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Research Article

GAINING THE GROUND: RETHINKING THE ROLE OF SWEET POTATO CROP AS A STRATEGY TO COMBAT HOUSEHOLD FOOD INSECURITY IN KENYA

***Joseph O. Otieno**

Department of Humanities and Social Sciences, University of Kabianga, Kericho Kenya

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Abstract

Roots and tuber crops that include sweet potatoes, potatoes, cassava and yams are grown by many small holder farmers in many developing countries as part of the agricultural system to provide family dietary requirements and occasionally as cash crop. In many of these countries, they are only second to cereals as staples and provide energy and carbohydrates and contribute significantly to food security at the household level. However, at the national policy level, little attention has been given to these crops (except for Irish potatoes) as one avenue of tackling food insecurity. Most government strategies meant to combat food insecurity focuses on increasing cereal crop production, relying on external market access to food items, food aid or assistance during famines and improving infrastructure and financing for 'traditional food' crops such as maize, wheat, sorghum, beans and Irish potatoes. This paper argues that there is need to re-orient policy and strategies that tackle food insecurity by promoting the adoption of technologies that will improve production, processing, commercialization, and consumption of these crops, especially sweet potatoes given its' adaptability to grow in different ecological zones; The adaptability of the crop makes it suitable for those areas considered marginal for most cereal cultivation. The commercialization and processing will provide income streams that famers can use to complement their own farm food production. The paper is based on an analysis of policy and agricultural production data from various government agencies.

Keywords: Food security, Policies, Roots and tubers, Sweet potato, Commercialization.

INTRODUCTION

This paper argues that promoting the cultivation, value addition and processing of sweet potato and other root and tuber crops can play a major role in tackling food insecurity at different levels in Kenya. According to Agriculture and Food Authority, the production of roots and tuber crops in Kenya covered approximately 322,000 ha in 2018 with a production valued at Kshs. 65 billion [1]. As a crop category, root and tuber crops are considered as the second most important food crop after cereals. However, even within this category, the emphasis is more on Irish potato which is listed among main food crop commodities whose prices are tracked by the government agency in charge of crop development [2]Root and tuber crops can be grown in diverse ecological conditions and have the ability to withstand or tolerate drought conditions, which makes them valuable in marginal areas of the country As a crop, sweet potato tends to fall outside the traditional 'zone of interference' by many African governments since it is not normally a controllable cash crop nor an emerging non-traditional export crop or a major cereal that attracts the attention of policy makers and the rather well to do members of the politico-economic elites in a country. [3]. It is considered to a large degree as a poor man's crop, and has remained so in many government's policy documents. It is a low input crop that rarely involve the use of fertilizers and pesticides and is normally grown by small holder farmers on farm plots that range from 0.5 acres to 5 acres with little commercial orientation [2]. These crops however have a great potential of narrowing food insecurity situation in the country and regionally if their production, value addition, processing and consumption is upscaled.

Corresponding Author:** ***Joseph O. Otieno,
Department of Humanities and Social Sciences, University of Kabianga, Kericho Kenya.

The demand and consumption for roots and tubers isprojected to increase by 48 per cent between 2015 and 2050, providing an incentive to farmers to increase production and the need for policies to address bottlenecks that may hinder their increased utilization [4]. Food insecurity in Kenya is mainly attributed to challenges of climate change, poor infrastructure, lack of access to agricultural finance, poverty and high-income inequality among households that affects their purchasing power and access to the food market and high population growth [5]. Climate change challenges that contribute to food insecurity include changes in enterprise suitability for specific areas, leading to decrease in profitability; unpredictable timing of farming operations due to seasonal weather variability and reliability, leading to lower production efficiency, There are many households in the country that face food poverty and who cannot afford the minimum dietary calorific requirements in many rural and areas on a daily basis. In Kenya, food security is considered alongside nutritional insecurity and defined asa situation when all people do not have access at all times, to physical, social and economic to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life [6]. Food insecurity should be considered in a more holistic manner to include food shortages in different times of the year rather than shortages experienced in months that are relatively removed from the harvesting season or in a 'difficult' year. As a fact it can be argued that many rural households as well as urban households in Kenya face a certain degree of food insecurity in terms of both calorific value, type, quantity for most parts of the year given the country's over reliance on rain-fed agriculture [7].

The Conceptual Framework

Two different but complementary strands of theoretical frameworks on Africa's agricultural development have

informed this paper to some extent. The first is the research on food security in Africa and in other parts of the developing world that tend to emphasize the fact that small-holder farmers, while innovative and open to taking up new technology or farming practices, are in many cases cautious enough to concentrate their efforts in meeting household food security as much as possible from their own production. The second strand of literature revolves, to some degree, around the induced innovation theory, mainly attributed to Hayami and Ruttan [8]. The theory partly offers an explanation on the demand for and adoption of agricultural technology that leads to intensification in production by farmers and on public expenditure on agricultural research. Agricultural technology, which is aimed at increasing production and reducing post-harvest losses, according to Farrington, *et. al* [9] includes the hardware i.e. seeds, machinery, vaccines, as well as management practices and techniques and increments in knowledge that strengthen local capacity for experimentation and general resource management. Targeted agricultural technology that is readily adopted by farmers can contribute to a 50% increase in production if backed by extension services and other necessary infrastructure available to the farmers [10].

The issue of food security in many parts of Africa is best understood by focusing on households who are unable to meet their basic dietary needs rather than focusing on widely accepted national averages on food shortages. As defined by Reutlinger*et al,* and supported by Food and Agricultural Organization of the United Nations [UNFAO], food security refers to access by all people at all times to enough food for an active, healthy life [11]. In many rural areas of developing countries, food insecurity and at times even famines, is not only a result of low agricultural productivity by small holder farmers and adverse weather or climatic conditions but also a result of generally low purchasing power of many rural households due to poverty and the resultant limited access and entitlement to food that these households face, Scholars such as Sen, A. have convincingly argued that these limitations in access is largely attributed to social inequalities in the society and development goals and strategies to overcome these inequalities should focus on people's capabilities rather than merely on the resources available to them or their welfare status [12].

While many governments emphasize increased food production and imports at the national and regional levels as strategies of tackling food insecurity, these do not necessarily translate to food security at the household level for many rural households. Many households who lack access to land or other factors of production and are unable to access food in the local markets will still be faced with food insecurity for a larger part of a calendar year. Food security issues should therefore be considered foremost in terms of food access and diversification of food resources considered as staple rather than predominantly in terms of food production or availability at the local or national level. A variety of factors determine a household's access to food. These factors range from on-farm productivity for farming households, levels of household income that determines their purchasing power, the general price of food in the local markets, socio-economic factors and the institutional framework that define and determine household access to food resources. Farming households face food insecurity when their own on-farm production plus their liquid assets and incomes cannot guarantee enough food for all household members to enable them lead active healthy lives. The more a household can produce from their own farms, the less their overall, if we ignore the nutritional aspects, reliance on their food requirement from the market. The other variables that determine food security at household level includes the size and quality of land, availability of capital, both in cash and machinery/equipment, farm labour, and intervening factors such as state policies and agricultural research that may come up with appropriate and affordable technologies.

There are a number of ways farming households' may meet their basic food requirements. One way is to try to increase food production from their own farms. Secondly, households may improve on post-harvest techniques so that they minimize post-harvest losses as argued by Erlich and Erlich [13]. Households can also meet their food requirements by increasing their' food purchasing power either by considering off-farm income generating activities or by growing crops that have a relatively high market demand and fetch relatively good prices or straddling between agriculture and off-farm activities. Whatever their circumstances, attaining food security, at the household level is fundamentally important in the decision-making of many smallholder farmers. Thegeneral assumption amongst agricultural development practitioners is that once many households are assured of their food security, it will be easier for them to release land and labor for growing non-food crops or other high value crops that will increase their food security situation and generate multiplier effects for the larger regional and/or national economy.

Commercialization, Value Addition and Processing

If sweet potato has to play a central role in meeting food security requirements at the household and national level, there is need for adopting innovative techniques that would lead not only to increased productivity but also to value addition and a reduction in post-harvest losses of the crop. Adoption of such technologies by farmers has multiple paths and to a large extent is a function of local resource endowments and the farmers' cultural endowments. Technological development that targets a given crop or region has to consider the relative abundance of certain production factors available to the farmer as well as cultural resources or local production techniques and knowledge. For instance, in some regions the limiting factor to increasing sweet potato production may be land in both absolute and relative terms, given the competing land needs at the household level. Where land is the limiting factor, sweet potato production can be increased by adopting intensification that would involve multiple season planting, use of improved varieties, adoption of clean planting materials [vies], integrating soil fertility management techniques as well as integrated pest management that would reduce loses at the production stage. Research by institutions such as International Potato Center (CIP) and national sweet potato research programs have focused on varieties that have different traits including early maturing, pest tolerant, improved nutrition such as beta carotene that can be promoted to help tackle food insecurity challenges at both the local and national levels [14]. Institutions that undertake technological development, whether aimed at increasing production, reduction of post-harvest losses, value addition or even agro-ecological and conservation based, must consider how appropriate such technology is in the context of addressing the constraining factor element and family or household food security needs. Researchers and innovators need to understand

the extent to which the farmer and the larger community consider a particular agricultural problem as being significant enough to entail a switch or adoption to a newer technology and the perceived benefits of such adoption. Where the developed technology or innovation does not address the farmers felt needs and is considered as top-down by the targeted beneficiaries, then the generated technology, even if it looks benign to the researchers and field extension staff, may be a 'demonstrative technology' with little adoption by the farmers. In real life, farmers may politely acknowledge how valuable the technology is to their production process or in minimizing post-harvest losses during its demonstration, but only a few will end up adopting it, even if its cost, including time factor or demand on labor, is reasonably within reach of most of the farming households'. In the case of sweet potato that to alarge extent is consumed in fresh form, technologies should address value addition and processing challenges to enhance value, product longevity and price fluctuations so that farmers can use the crop as an avenue for increasing farm level incomes that can contribute to tackling household food insecurity by resorting to market forces.

Improving sweet potato production should also consider its' commercialization and value chain processes so that farmers are not faced with an element of 'over production' that goes to waste given the perishability aspect of the crop. Commercialization will help maximize farmer incomes if market access and post-harvest shelf life challenges are incorporated as part of the strategies in addressing overall food insecurity. Such commercialization can be achieved by targeting the demand in urban centers where many urban households may find wheat- based products to be relatively expensive. There is also a positive consumer awakening, especially in urban areas, that values traditional crops and organically grown none-wheat based diets in both breakfast and main meals in middle to upper income urban households. Commercialization strategies can help transform the crop from being largely a complementary staple at the household level to a cash crop able to increase the farmers purchasing power for other food products. As noted by Agricultural and Food Authority [2], demand for sweet potatoes is increasing countrywide and there is need to focus on processing and other forms of value addition. This will call for farmer training in value addition, processing and the development of market infrastructure, including market information and other institutional support. Commercialization will also fit into the country's policy framework under the Bottom-UP Economic Transformation Plan 2022-2027 whose key issues in regard to food security include raising the productivity of key value food chains including maize and sweet potatoes as well as reducing dependence on the importation of basic food items such as rice, wheat and sorghum [2].

Sweet Potato Production in Kenya

In Kenya, sweet potato is grown in a majority of the counties, its' production has remained relatively subsistence in orientation and many farmers consume the crop in fresh form at the household level, selling what they may consider as surplus in the local markets. Though production data for sweet potato and other roots and tubers crops are often an extrapolation of local data at various scales and may not reflect exactly the picture of total production, there has been a marked increase over the years as shown in table one below. The recent increase in demand has seen the area under sweet potato production increase from 48,740 ha in 2022 t0 54, 405 ha in 2023 while production increased from 596,791 metric tonnes in 2022 to 669,141 metric tonnes in 2023. Most of the sweet potato grown in the country is grown in Nyanza counties of Homa bay, Migori, Siaya and Kisumu and western counties as shown in the table below. Other than Nyanza and Western counties of Busia, Kakamega and Bungoma, there is also significant production in the counties of Machakos, Bomet and Kwale. The average yield per hectare remains relatively low at 12.1 metric tonnes while the average farm prize for an 88 Kg, bag is Kshs. 3,200. [2]. Given the generally low yields and farm gate prices, there is need for increasing productivity, processing and competitive marketing if farm level incomes have to be increased through production and commercialization of sweet potato. In order to increase productivity, attention should be paid to clean planting material [vines] to minimize the risk of sweet potato fly disease that tends to lower yields, field rotation where possible and adoption of agronomic practices that include mound size and number of vines planted per mound.

Increasing productivity should consider the farmers' broader goals in the crop that includes not only high yielding varieties but also having access to late and early maturing varieties so as to meet their diverse needs, marketability of different cultivars, their storage potentials, whether fresh or in the processed form and the economics of concentrating so much effort into sweet potato production as compared to other competing crops.

Table 1. Production and Value of Sweet Potato in Selected Counties in Kenya in 2023 and 2023

County	Area	Production (Tons)	Value Kshs
Homa Bay	11,648	168,015	3,689,000,000
Migori	10,838	155,230	4,212,250,000
Siaya	7,440	84,540	3,494,800,000
Busia	4,235	60,576	2,616,44,0000
Bungoma	1735	22,068	363,520,000
Kisumu	3174	29580	1,960,200,000
Kakamega	3222	21,166	326,300
Meru	1407	18'481	745,247,000
Muranga	599	6,191	228,375,290
Bomet	841	4240	106,637,650
Machakos	874	3498	176,825,000
Kwale	935	4450	111,250,000

Source: State Department of Crops Development and Agricultural Research [SDCDAR] and Kenya Revenue Authority [KRA].

Research has shown that sweet potato can be processed into flour, bread, sweet potato chips and be used in baking, when combined at certain levels with other flours such as wheat flour. The international Potato Center (CIP) has developed a simple method of processing sweet potato that can be adopted at the household level include peeling, washing, cutting into chips and then sun drying to extend the storage life and variability in its consumption. Amongst the storage and processing technologies that researchers have developed include the 'fresh storage pit', where farmers can store fresh sweet potato for up to six months in ground, the salting of processed chips to help increase the storage lifespan of dried chips before they are attacked by weevils or storage pests, introduction of slicers so as to increase the efficiency and ease of slicing and maximize on labour availability during the harvesting and drying times. The dried sweet potato chips can be ground into flour that can be used as complements to traditional baking flour. To minimize discoloration, the drying should be done in moderate temperatures that does not exceed 55 degrees Celsius [15]. Processing allows farmers to keep the

crop at home in the granaries rather than in-ground, where in many cases most varieties are susceptible to weevil attacks or infestation. The processed sweet potato can be used to tide the family during the food shortage period and act as a security strategy that households may adopt. Commercialization of sweet potato production calls for a focus of who amongst the farmers are likely to adopt the crop as a cash crop rather than produce mainly for family subsistence needs thus paying attention to the social characterization and differences amongst the farmers. Farm acreage and farmers resource endowment, including an understanding of the market dynamics are key factors that can impact farmers ability to move towards commercialization [14]. There is need to understand the competing production goals a farmer has and leverage on the unique characteristics and versatility of the crop to adopt to diverse ecological conditions and being a low input crop to promote it amongst the farmers as a viable cash crop.

The push for increased productivity and attendant commercialization can help contribute to poverty reduction amongst households that grow sweet potato largely as a subsistence crop. The commercialization of the crop can easily be achieved by the fact that in most of the growing areas, part of the crop is already being sold in the local markets and emerging urban markets and the critical issue is how to upscale this and help formalize the markets to be reliable and competitive, In order to achieve this, there is need to adopt a broader strategy that would include diversification of rural livelihoods, development of market infrastructure and crop specific support that would enhance the value of sweet potato crop. It also calls for a realization that farming systems evolve over time, propelled by changing circumstances that affect resource availability and access to them. Some of these factors may be internal while some of the factors may be external. The dynamism with which a community adjusts means that changes occur periodically and that there is need to understand the cause for these changes and their implications for both food security and improvements in household welfare. Farmers may be cautious in expanding sweet potato acreage if it will entail a major trade off with other crops considers as critical in the household food security situation. In a study in North East Uganda, it was noted that the outbreak of African Cassava Mosaic Virus [ACMV] disease in the 1980's that devastated cassava production [a major staple] combined with political turmoil in the region at the time, the demise of cotton as a cash crop at the time, led to a 'boom' in sweet potato production and its' eventual emergence as the regions cash crop targeting Kampala market. [14].

The versatile nature of the crop, short maturity period, vegetative propagated nature that requires no seeds hence low capital costs can translate to quick expansion of acreage of agricultural extension officers give it the necessary attention and the county governments where it is a major crop adopts policies that would encourage its' commercialization and processing. It is also considered dependable, allowing for piecemeal harvesting over a period of time giving farmers access to the crop at different times of the year. The 'over supply' nature during peak harvesting season that normally leads to a drastic fall in prices per bag can be tackled by encouraging on farm processing, including in-ground storage that has proven useful in lengthening the shelf life of the roots in the case of North East Uganda [16]. Processing provides an opportunity for diversifying the utilization of the crop to be used as animal feed or for starch production as has been done in some Asian countries where up to 40% of sweet potato produced is used as animal feed [16]. Value addition in sweet potato leads to products such as dried sweet potato chips that can be crushed into flour and mixed with wheat flour for home-based baking of buns that can be sold locally and act as an income stream to households as well as promote the vertical integration of the crop from the farm to the urban consumer. Commercialization of the crop will not only contribute to food security measures in rural areas but also the broader goal of rural transformation and establishment of agro-processing ventures in rural areas in line with the country's Vision 2030 that intends to help Kenya move towards being industrialized and food secure [18].

Conclusion

Many farmers in the country grow sweet potato as a subsistence crop and many policy documents tend to pay limited attention to the crop, yet its' versatility in terms of where it can be grown and low input demand gives it a great potential to help fill the food security gap in the country. The fact that sweet potato as a crop needs only three to four months between planting and harvesting made it an ideal crop for meeting food security needs as well as creating an alternative income stream for the farmers**.** Sweet potato processing can provide an avenue not only for value addition but also a diversification in its utilization and help create a viable income stream to the farmers. Processing and improved storage technologies can make the product be available for a longer time and be used by the family during the food shortage period in the production cycle. The fact that the crop is grown mainly by 'poor' small holder farmers means that an improvement in production and income from sweet potato can strongly contribute to poverty alleviation measures to many rural households who may not be currently have a traditional cash crop such as teas, coffee, floriculture, sugar cane or avocadoes. The gendered nature of sweet potato production, where it is grown mainly by women on small plots does also imply an empowerment strategy if incomes from the crop can be increased. Women generally tend to pay more attention to food security situation in their households and may not adopt full commercialization at the expense of their families, balancing between family dietary needs and cash income. The transformation of sweet potato from being dominantly a subsistence crop to a commercial crop will require an interplay of policy interventions by stakeholders in the agricultural sector, private enterprises that can promote value addition and engage in processing and marketing of sweet potato products. This makes it imperative for policy makers to broaden the strategic food reserve basket to include other foods beyond maize, beans, rice and Irish potatoes to include pulses and roots and tubers by improving on their storage and value addition. Such a policy orientation will require investments in sweet potato research, improvement in extension services and marketing infrastructure of the crop and its' products.

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