

Fostering Crop Productivity in Rural Rwanda: Policy Implications

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Abstract:

Agriculture continues to be the backbone of the economy of Rwanda contributing more than a third of the country's GDP. The government of Rwanda with collaboration of researchers and its population has to stress on policies and projects to stimulate productivity as they are many corners in agriculture sector to be improved. Bolstering the livelihoods in developing countries is feasible through maintenance of food sovereignty and safety by increasing productivity. The research spotlights the policies to improve the livelihood of rural population of Rwanda through crop productivity improvement. The current review concluded that the government should take the first ride to innovate farming systems. The future researches will examine precisely each policy spotlighted in the current research and provide practical process to achieve the government goal of being the middle income country.

Keywords— Rwanda, Crop productivity, Cropping policies, Food self sufficiency.

I. INTRODUCTION

Mankind's food consumption derived mostly on crops production; about 78% of the average per capita calories consumption needs worldwide comes from crops grown directly in soil (Brevik *et al.*, 2013). The population growth, environmental changes and the rise of income of the population are putting pressure on the demand for food that requires increasing productivity. Rwanda as a land locked developing country with few natural resources where land is the main source of income of the population and agriculture sector contributes for a third of country GDP (employs 80% of the population) in rural areas, 90% of national foods and 70% of national exports; according to the Rwanda Development Board (RDB: A government agency to transform Rwanda into a dynamic global hub for business investment and innovation). It is among the most densely country in Africa (the third with the population density of 471.87population/km², United Nations, 2015) and like other developing countries, is facing a food shortage due to all those challenges especially the rural areas. Rwanda has made a significant change in agriculture sector during the past decades, contributes to 80% poverty reduction from 1994; but as it is coping with population pressure and climate change, a lot of changes have to be made in cropping activities in order to fill the gaps in food self sufficiency.

Food insecurity and food self sufficiency are the major challenges facing the rural population in Rwanda. About 22% of households are food insecure and 24% of children less than 5 years are stunting, 2% are wasting, and 9% are malnourished (NISR, 2014). Different scholars argue that it is due to the decline of agricultural production and mentioned different hinders for that low productivity; within them a decline of per capita land due to the population growth and fragmentation of land into small parcels, illiteracy and low income of farmers, gender inequality; women in age of 15-60 spend their third of their time in agricultural activities while men of the same age only spend 19% (MINAGRI, 2009), where agricultural activities require to be strong enough and most of women are not able to do those activities (World Bank, 2013).

The Government of Rwanda is coping with those problems with its agricultural policy to transform farming practice nationwide. This involves a rapid shift away from traditional models of production toward specialization in a small number of government-approved, marketable staple or cash crops (Neil Dawson and al., 2016). The current research is not going far from the government policy but it will suggest the policies to increase crops productivity in order to maintain the wellbeing of the rural population and enhance food self sufficiency that will support to achieve the government policy.

II. LITERATURE

A. Current cropping policies in Rwanda and its impacts on crops

The government of Rwanda launched a program named Vision 2020 in 2000 with the goal of transforming the country into a knowledge based middle-income country by 2020. This program has different specific objectives among them transforming agriculture into a productive, high value and market oriented sector by the year 2020. Other agricultural policies are implemented towards the program. The current Rwandan agricultural policies are regulated to increase productivity in the sector by achieving scale in agricultural production by modernizing farming, reduce poverty, ensure food security and have surplus for the market (MINAGRI, 2016). To ensure food crop productivity, the Government of Rwanda launched in 2007 a Crop Intensification program (CIP) with specific objectives to increase crop production. The outputs of the CIP were good for the 6 selected crops (maize, beans, wheat, rice, Irish potatoes and cassava) about 30% increases between 2007 and 2009(MINAGRI, 2011) afterwards it failed, therefore a high attention needs to be given to the style and decision making in the program (Huggins, 2013).

B. The challenges of cropping systems in rural Rwanda

A high population density and the fragmentation of land in small plots (80% of land holding are less than one hectare) mostly on hills or hills sides (about 70% of agricultural land) are causing soil infertility due to the high exploitation, as well as soil erosion (Cantore, 2011; Kagabo et al., 2013) that slow down crop productivity especially on steep slopes (Daniel C. Clay et al., 1990; David Booth and al., 2014). In the other hand the limited cultivated and habitat land caused the deforestation so the climate variability.

Climate variability, irregular rains and warming in some places are threats for cropping activities and it is expected to unfavorably affect agricultural production in Africa (E. Bryan et al., 2013) if nothing changes. In case of heavy rain and flood period, the soil is likely to encounter the erosion, soil loss and infertility particularly in Northern part of the country (Kagabo et al., 2013); those result to the decline of production. An example of those effects was occurred in the Eastern part of Rwanda due to the flood in rainy season and drought in dry season that result to a significant crop yield decline in 2011 (Rwanyiziri and Rugema, 2013). The rural farmers have limited resources to face to those changes (Thomas and Twyman, 2005) due to low income and ignorance of rural farmers; one third of farmers is using fertilizer and even not enough; many farmers believe that their soil only need organic fertilizers derived from animals feces, where those last are inadequate to produce the food needed for all the farmers are not even have those animals.

In the other hand land and water management contribute to most African countries' lagging agricultural productivity growth and the related decline in food production per capita (Jonathan A. et al., 2007) even if most Eastern African countries are plenty of water; irrigation systems are limited and undeveloped, only 6% of cultivated area are irrigated (World Bank, 2014) that slow down agricultural activities and make many farmers to wait for the rain as result failure to produce the food needed. The 2015 Comprehensive Food Security and Vulnerability Analysis (CFDVA) report estimated that over 70% of the food consumed is delivered from the market on high prices caused by the low production and importation of addition food from foreign countries, an increase from 65% on food price in three years ago.

According to the National Institute of Statistics in Rwanda (NISR, 2012), subsistence agriculture in Rwanda that covers 99.8% of the agricultural systems is the main drive of the challenges encountering cropping activities in rural Rwanda. The country is still depending on foreign aids and the goal of CIP of boosting crop productivity through improved inputs use, irrigation and rain water use efficiency and soil quality is doubtful to succeed as expected especially for the year 2015; this was caused in some way by low soil fertility and rain variability (N. Cantore, 2011), mismanagement of activities and the shortfalls of inputs in deliveries to farmers.

III. IMPLICATIONS

Rural peasants are confronted by hunger caused by the crop low production and increasing productivity is still a challenge for small farmers. In order to meet the national mission of becoming middle income country, the population should first be self-sufficient so that they can enroll in other sectors of activities; a Kinyarwanda slogan "Hakora uwariye" literally means that "the one who can work, is the one who have eaten" explain it well. With 47.9% of arable land (world Bank, 2015), formulation and follow up of agricultural policies, Rwanda can reduce hunger and retrieve itself in poverty. The research contribution is to pinpoint some useful policies to increase crop production in Rwanda cited below.

A. Agriculture extension

In much of southern Africa, the governments are responsible for ensuring that their populations have reliable access to food (Bratton and Mattes, 2003) while the majority of the population are small farmers and don't have enough knowledge and means to boost their productivity. Rwanda which has a great contribution of its economy delivered form agriculture should build capacity and regulations for sustainable agriculture to support farmers to invest more and improve their varieties and adoption of technologies in order to produce more without waiting for foreign aids. Otherwise the economy will collapse when those aids are removed.

Technologies and improved practices give assurance to boost agricultural production and reduce poverty in developing countries, but it is slow down for the small farmers in particular from Sub Saharan Africa (Udry, 2010). Among the causes of the low adaptation are lack of knowledge, uninsured risks and lack of coordination (Barrett, Carter and Timmer, 2010; Jack, 2013). Still on this point, enhancing productivity and the production of food, assist in providing opportunities for income generation and provides the improvement of nutritional advice and enhance rural life (FAO, 2003). An application of scientific research and knowledge to agricultural practices through farmer education; also known as the delivery of information inputs to farmers and its investment is an essential input of agricultural growth (Anderson and Feder, 2003); agriculture extension will facilitate the collaboration between government and farmers in farming activities.

The government of Rwanda must organize trainings across the country to farmers in order to enforce this practice. The High Level Panel of Experts on Food Security and Nutrition (HLPE) argued that the national research and extension systems need full attention and investments from governments. It should initiate by the government in most developing countries because it requires significant investment that is costly for small farmers. The farmers need to have enough knowledge on what, how and when to practice farming activities and which soil is appropriate for such kind of inputs there are going to use. From this regard, advanced practices will be feasible so the productivity booms.

B. Adoption of improved inputs

The first consideration is the enhancement of fertilizers use. Soil fertility is the main factor for growing plants; therefore both organic and inorganic fertilizers are needed. Adopting organic fertilizer use is positively found to have positive effects on the crop productivity. Maize increased by 100% in Kenya (Hine and Pretty, 2008); millet yields increased by 75-195% and groundnut by 100-200% in Senegal (Parrot and Marsden, 2002).

The green manure and cover crops are ones of the organic fertilization systems and can play an important role in sustainable cropping systems by increasing productivity in Rwanda. The National Wildlife Federation reported in 2012, the role of cover crops in decreasing soil erosion and agricultural cost (additional of other ingredients as their leaves also play a role of fertilizers) and increasing cropping system resilience in the face of climatic challenges; they improve also soil and water conservation, fertility (Nitrogen fixation) and healthy environment (Ajay Nair and al., 2016). This system can help in the challenge of hillside erosion that invades cropping activities in Rwanda.

The second useful practice Rwanda can stress is the crop rotation. It has shown that the crop rotation ensure differential nutrient uptake that will enhance soil fertility, reduces erosion, manage pests as results crops yield increase (Ling Zhou, 2015; Woodfine, 2009; Keith, 2006). Example was found in the North Rift and western regions of Kenya where maize yields increased by 71% and bean by 158% (Hine and Pretty, 2008) by using velvet beans as cover crops (Kaumbutho et al., 2007). By adopting this practice, Rwanda can boost its crop production learning to its neighbor (Kenya).

Although some farmers in Rwanda believe that their soil only need organic fertilizers and believe that inorganic ones are not safe; the role of additional of inorganic nutrients is needed and by understanding the better use of those fertilizers the productivity will increase. Inorganic fertilizers have been shown to increase crops yield (Sam Portch and Ji-yun Jin, 2000) and maintain food self sufficiency (Fredrich Kahrl et al., 2010). By the increased use of inorganic fertilizers, China increased its grain production and arrived at feeding a huge amount of its population (Mingsheng Fan et al., 2011). On the other hand, crops rotation and covers crops not only enhance soil fertility but also increase productivity as they are applied as multi-cropping known as more productive than mono-cropping system (Bowler, I., 2002; Thrupp, L. A, 2000).

Fertilizers are the main factors to provide adequate food for the world growing population (Bijay Singh and John Ryan, 2015). By maintaining soil fertility, agriculture will sustain and the crops will boom and Rwanda need to increase the use of inorganic fertilizer in order to fill in the gaps unfilled by organic fertilizers to boost the food production.

Another input to consider for sustainable crops is the adoption of high yield crops. The promotion of high yields crops depending on cultivation area can boost crops production. An introduction of new bean variety in 7 African countries resulted to the increase varied between 2% and 137% ; including Rwanda, 43% increase; reported CIAT (International Center for Tropical agriculture) in 2008 report, with long term introduction of those seeds and other varieties, the farmers will produce more crops. Those crops can resist to pests, diseases, environmental conditions and reduce spoilage also can contribute to the increase of yields and agriculture growth (Matin Qaim, David Zilberman, 2003). High yield technology adoption has been proven to reduce chemical pesticide use by 37%, increased crop yields by 22%, and increased farmer profits by 68% (Wilhelm Klümper, Matin Qaim, 2014). Improvements in maize varieties and cropping techniques have contributed to increased grain yield per unit area since 1960s in China (Li and Wang, 2009). Adoption of high yield crops in Rwanda will help to increase crops productivity and contribute to increase the livelihoods of the small farmers by reducing hunger; those crops tend to perform better in developing countries than in developed countries as they perform better than their conventional counterparts in agronomic and economic terms (F. J. Areal et al., 2013).

C. Expand and boost the irrigation systems and rain water harvesting

The irrigated area worldwide should be increased by more than 20% and the irrigated crop yield should be increased by 40% by 2025 to secure the food for the growing population as on average the crop yields from irrigated land are double those from non irrigated (Lascano and Sojka, 2007). Rwanda has no exception for increasing irrigation system; irrigation has been an essential agricultural activity with high impact on crop productivity.

The government policy of mechanization and irrigation implemented in 2009 and ended in 2013 was made a huge impact on the production of food; an example was the use of water from Nasho Lake for irrigation, the farmers in Nasho valley can now produce crops all year round including in season C, in which most farmers grow cash crops like tomatoes and onions leading to a better livelihood and improved nutrition. The policy need to be nationwide; it cover mainly the east province (IAI: Immediate Action Irrigation) and the west (GWLM: Gishwati Water and Land Management). Therefore the increase of infrastructures that facilitate irrigation process and water storage will help farmers to grow plants in all season without waiting for the rain fall as many places in Rwanda are facing drought. Where there is water availability, the soil moisture, so the better management and plentiful crop yields and the people are food self sufficiency.

D. Reinforce Crop Intensification Program activities

The CIP has been increased the production of crops (maize, wheat, cassava production tripled; Irish potatoes and rice production increased by 30%) in 3 years (2009-2011) and made a significant improvement on living standards of the population of Rwanda. Afterwards the mismanagement as mentioned in the challenges, the production starts to slow down. The program has already set useful ways, the government has to make a strict follow up on the implementation and evaluation; and also the distribution of the inputs supposed to use for cropping activities by setting strict punishments on any one whose implementation is away from the government regulations and instruct farmer to report on each case of withstand on their rights of improving the modern cropping systems formulated by the government and make them to be fearless on suggesting their opinions as they are the most who spend a bountiful time in those activities.

IV. CONCLUSION

The worldwide food production is a greater challenge that reveals hunger and poverty especially for rural developing countries while the environment change is another treat for cropping activities. Improved cropping systems, hard working and the contribution of decisions makers are the way forward to overcome from this challenge. This review focused on the challenges facing the small farmers in Rwanda, where different challenges uncouncted by small farmers are found. In the path ways to overcome those challenges, there are improved soil management and application of research and technology in investing more in agriculture sector.

The research suggested the improvement of the implementation and the evaluation of current policies but boosting rural living standards requires a broad approach, based on an understanding of the way in which rural economies evolve and develop; it requires different fields of study and demands a focus on agriculture by supporting small farmers to develop and sustain their production systems. Those will be analysed in the future researches by observations and interviews with the farmers. Meanwhile agriculture extension is another policy suggested to assist the government current policies in order to control and facilitate farming activities. Our strong perspective is that the government of Rwanda should be the engine of the farming activities by providing investment and facilitate small farmers to afford the useful skills and inputs as well as learn and cooperate with other governments as the problem of food production is worldwide.

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