aims at highlighting the constraints that rice agribusinesses/entrepreneurs face within the Kenyan rice value chain which are largely divided into three categories: agro-ecological, technological, and socio-economic. These constraints will provide a deeper understanding of Kenya's rice value chain as well as the myriads of rice marketing channels. This paper will recommend suitable policy remedies that may help boost rice production and marketing in Kenya.

BANKING ON RICE FOR THE FUTURE

History of rice in Kenya

Historically, rice has long been perceived as a cash crop

for the rural population where it is grown, however, that perception is changing rapidly with many communities now appreciating the importance of rice as a food crop as well as an important source of income. This change in perception has greatly influenced the balance between production and consumption of rice in many African countries (Olembo et al., 2010). Rice production in Kenya dates back to 1907 when it was introduced by Europeans at the Coast (Onyango, 2014). There are three main value chains found in the Kenyan rice sub-sector: the integrated large farm chain, the highly concentrated chain on the National Irrigation Board (NIB) schemes, and the traditional market value chain of the non-NIB irrigated production and rain-fed producers.

There are several rice cultivars that have been released to farmers for both upland and irrigated conditions. The first dominant rice variety in Kenya is the irrigated aromatic rice Basmati 217. Other traditional irrigated rice cultivars grown by farmers include Sindano, ITA310 and BW196. The Basmati 370 was introduced to farmers as an irrigated aromatic variety in the country in the late 1990s as an improved variety. African Development Bank (ADB) funded a program known as the West Kenya Rain-fed Rice Development project (WKRRDP) to promote upland rice in Kenya. The program was implemented by the Lake Basin Development Authority (LBDA) in the Lake Victoria Basin Region between 1989 and 2000. The WKRRDP program had several components such as provision of extension services and credit to rice farmers, construction of a rice mill, and adaptive research (Lake Basin Development Authority, 1991). Through the collaborative efforts of the Kenya Agricultural and Livestock Research Organization (KALRO) and the Ministry of Agriculture, Livestock and Fisheries, the program released Dourado precoce and IR 2793 varieties to farmers.

The New Rice for African (NERICA) developed by African Rice Center (ARC) is an inter-specific hybridization of *Oryza glaberrima* and *O. sativa*. These cultivars combined the hardiness of the African rice with the productivity of the Asian rice to develop NERICA, which has provided a window of opportunity in SSA to reduce hunger. The NERICA cultivars were released to Kenya by ARC in 2004 for adaptability trials. Among the eighteen NERICA cultivars tested, four (NERICA1, NERICA4, NERICA10 and NERICA11) were found to be suitable and were released to farmers in 2008. The yield of the NERICAs' ranged from 3.5 to 5.0 t/ha. In 2014/2015 crop year Bayer East Africa in conjunction with Lake Basin Development Company (LBDC) and National Irrigation Board (NIB) tested the performance of hybrid rice varieties Arize Tej Gold and Arize 6444 Gold at Bunyala and West Kano irrigation schemes and found them promising in transforming the rice sub-sector (Table 1), since they have high tillering capacity of 20 to 35 tillers per plant, high yields of between 8 and 10 ton per ha and have a milling rate of 60.1%.

Table 1. Potential of hybrid rice varieties in comparison with local variety at Bunyala and Ahero Rice Irrigation Schemes, Kenya.

Variety	Plant height (cm)	Tiller number	Yield (t/ha)	Recovery rate (%)	Total extraction (%)
Arize Tej Gold	129.0	29	8.6	60.1	76.4
Arize 6444 Gold	130.0	28	9.2	61.0	75.0
IR 2793	88.6	21	4.1	60.0	73.0

Source: Bayer East Africa and Lake Basin Development Company (2015).

Table 2. Brands of milled aromatic and non-aromatic rice in the major supermarkets shelves in Kisumu City, Kenya

Milling company and packaging	Brand	Non-Aromatic (Ksh/kg)	Aromatic (Ksh/kg)
Lake Basin Development Authority	Lake Basin	105.00	175.00
Dominion Farms	Prime Harvest	95.00	-
Capwell Industries Ltd.	Cil	-	170.00
Mjengo Limited	Dawat	-	185.00
Capwell Industries Ltd.	Pearl	-	210.00
Capwell Industries Ltd.	Ranee	110.00	190.00
Krish Commodities	Sunrice	-	205.00
Kings Commodities	5 Stars	105.00	-
Argus Limited	Argus Mzuri	105.00	-
Mjengo Limited	224 Pilau	-	155.00
Mwea Millers	R&P Mwea	115.00	165.00
Mwea Rice Mills Ltd.	MRM	-	123.00

Average prices in the four major supermarkets (Nakumatt, Tuskeys, Choppies and Uchumi in Kisumu City, Kenya, means no brand, US\$1 = Ksh 100.00).

Recently, new generations of high performing rice cultivars named Advanced Rice Varieties for Africa (ARICA) were launched by ARC. Five ARICA varieties (three lowland and two upland) out yielded the checks which were the NERICAs (IRRI, 2013). The two upland (ARICA 4 and ARICA 5) varieties yielded 15% more than NERICA 4, a favorite cultivar in East Africa, while the three lowland cultivars (ARICA 1, ARICA 2 and ARICA 3) have yield advantage of 30 to 50% over NERICA-L19. The varieties ARICA 4 and ARICA 5 have been released in Uganda, while in Kenya adaptabilities trials are ongoing (Africa Rice Centre, 2013). The issue that ponders in the minds of many researchers is whether the new ARICA cultivars will be the turning point for Africa (Kenya inclusive) towards the green revolution.

Rice production

Rice is produced both under irrigation and upland conditions in Kenya. It is currently the most expensive cereal in the country, retailing at about Ksh.80 to 100 kg⁻¹ (US\$0.84 to 1.05 kg⁻¹) for non-aromatic and Ksh.150 to 200 kg⁻¹ (US\$1.58 to 2.11 kg⁻¹) for aromatic type (Table 2). The trend of rice production in Kenya from 1961 to 2013 is as shown in Figure 1. It is noted that between 2008 and 2013, the total rice produced increased by

about 7-fold from 21,800 tons to 146,900 tons. At the same time, average on farm rice yields of 4.25 t/ha was achieved under irrigable ecosystem which is within the average range of 3.4 to 5.4 t/ha obtained in SSA. The overall increase in production is largely attributed to the increase of total area under rice cultivation.

Presently, about 78% of the total area under rice cultivation in Kenya is under irrigable ecosystem (Table 3) in national rice schemes that are managed by the National Irrigation Board (NIB). These irrigation schemes include Mwea, Bura, Hola, Perkeria, West Kano, Bunyala and Ahero. Small quantities of rice are produced along river valleys especially in smallholder irrigation schemes which include Kore, Alungo, Nyachoda, Wanjare, Anyiko, and Gem-Rae in western Kenya and Kipini, Malindi, Shimoni and Vanga at the coastal region. In the irrigable ecosystems, rice production involves continuous flooding as is typified in the Mwea, Ahero, Bunyala, and West Kano Irrigation Schemes. This system of rice production depends on a continuous supply of water for irrigation and soils with high water holding capacities. Moreover, if there is water scarcity in times of drought it means that the schemes have to receive rationed water thereby reducing productivity.

Rice yield in upland ecosystems in Kenya is about 1 ton/ha (Kijima et al., 2006; Africa Rice Center, 2008). The low yield of rice in upland conditions is due to constraints

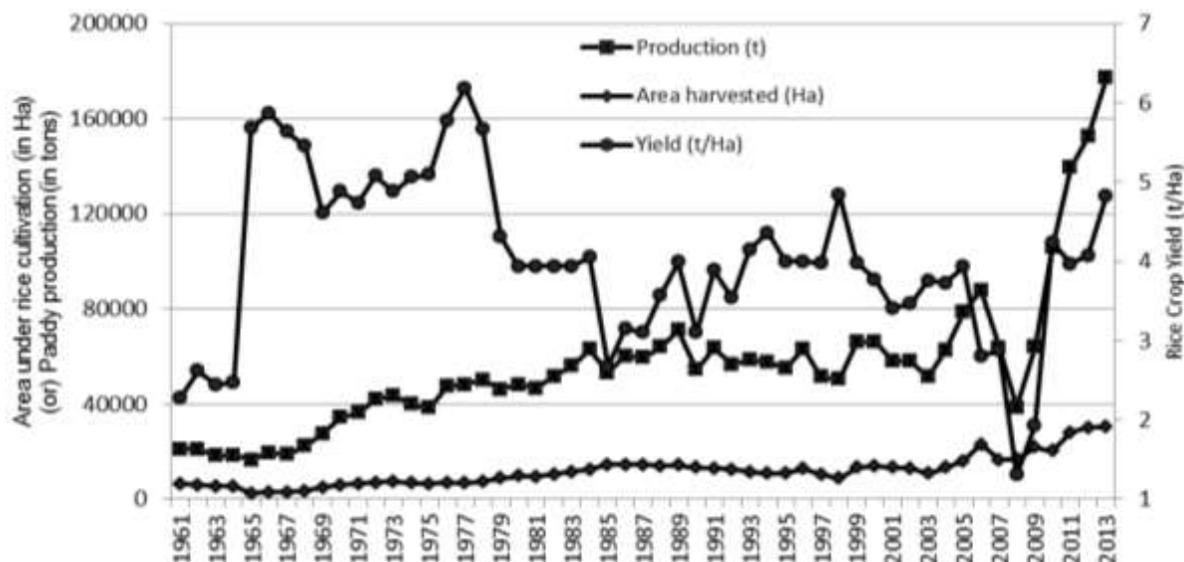


Figure 1. Trends of rice production in Kenya.

Table 3. Production of rice in major irrigation schemes in Kenya.

Scheme	Production (tons)		
	2013	2014	2015
Mwea	64,672	70,416	91,624
Ahero	8,326	7,405	7,942
West Kano	5,165	4,345	4,660
Bunyala	4,278	4,289	4,600
South west Kano	8,262	9,574	10,268
Total	90,703	96,029	119,094

Source: Kenya Bureau of Statistics (2016).

such as nutrient depletion, loss of organic matter and drought. Production of rice is also negatively impacted by pests and disease incidences such as bird damage, rice midge, blast, leaf blight, and the parasitic weed *Striga* (Bruce, 2010). Thus, any future increase in rice production will only come as a result of improved yields, through expanding the area under production and reducing field and storage losses (Orke and Dehne, 2004).

Remedial measures to curb imports

Kenya's dependency ratio on rice imports is very high with nearly 73% of rice consumed in Kenya is being imported at an average cost of US\$87.5 million per annum over the past 5 years (Atera et al., 2011). Rice is imported to Kenya from several counties, namely: Pakistan, Vietnam, Thailand, Egypt, and Tanzania (Figure 2), thus causing strenuous pressure on foreign

and trade balance. Given that there is over reliance on international market, the domestic rice production has significant implications on food security and poverty reduction. In order to narrow the gap between import and production of rice (Figure 3), the Government of Kenya has put in place several remedial measures. One of these measures is the expansion of the irrigation schemes in the country to increase rice production. For instance, the government has increased the land under rice farming at the Mwea Irrigation Scheme from 24,000 to 48,000 acres. Government has also put in place mechanisms of rehabilitating several schemes in Western Kenya including small holders' schemes and improving their infrastructure. Research on improvement of varieties and provision of farmers' incentives such credit will play a major role in boosting production. Construction of fertilizer plant in Eldoret is another major undertaking of government to reduce the cost of production. Recently, Japan International Cooperation Agency (JICA), in partnership with the Alliance for a Green Revolution in

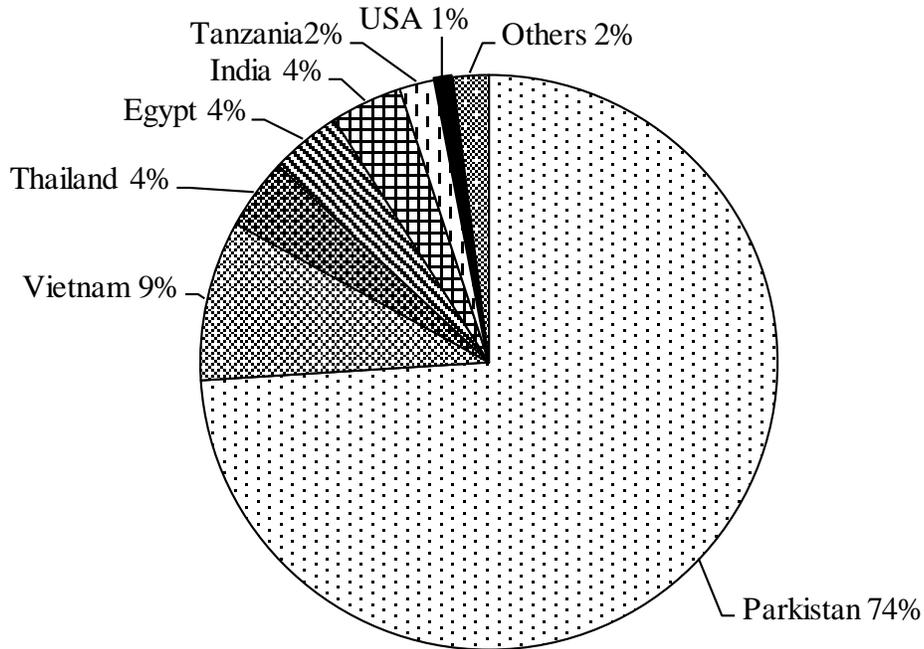


Figure 2. Share of rice imports (%) in Kenya from different countries.

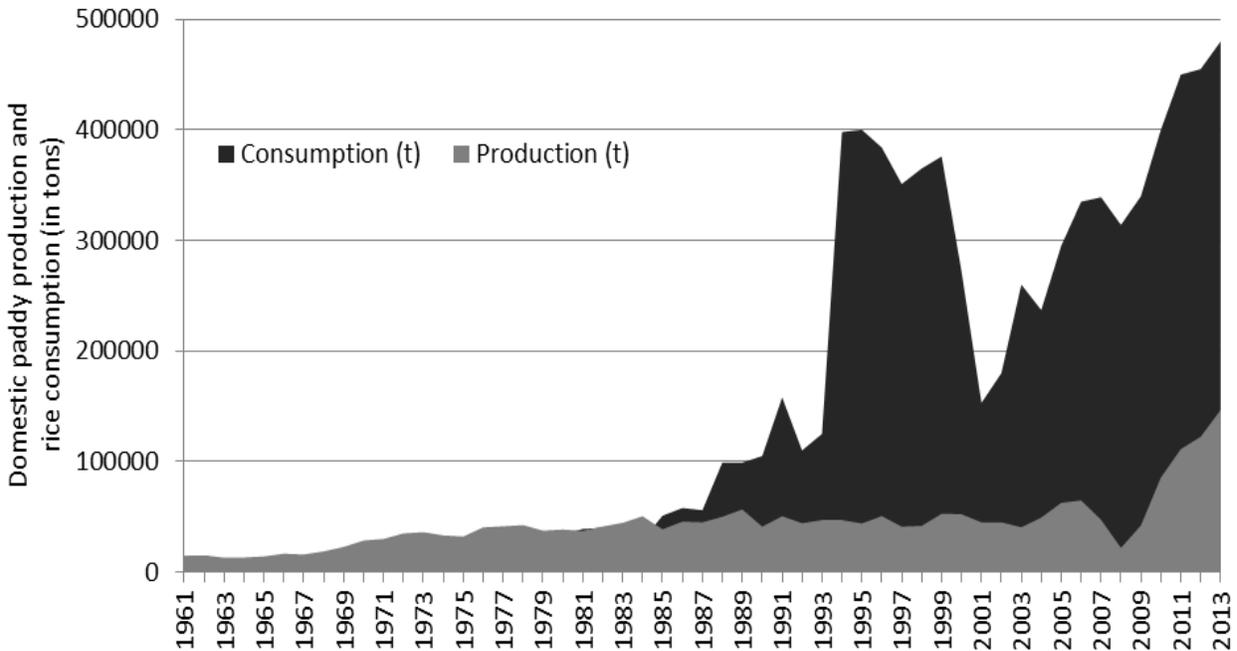


Figure 3. Gaps between domestic rice production (paddy) and consumption in Kenya.

Africa (AGRA) launched an initiative known as “Coalition for African Rice Development” (CARD) which is aimed at doubling rice production in Africa by 2018. This will not only contribute to improvement of food security, but also to rural development and poverty reduction in the region.

DOMESTICATING KENYAN RICE MARKET

Rice marketing channels

Nearly 95% of the rice produced by the farmers in Kenya

is marketed locally. There are several rice traders in the country who are taking advantage of the evolving market opportunities and changes in consumer demand. These traders include the government owned National Cereals and Produce Board (NCPB) which purchase paddy from farmers and process in the state-owned mills. These state-owned mills also purchase paddy from farmers and process the same through their rice mills in Ahero, Mwea and Kibos and supply their milled rice products to supermarkets and local retailers. In addition, there are also numerous small traders, mostly women who sell the commodity in the local market.

There are four major rice mills owned by the government spread across the country with varying milling capacities which include the Lake Basin Development Authority (LBDA), National Irrigation Board (NIB-Mwea), Western Kenya Rice Mills (WKRM), and Tana River Development Authority (TARDA) rice mills. The LBDA rice mill has a milling capacity of 3.5 metric tons/h, NIB-Mwea has a capacity of 3.5 metric tons/h, while WKRM mills have capacity of 3.0 metric tons/h and Tana Delta Rice mill owned by TARDA has milling capacity of 3.0 metric tons/h. In addition, there are several privately-owned mills such as Dominion Farms Mill, Capwell, Nice Rice Millers and other small mills especially in Mwea and western Kenya with throughput of about 2.0 to 2.5 metric tons/h each. It is notable that rice mills have achieved competitive status, although they experience frequent machine breakdown, low investment in modern mills, stiff competition from cheap rice imports and lack of a reliable source of energy for mill operation. The Kenyan Government in collaboration with JICA stepped up this initiative to promote rain-fed rice by providing several rice mills in western Kenya with a throughput of about 1.0 metric ton/h.

Currently, paddy is retailed at Ksh.35 to 40 kg⁻¹ (US\$0.37 to 0.42 kg⁻¹) of non-aromatic and Ksh.55 to 60 kg⁻¹ (US\$0.58 to 0.63 kg⁻¹) of aromatic. Market survey on milled rice conducted by the Marketing Department of Lake Basin Development Authority in the supermarkets in Kenya in 2016 revealed that price is driven by the varying availability of cheap Asian imports, tariff regimes, transport costs and distance to markets. It is important to note that paddy prices are high due to low on-farm investment in inputs, seed, and labor and so yields are low by global standards. Currently, production is growing faster than demand, which is based on increases in area under rice instead of gains in productivity and this will slow down the local supply growth and unable to keep pace with the demand.

Challenges in the rice sub-sector

Among the major challenges experienced in the rice value chain, the unfavorable weather conditions and inadequate water for irrigation, acceptable variety, low

and declining land productivity, high cost of inputs, poor infrastructure, lack of machinery, transboundary/regional issues, and human and institutional capacities with the rainfed rice system suffering the worst decline in performance.

Among the identified challenges, the most critical one is the lack of development of high yield rice cultivars whose grain quality is not only acceptable to most consumers but also tolerant to local pests in both rainfed and irrigated ecosystems. Additionally, the poor post-harvest practices of farmers of recycling seeds for planting contribute to low quality output. Another major challenge that rice farmers face is high post-harvest losses which account for about 15 to 50% of the market value of production. In terms of milling, many small millers do not have good quality milling equipment, have poor handling and storage facilities, which lead to high levels of broken grains and increased foreign matter in milled rice. In Kenya, there are several small private owned mills producing low and poor-quality rice which is a barrier to competitiveness. This has significantly affected the traders and has been a hindrance in accessing quality paddy in the market and thus a constraint to traders in expanding their activities.

Further, the sector lacks a coherent and comprehensive policy, plan, and program to tackle the many constraints and deficiencies in the rice sub-sector. Thus, policy makers, producers and millers need to identify, brand, and promote high quality locally adapted rice varieties in national, regional, and international markets in order to boost rice productivity. Strengthening research and development through training and provision of adequate funds to conduct research will also help to address some of the aforementioned mentioned challenges. The rainfed rice system needs to be given more serious attention in the process of revitalizing rice production. A coherent and comprehensive policy, plan, and program will thus help in tackling the many constraints and deficiencies in the rice sub-sector.

Opportunities in the rice industry

Despite the challenges Kenya faces in terms of rice productivity, there exists great opportunities to increase rice production and strengthen both household and national food security systems. As already mentioned, the government is trying to increase rice production through land expansion and rehabilitation of the existing schemes to reduce rice imports. In addition, the donor community has increased foreign aid assistance to Kenya to support programs that help reduce poverty and improve on food security. Rice sub-sector has benefited greatly through JICA and FAO to improve and develop underexploited rice producing areas which will substantially increase production as well as improve on food security and farmers' incomes. Through research

the low potential pest susceptible old varieties should be replaced with the new high yielding varieties with promising yield potential. Further, cultivation of hybrid rice should be encouraged by stakeholders through field sites demonstrations and making seed available to farmers.

At the moment in Kenya most farmers, processors and other end users of agricultural mechanization technologies do not use enough technologies for their farming and processing operations to have much impact on national productivity. This therefore makes the Kenyan rice value chain labor intensive and uncompetitive. Most operations in the rice sub-sector are labor-intensive when conducted manually and the end result is low productivity. This low productivity has several causes of which many are related to low use of mechanization. Therefore, there exist an opportunity of promoting mechanization in the rice value chain including: proven willingness by end users across the country to adopt economically beneficial technologies, fabricators who are able to produce low cost equipment at affordable prices, and willingness and capability among fabricators to copy machines that have a proven record of technical and financial success.

CONCLUSION

The policy makers are aware that increasing rice productivity per unit area requires adopting intensive use of land by increasing the cropping intensity which will help in sustaining production so as to meet the increasing demand for rice. Emphasis therefore, should be laid to farmers on the adoption of non-monetary inputs like timely sowing, maintaining optimum plant population, timely irrigation, efficient use of fertilizers, need based plant protection measures, and timely harvesting of the crop. The government should come up with a policy to support industrialization through private firms to drive investment in order to make rice profitable for firms that are investing in true commercial production and processing. In addition, the county governments should have policies that are leading to different enabling environments around the country and differentiated opportunities for expansion of the rice industry across the value chain.

CONFLICTS OF INTERESTS

The authors have not declared any conflict of interests.

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