

POTATO MARKET ASSESSMENT

FOR

EAST AFRICA

2015

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ACRONYMS

CIP	- International Potato Centre
KALRO	- Kenya Agriculture and Livestock Research organization
GIZ	- Deutsche Gesellschaft für Internationale Zusammenarbeit
KFC	- Kentucky Fried Chicken
NPCK	- National Potato Council of Kenya
EAFF	- East Africa Framers Federation
CAADP	- Comprehensive Africa Agriculture Development Programme
RFO	- Regional Framers Organizations
SFOAP	- Support to Farmers Organization in Africa Programme
IFAD	- International Fund for Agricultural Development
AFD	- French Agency Development
USAID	- United States Agency for International Development
MoALD	- Ministry of Agriculture and Livestock Development
PSS	- Positive Seed Selection
KEPHIS	- Kenya Plant Health Inspection Service
ADC	- Agricultural Development Corporation
KENAFF	- Kenya National Framers Federation
NGOs	- Non Governmental Organizations
DLS	- Diffused Light Storage
KNBS	-Kenya National Bureau of Statistics
PSDA	- Promotion of Private Sector Development in Agriculture
PLA	- Policy Lobby and Advocacy
VC	- Value Chain
VCDC	- Value Chain development Committee
AHDB	- Agriculture and Horticulture Development Board
ID/OS	- Institutional Development and Organizational Strengthening
KINAPOFA	- Kenya National Potato Framers Association
MVIWATA	- Mtandao Wa Vikundi Vya Wakulima Tanzania

I. EXECUTIVE SUMMARY

Potato, also known as Irish potato in Kenya and Uganda and as round potato in Tanzania is a very important food crop within the region. Potato contributes substantially to the regions' household income for growers and other agents within its value chain. Under suitable climatic conditions and good agronomic practices, a one hectare piece of land can yield over 40 metric tons of potatoes per season depending on the variety. This translates to about 800 bags of 50kg. At an average price USD 12 per 50kg bag the farmer earns total revenue of USD 9,700 (USD 3,880 per acre) potentially earning a profit of over USD 2,900 with estimated input cost of USD 800 per acre. This shows the enormous potential of potato in contributing to wealth creation among the smallholder farmers in the East African region. A total of 7,098,640 of potato are produced from an aggregated 645,606 (FAO, FAOSTAT, 2015)¹ ha of land in the five countries.

Certified seed potato is a big challenge in the East African countries. Certified Seed availability is a major setback in the development of the potato value chain in sub-Saharan Africa. Foundation seed production in Kenya is the responsibility of KALRO-Tigoni, Agricultural Research Institute, Uyoire for Tanzania and KAZARDI in Uganda. These institutions are faced with challenges that are still limiting them to produce enough basic seed for their respective countries. The national potato research programs spearheaded by these institutions can at best be expected to provide a very modest amount of basic seed. Further multiplication and distribution of this seed is mainly left to private sector in the three countries. As it is now, most farmers retain own "seeds" from their previous harvests or buy from their fellow farmers. These tendencies only serve in reducing productivity and also help in worsening the pests and diseases related challenges.

All across the region, the market characteristics are similar. Potatoes are sold packaged in extended bags that weigh from 110 to 260kgs. These extended bags are conspicuous in every market all across the three countries. Relevant farmer organizations and other like-minded stakeholders in each of the three countries are lobbying and advocating for eradication of the extended bags with limited success. There are inadequate and disjointed potato production and marketing regulations which are also not anchored on any potato subsector policy framework. There also exists agreed on Eastern and Central Africa harmonized marketing standards which have not been fully institutionalized and implemented in individual countries.

Many of the traders selling potatoes are not well conversant with the names of different potato varieties they are trading on but give them names associated with areas where their production originated from or is predominant. Each country has specific opportunities but there exists some opportunities that cut across the region. There exist a number of buyers who require periodical supply of ware potato but do not know how to be connected directly with producers for contractual supply. This study captures some of those opportunities and their details that include the varieties they need, quantities, quality and contacts. One such regional opportunity is from the international food chain restaurants such as the Kentucky Fried Chicken (KFC) that imports their ready-cut frozen chips from Pakistan, Egypt, South Africa and others. Some of these restaurants are looking forward to working with local farmers to supply potato as long as can supply the right varieties and quality of potatoes they need.

The study findings indicated that there is a regional opportunity from the identified market outlets totaling to 2,627.23 tonnes per month from the buyers who are seeking to be supplied with different varieties of ware potatoes monthly. The buyers have expressed willingness to be linked directly with the producers for contractual agreements.

There exist a relatively big number of small scale crisps processors all across the three countries. Their level of operation is very low and therefore the quantities of fresh potatoes they require is also low, 2 to 5 bags of 100kg per week. Few medium to large scale processors like NORDA and Tropical Heat exist in Kenya and Uganda. Tanzania mainly relies on imported potato products and some few relatively small scale processors like, Crisps, Snacks, Jingles and Bingos.

The regions' potato sub sector seems to suffer from the same challenges, even though some countries do well than others in terms of addressing those challenges. Availability of potato seed is a challenge in every country. Pest and diseases is yet another. Presence of uncoordinated and disjointed policies plaque the region and lack of concerted efforts to develop seed variety suited for processing is a challenge that cuts across the three countries. Kenya seems to be ahead of the rest in the potato sub sector. It has made substantial progress in developing potato industry and the rest of the region could learn more on Kenya in this regard. For example, Kenya has more than 60 existing varieties and recently added 37 new ones. Kenya has more processors and has managed to come up with a potato council - NPCK that deals with potato issues on a day by day basis. This study has managed to document elaborately the Kenya's potato sub sector including the formation and management of National Potato Council of Kenya. It also talks about the efforts Kenya National Farmers Federation and Kenya National Potato Farmers Association has done towards developing the sub sector in both seed and ware production, marketing, policies and processing.

It is highly recommended that steps be taken to ensure that the producers are linked to the processor and other market outlets for the benefit of all. It is also recommended that EAFF follow up with the market outlets especially the franchise food restaurants and processors that have shown interest of working with the farmers and farmer groups in the region. Another recommendation is that a study be commissioned to establish the actual potato production acreage and quantities and also determine the amount of potato consumed in the region of production to establish the role of the potato as a food security crop.

1 INTRODUCTION

The CAADP Africa Forum is a platform of exchange for people working in agriculture across the continent. The platform is meant mostly for farmers and farmer representatives, but also for policy makers, manufacturers, traders, retailers, financiers, development workers and others who work in, with or for African agriculture. The CAADP Africa Forum is part of the CAADP framework, and is coordinated by the five Regional Farmer Organizations (RFOs) and their continental platform (Pan African Farmers Organization). These organizations are implementing a series of activities aimed at strengthening farmer organizations in their engagements in the potato value chain at the national and regional levels. The activities are part of the SFOAP program, financially supported by the European Commission, International Fund for Agricultural Development (IFAD), French Agency for Development (AFD) and the Swiss Development Cooperation (SDC). The CAADP Regional Africa Forum serves as a platform to complement these on-going initiatives, and aims to explore and exploit potential linkages with other potato stakeholders.

The forum at Musanze in Rwanda 31st August to 4th Sept 2015 follows the CAADP Regional Africa Forum 2013, which was held in Nairobi, Kenya in November 2013. During this meeting, farmer organizations from Eastern Africa discussed issues related to the potato value chain, at great length, and were able to visit a potato processing company, and several seed potato research facilities.

It is as a follow up to these discussions that EAFF with the support of AFC commissioned a study on potatoes in Kenya, Tanzania and Uganda

1.1 The objectives of the study:

- i. Potato Market Assessment: To assess the market opportunities for potatoes in the region, focusing on three main countries - Kenya, Tanzania and Uganda. The assessment will:
 - a. Profiling main buyers of potatoes in these three countries, who include major traders, restaurant chains, and potato processing companies, among others. The profiling will obtain the names and specific contact details of the buyers, potato varieties that they buy, the main challenges that are faced by these buyers and the buyer requirements, in terms of potato varieties and quantities being sought.
- ii. Potato sector analysis: The analysis will cover:
 - a. Overview of the National Potato Council of Kenya (NPCK), describing how it was formed, who formed it, its mandate, its performance.

- b. Performance and opportunities in the processing sub-sector, including variety selection, market viability, among others.
- c. Performance and opportunities in the seed potato sector, and identify opportunities to invest in the seed potato sector with respect to access to breeder material, economic viability for small-holders, and access to various technologies for seed potato production.
- d. The performance of potato farmer organizations in Kenya, highlighting their role in mobilizing potato farmers across the country, representing potato farmers during policy dialogues, challenges in sustaining the organization among other challenges.
 - e. Technical advice to EAFF members: The team will observe and advise EAFF members as they develop their action plans for 2016. This advice is intended to enrich the plans. The team will also critique the plan as they are presented during the Forum

1.2 Methodology and tools

The study was conducted in Kenya, Uganda and Tanzania and involved analysing potato production and marketing. In Kenya the study involved assessment and documentation of development changes in the potato subsector since 2003 with emphasis on various interventions and initiatives that include formation and operation of National Potato Council of Kenya (NPCK) and Farmer organizations, and identifying business opportunities. In Uganda and Tanzania the study evaluated the potato subsector with more emphasis on marketing and business opportunities. Desk reviews, interviews of key institutions and informants and groups discussions of relevant actors and players along the value chains were used to collect information. The information collection was on various projects and interventions initiated in the recent past and their effectiveness in transforming the potato sub-sector in Kenya. While in Uganda and Tanzania key institutions and major potato buyers were interviewed on issues relating to potato quality, supply and demand. The information collected was collated, rationalized, collaborated from different sources and summarized.

1.3 Potato Sub-sector Overview in East Africa

Potato (*Solanum tuberosum*) is an important food and cash crop in Eastern Africa (E.A.). Its importance continues to rise due to increased urbanization, change of eating habits and increased uptake of processed potato products such as French fries (chips) and crisps. The tuber crop is ranked among the top 10 strategic staple crops for food and income security in East and Central Africa (Kaguongo, Rwomushana, Kashiija, Senkesha, & Kabira, 2015). Due to the growing attraction to potato production, the area under the crop has continued to increase

steadily over the years, principally under smallholder production systems, which are characterized by high population density, with farmers owning parcels of land measuring between 0.25 and 5 hectares.

Over the last 20 years potato production increase in East Africa (Kenya, Uganda and Tanzania) has mainly been by area expansion (Figure 1). Between 1994 and 2013 total production area for the three countries increased by two -fold, from 199,614 ha to 461,172 and production increased three-fold, from 1.7 to 5.0 million tonnes per year (FAO, FAOSTAT, 2015). The statistics shows yields have stagnated at a very low level, between 5 and 10 tonnes per hectare (t/ha), while the potential is between 20-40t/ha (Raemaekers, 2001).

The major constraints for the dynamic development of the potato industry are mainly at the level of production, infrastructure and the education of farmers. Major production constraints are shortage or lack of clean seed. Less than 5% use clean seed (Kaguongo, Ng'ang'a, Muthoka, Muthami, & Maingi, 2010) ; build-up of crop specific soil and seed borne pests and diseases such as bacterial wilt; unavailability of adequate improved varieties; unavailability of varieties suitable for specialized utilization; insufficient nutrient supply to the crop and nutrient mining of the soil; and the use of inadequate fertilizers.

Other areas of concern in the sub-sector include post-harvest management, market access, access to information, capacities of extension and research bodies and policies which influence the entire potato sector. Lack of storage, fluctuating prices, post-harvest losses, lack of marketing standards and lack of knowledge remain a major bottleneck in optimizing potential contribution of the subsector to the regional economies.

Greater involvement by the private sector in potato value chains would offer a means of unlocking the yield gap by overcoming the bottlenecks limiting the full utilization of the potato and offering expanded regional market for potato products and subsector services. Regional efforts can help exploit economies of scale for sharing knowledge and technology, implement creative applications of information communication technologies, advocate for farmer-friendly crop-related regulations and policies, improve the business-enabling environment, and expand intra-regional trade. Identification of business opportunities that cut across the East African countries can attract large companies and create market for potato farmers in the region.



Figure 1: Seed and ware Potato production in East Africa

Source: <http://www-faostat3.org> accessed 05/10/2015

2 POTATO SUBSECTOR IN KENYA

2.1 National importance of potatoes in Kenya

In Kenya potato ranks as the second most important food crop after maize. It is both a staple food and a cash crop for many rural and urban Kenyans who are engaged in production marketing, trading and processing. It is a major source of income and is increasingly assuming importance as a cash crop and contributes over USD 490 million (Kshs 50 billion²) worth of production at market sales rates to the national economy annually (Kaguongo, Maingi, & Giencke, 2014). As a food crop, potato is an important source of carbohydrate, proteins, and vitamins; and plays a major role in food security. Its annual production is 3 million tons from two main cropping seasons (Kaguongo, Maingi, Ronoh, & Ochere, 2015). Potato subsector employs an

Importance of Potato in Kenya

- Annual production of the crop is worth KSh50billion,
- Industry directly and indirectly employs about 3 million people.
- The potato produces more food per unit area and time than wheat, rice or maize, and is adaptable to a wide variety of farming systems and agro-ecological zones.
- The crop has a short production cycle (ready for harvest within around 100 days of planting). It can be grown as an off-season crop.

estimated 3 million people along its value chain as producers, middlemen, traders, processors and other marketers (Kaguongo, Lungaho, Borus, David, & Ng'ang'a, 2013). There are about 800,000 (Kaguongo, Maingi, & Giencke, Post-harvest Losses in Potato Value Chains in Kenya: Analysis and Recommendations for Reduction Strategies, 2014) producers in the 13 leading potato-producing counties in Kenya. These are mainly distributed in Rift Valley, Western, Central, Eastern and coast regions of the country.

Potato contributes substantially to household income for growers. Under suitable climatic conditions and good agronomic practices, a one hectare piece of land can yield over 40 metric tons of potatoes per season depending on the variety. This translates to about 800 bags of 50kg. At an average price KES 1,250 (USD 12.25) per 50kg bag the farmer earns a total revenue of KES 1,000,000 (USD 9,803) which is equivalent to KES 400,000 (USD 3,922) per acre, and potentially earning a profit of over KES 300,000 (USD 2,940) with estimated input cost of KES 83,000 (USD 814) per acre (Table I below). This shows the enormous potential of potato in contributing to wealth creation among the smallholder farmers (Kaguongo, Report Prepared for the Senate Speakers' Round Table Meeting, 2014).

2 The exchange rate for US dollar to Kenya Shilling was 1USD=102 KES

Table 1 Potato production Potential

Indicator	Current Performance	Potential performance
Yields in mt/ha	12 tons	40
Estimated 50 kg bags	240	800
Price per unit USD	12.25	12.25
Estimated Total Revenue	2940	9800
Estimated cost of production	1471	2034
Estimated Profit	1469	7766

2.2 Potato Production in Kenya

2.2.1 Seed Production

Certified seed potato is in short supply in Kenya. Lack of sufficient quantities of certified potato seed is one of the major setbacks to the development of the potato value chain in Sub Saharan Africa. Basic seed production in Kenya is the responsibility of Kenya Agriculture and Livestock Research Organization (KALRO) - Tigoni. The national potato research programme is expected to provide a very modest amount of basic seed. Further multiplication and distribution of this seed is best left to the private sector. The seed multipliers have however been frustrated by shortage of both basic and certified seed. The private seed multipliers layer is expanding fueled by the high demand for quality seed potato as well as a result of enormous efforts made by various stakeholders in the industry such as the Ministry of Agricultural and Livestock Development, the GIZ, CIP, and other development partners' programmes and lobbying and awareness creation by NPCK). Different approaches have been used to organize and improve the seed



Figure 2: Aeroponic seed production



Figure 3: Hydroponic seed production

potato production system, with varying levels of success. However despite several years of promoting the seed potato production in Kenya, there is still an enormous gap between the basic seed produced at KALRO Tigoni, and the demand for the basic seed by small-scale and large scales seed multipliers like Kisima Farm. This has led to stakeholders and some donor programmes such as GIZ, USAID, and research programmes like CIP with encouragement and coordination by NPCK, supporting private sector players to go into seed production. There has been some positive response with encouraging results.

On the other hand available certified seed is beyond the reach of the small holders. The process of certification is expensive and these expenses impact negatively on the price of the certified seed potato with respect to farmers' purchasing power. A kilogram of certified seed potato costs between KES 45- 50 (USD 0.4-0.44) with seed from public sector being cheaper than from private producers. Private producers sell certified seed at KES 50-60 (USD 0.49-0.59). Public seed producers are subsidized by Government and therefore sell the seed potato at lower price than private producers

Another problem is getting the varieties that farmers want to grow in response to market demands. Shangi, a farmers' variety is the most popular in the fresh produce markets. It is also high yielding and has very short dormancy and therefore very popular with farmers. But there has been no certified or clean seed of this variety. The KALRO National Potato Research Centre Tigoni was recently forced to respond to farmers demand to clean the variety and release it to them. But the variety does not have processing qualities. It has deep eyes and irregular tubers with high sugar content. Due to its very short dormancy (time seed takes to sprout), it has poor storage qualities as it tends to sprout very quickly.

There is a serious shortage of processing varieties. Many of the processing companies are operating at below 50% of their processing capacity (Kaguongo, Maingi, Ronoh, & Ochere, 2015) The only variety with desirable processing characteristic is Dutch Robjijn. However the variety is not popular with farmers because it is low yielding (Kaguongo, Maingi, Ronoh, & Ochere, 2015) and highly susceptible to diseases and therefore is expensive to manage, and maintain.

Dutch Robyjn and Shangi are the main varieties used in crisps processing in Kenya. However, there are 3 newly released varieties (Destiny, Rumba, & Taurus) suitable for crisps processing and another 7 newly released varieties (Caruso, Derby, Jelly, Markies, Rudolph, Sagitta, & Toluca) suitable for both crisps and ready-cut chips processing. There also over 30 new varieties that have been introduction into the country by Kenya/Dutch Potato project and are currently undergoing trials. Some have shown desirable climatic and marketability qualities (NPCK, 2015).

Informal seed potato systems currently dominate the sub-sector, contributing over 94 % of the total seed used nationally, while both clean and positively selected seed contribute less than 3% and certified seed contribute the rest less than 3% (Figure 4).

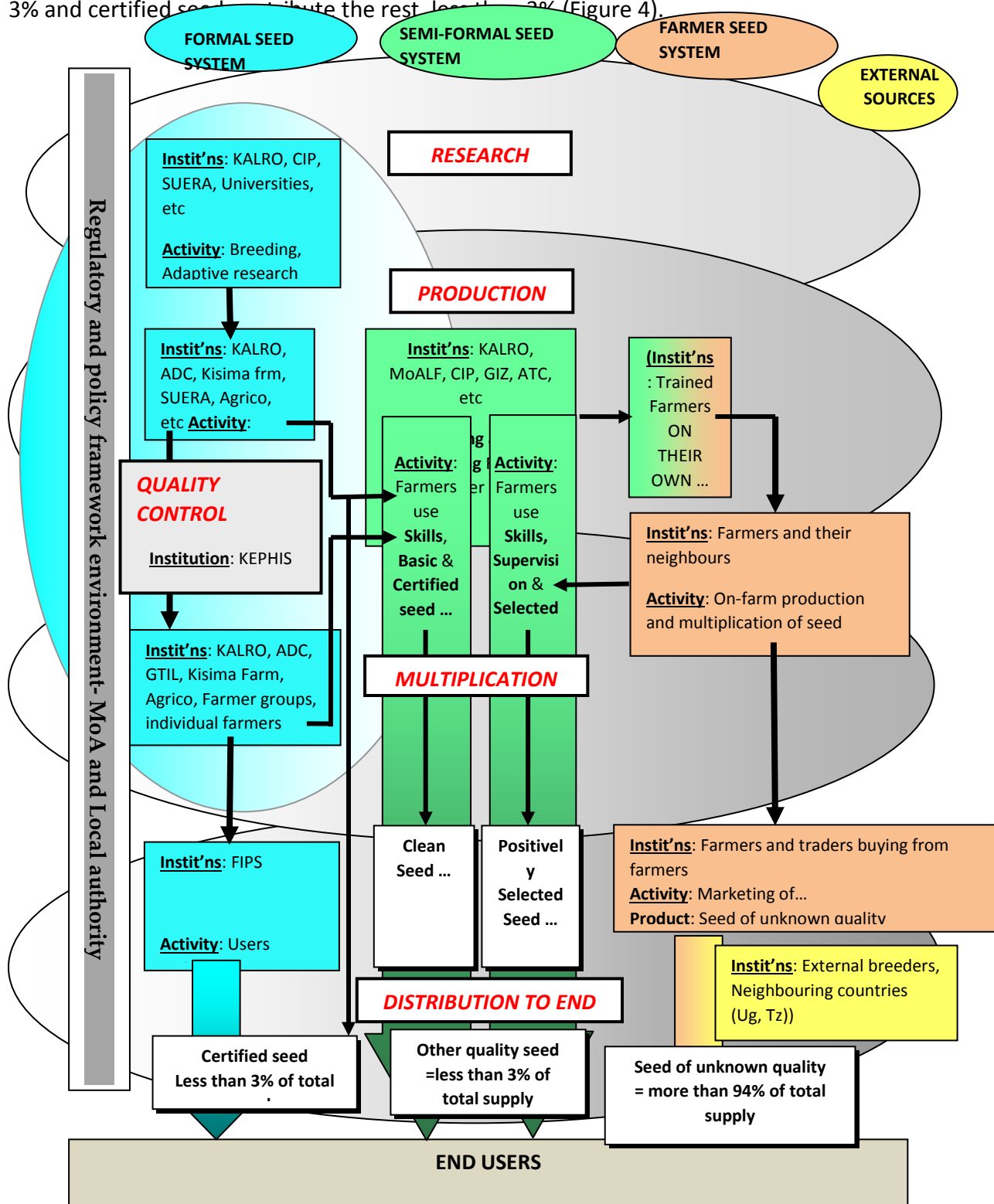


Figure 4: Flow chart of seed systems in Kenya

a) The informal seed systems

Clean seed is multiplied at farm level by trained farmer seed multipliers. It originates from certified or basic seed and its production follows guidelines laid down in farmer training programmes conducted by organizations such as the MoALF (Ministry of Agriculture, Livestock and Fisheries), KALRO, KEPHIS, GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit)

USAID and other donor programmes. Most production guidelines used in the production of certified seed are also used to produce clean seed – only sample testing and supervision by KEPHIS is omitted. Negative selection is used to remove diseased and weak plants.

Positively selected seeds (PSS) is seeds produced from ordinary or farmer-saved seeds through a process of selection carried out by farmers who have been trained and have knowledge of good seed selection and management techniques. Farmers plant the tubers and then at a stage when crop is vigorously growing (about 1.5 to 2 months after planting) they go through the potato field and selects the most vigorous and diseases free plants and mark them with sticks. The selected pants are harvested separately and the tubers are kept as seed. However, the Kenyan law recognizes certified seed that have gone through strict production guidelines and inspection by the Kenya Plant Health Inspectorate Service (KEPHIS) as the only tradable seeds. All other seeds including positively selected seeds, clean seeds and farmers own seeds are considered as non-tradable by law, the Seeds and Plant Varieties Act, Cap 326 of Kenya.

Use of certified seed and other quality seed has remained low despite efforts over the years from the government, research institutions and development partners to increase availability. Majority of farmers are aware of the importance of quality seed and some of them are willing to pay premium for quality. Farmers are travelling an average of 124 km to source for certified seed, spending about 5 cents per kilogram of certified seed on transport charges (Kaguongo, Ng'ang'a, Muthoka, Muthami, & Maingi, 2010). Although 90% of farmers stored seeds, only less 4 % have been trained on seed storage and diffused light stores, while only 40% of farmers renewed seed regularly. In the formal seed system, which involves production and distribution of certified seed, Kenya Agricultural and Livestock Research Organization (KALRO) (former KARI) in collaboration with International Potato Centre (CIP) develops and maintains potato varieties; and supplies foundation seed. Kenya Plant Health Inspectorate Services (KEPHIS) offers seed inspection services while the Agricultural Development Corporation (ADC) and the trained seed producer farmers and private companies, carry out multiplication of basic seed to produce certified and clean seeds. The Government provides the policy and regulatory framework while extension services are specifically provided by Ministry of Agriculture and Livestock Development (MoALD) together with other partners like KALRO, Kenya National Farmers Federation KENAFF and NGOs.

Total national quality seed requirement is approximately 220,000 tons per year. This takes into account that farmers buy fresh seed after 2-3 seasons and that only one third of potato growers will buy fresh seed each year (Kaguongo, Ng'ang'a, Muthoka, Muthami, & Maingi, 2010).

b) Formal seed systems

More than 60 potato varieties are grown in Kenya, but only less than 15 of them are widely distributed in the growing areas. Currently, 'Shangi³ and 'Tigoni' (an officially released variety) are the main varieties because of market preferences. 'Shangi' needs a very short cooking time, which saves on energy costs. Although most varieties in Kenya have a white skin, there is preference in some regions for red skin varieties. Table 2 shows varieties grown in some selected counties.

Table 2: Potato Varieties Grown in Some selected counties

Potato varieties grown in each county (% within the county)	Meru	Bomet	Nakuru	Nyandarua	All
Potato Varieties					
Shangi	49.1	30.8	98.5	100	74.0
Asante	79.2	0.0	5.9	6.8	20.7
Dutch Robjyn	0.0	96.2	2.9	0.0	21.1
Tigoni	0.0	3.8	17.6	38.4	17.1
Sherekea	50.9	0.0	5.9	8.2	15.0
Kenya Karibu	0.0	7.7	14.7	23.3	12.6
Tigoni red	52.8	0.0	0.0	0.0	11.4
Desiree	3.8	23.1	4.4	11	10.2

Source: Kaguongo et al, 2014

Due to limited seed production, lack of desired varieties and insufficient distribution network, certified seed only contributes around 2% to the national seed potato demand. The limited availability and use of quality seed potato is a key impediment to increased productivity in the potato sector in Kenya. Considering the short crop rotations that the farmers practice, seed potato quality is an important factor in improving the sustainability of production. Quality seeds have the greatest impact on yields followed by irrigation, fungicides and fertilizers. However, seeds have the lowest adoption rate. (Wang'ombe & PieterMeine, 2013).

³ In the different publications, 'Shangi' is also named, 'Zangi' or 'Cangi'.

On basis of selected counties main source of seed used by the potato farmers is their own harvest (67.1%) and seed from neighbours (25.1%). Only 42% of farmers renewed seed regularly (Kaguongo, Maingi, & Giencke, Post-harvest Losses in Potto Value Chains in Kenya: Analysis and Recommendations for Reduction Strategies , 2014). The seed renewal rate was higher in Bomet and Meru where more than 60% of farmers renewed seed after one to three seasons while over 50% in Nyandarua and Nakuru counties never renewed their seed. Farmers from Meru and Bomet showed the highest rate of certified seed application (30%): In particular Bomet farmers are known for producing for the processing industry. The industry mostly provides the required seed material.

On-farm seed multiplication is further supported by varieties like ‘Shangi’, which is not certified and even clean seed is not available. Despite its advantages of higher yields and fast growing, the variety is easily affected by diseases. Because ‘Shangi’ germinates rapidly after harvest, seed tubers are planted shortly afterwards within a few weeks. This short dormancy allows the seed from one season to be planted in the next growing season, avoiding any storage. But the variety is also not suitable for storage as ware potato resulting in immediate selling after harvest.

c) Technology introduction

Recent efforts by Government of Kenya, donor programmes and research programmes as well as Private sector players have improved the availability of clean planting materials. The certified seed availability has improved from less than 1% in 2006 to less than 5% currently. This has been brought about by entry of new public sector players like Agribusiness Training centers and Private sector participants who are involved in seed potato multiplication. Njabini ATC, a MOALF institution for example is producing 100 tons of seed potato and has a Defused light store (DLS) store that can hold 80 tons. Kisima farm a private sector is producing on average 900 tons of seed⁴ per season and it is sold to farmers from all over the country. The farm has aeroponic mini-tubers production unit and so are not constrained with availability of basic seed. The only challenge is obtaining varieties that are demanded by producers.



Figure 5: Shangji Seed in DLS Store

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The initiatives that have been undertaken by various stakeholders include introduction of new seed production technologies such as aeroponics where mini tubers are produced in a greenhouse and later multiplied in field. The technique has reduced the time of producing first



Figure 6: Aeroponics potato mini tuber production

generation seed from 7-10 years using conventional methods to 3 years. There has also been efforts to recruit and train more small scale seed multipliers to ensure that farmers can have clean materials within their reach as opposed to travelling long distances in search of seed. At the same time Government of Kenya has encouraged importation of new varieties to meet the ever increasing demand for processing varieties. So far about 37 new varieties have been brought into the country and are on trials for suitability to the growing climatic conditions and for processing and consumption purposes.

d) Challenges in the seed potato value chain

- *Inadequate seed distribution systems:* The sub-sector lacks an elaborate distribution system and farmers have to travel long distances to source certified seed from either ADC or the other few existing multipliers. The existing seed production and distribution system is characterized by a number of constraints and inefficiencies which include: inadequate funding and personnel at both institutional and farm level; inadequate distribution of roles between public and private sector; limited land for research and multiplication levels making it difficult to allow for the mandatory requirement of three year crop rotation.
- *Inadequate quantities of breeder and basic seed:* Limited quantities of basic seed are produced, making it difficult for seed multipliers to meet the ever rising demand for quality seed potatoes
- *Under-funded regulatory bodies:* The prerequisite National Performance Trials (NPTs) and Distinctiveness, Uniformity and Stability (DUS) tests for a variety release are poorly

funded and are also perceived to be costly and time consuming. Moreover, the high cost of inputs such as fertilizer, inadequate technical know-how among farmers and, high transportation costs during distribution, perishable nature and bulkiness of seed tubers, in addition to lack of on-farm storage facilities and poor access roads, have continued to hamper the efficiency of the seed potato sub-sector.

- *High cost of agricultural inputs:* Cost of seed potato, fertilizers and chemicals is high. For example cost of seed potato contributes about 60% with cost of a kg of certified seed selling for between USD 0.4 to 0.44. If farmers buy ordinary farmers seed from other farmers the cost drops to USD 0.2.
- *High cost of production of seed potatoes:* the start-up costs for setting up a facility for aeroponics or hydroponics is expensive. According to NPCK it costs about USD 9804 to set up an Aeroponic unit of 8 by 24 meters using conventional materials. Hydroponic unit of same size costs USD 4901. The cost would be much lower if local materials are used. Constructions of these units using locally available materials such as wood and bamboo would reduce the cost to about a third (about USD 3,200 for Aeroponic unit and USD 1630 for hydroponic unit.).

In the formal seed system, which involves production and distribution of certified seed, Kenya Agricultural Research Institute (KARI) in collaboration with International Potato Centre (CIP) develops, maintains potato varieties and supplies foundation seed. Kenya Plant Health Inspectorate Services (KEPHIS) offers seed inspection services while Agricultural Development Corporation (ADC), and a myriad of farmers and private companies carry out multiplication of basic seed to produce certified seeds. The Government provides policy and regulatory framework while extension services are specifically provided by MOALF together with other partners like KALRO and NGOs.

e) Opportunities in seed production

- *High demand:* There is a very high demand for quality seed with high yields. Interested investors including farmer association could make good business in production and supply of quality seed potatoes
- There is demand for packaging materials for seeds. Seed potatoes sensitive and need to be packaged the correct way. KEPHIS will not allow marketing of seed if suitable packaging bags made of sisal or jute are not used. These are in short supply and what is available is very expensive (about USD2 per bag) which increases the cost seeds. Investors could procure and supply such packaging bags.
- There is shortage of processing varieties. The processing companies are looking for varieties. Investing in such engagements would be good business.

2.2.2 Ware Potato Production

The most favourable climatic conditions for potato cultivation are found in areas at altitudes between 1,500 m and 3,000m above sea level, where Kenya's main staple food maize has no comparative advantage. At this altitude potatoes grow faster than maize and produce more food per unit of land (Kaguongo, Maingi, & Giencke, Post-harvest Losses in Potato Value Chains in Kenya: Analysis and Recommendations for



Figure 7: Potato harvesting in Narok County, Kenya

Reduction Strategies , 2014). While maize takes 6-9 months to grow in high altitudes, potatoes take 3-4 months. The potato production areas are found mainly in the highlands of central, eastern and rift valley regions, in Mau range and the slopes of Mt. Kenya. Moreover, other regions such as Mt. Elgon in the Western province and Taita Taveta in Coast region at the southern border region with Tanzania are prominent production areas.

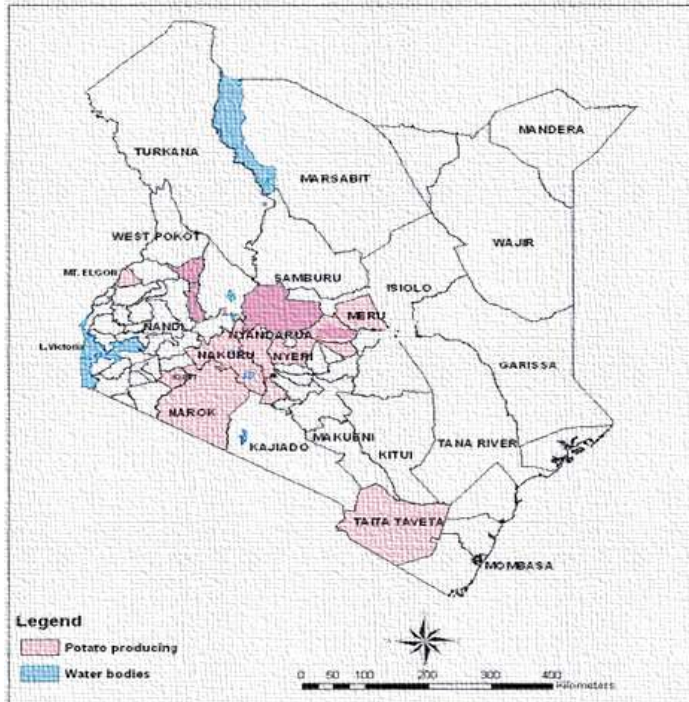


Figure 8: Landscape of smallholder farms in Bomet potato region

Potatoes are grown by about 800,000 smallholders. It is estimated that 83% of the land under potato cultivated by smallholder farmers with 0.2 to 0.4 ha of potato production. Approximately 17% of the potato fields are owned by larger farmers with above 2ha of potato land (Jannssen, 2013). The average production in Kenya is estimated at 7-10 tons per ha, compared to a global average yield of 17 tons per ha (Muthoni, 2011). Kenyan farmers achieve two harvests per year.

The total production area has increased
 Figure 9: Map of Kenya's potato Growing Counties

gradually and is estimated to have reached 150,000 to 160,000 ha to date (Table 3), up from estimated 105,000 ha about 10 years ago.



Table 1: Productions trends (area in ha) in main potato growing counties

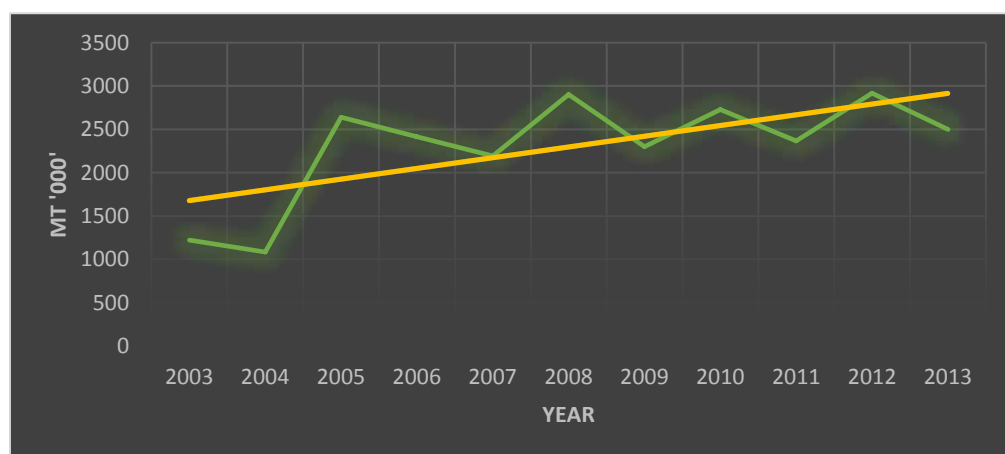
County	2010	2011	2012
Meru	17,463	12,500	18,092
Nyandarua	28,688	30,577	27,520
Nakuru	16,053	16,804	22,566
Bomet	2,900	3,680	2,987
Elgeyo Marakwet	8,311	15,097	20,992
Narok	6,836	7,808	6,292
Kiambu	11,271	10,092	18,769
Nyeri	8,067	6,404	7,821
Bungoma	5,113	6,051	5,321
Total area (ha)	104702	109013	130360

Source (Kaguongo, Maingi, & Giencke, Post-harvest Losses in Potato Value Chains in Kenya: Analysis and Recommendations for Reduction Strategies , 2014)

The other counties that grow potatoes are Uasin Gishu, Kericho, Transnzoia, Pokot, Kirinyaga ,Taita Taveta and Embu.

Total area under potato is estimated to be about 150,000-160,000 ha with an average yield of about 10 tons. Farmer seed system currently dominates the sub-sector, contributing about 96 % of the total seed used while both clean and positively selected seed contribute 2.6%, and certified seed contribute the balance about 1.4% only. Use of certified seed and other quality seed remains a challenge due to shortages. However, majority of farmers are aware of the importance of quality seed and are willing to pay some premium for quality. Farmers travel an average of 124 km to source for certified seed.

Figure 10: Potato production in Kenya (2003-2013)



Source: FAOStat 2014 and MoA, 2013

2.2.3 Challenges at farm production Level

- Small farm size not very ideal for potato farming as they are not adequate for crop rotation, Farmers therefore experience high diseases incidences that lead to low yields
- Lack of high yielding varieties that are suitable for various purposes. This too leads to low productivity
- Potato crop is an expensive enterprise due to its high inputs requirements. Seed alone costs about USD 314- 353 at the rates sated elsewhere in this report. Farmers find this expense too high and tend to apply low rates of the farm inputs, farther reducing productivity.

2.2.4 Opportunities at Farm production Level:

- As already stated at seed production level, there is high demand for quality planting materials and it would make good investment sense to fill the gap.
- Potato is labour intensive crop. Introduction of mechanization would help farmers to improve production and also reduce cost of inputs, and reduce food losses that occur through poor harvesting by hand. Association could invest in machinery and provide such services to the members.
- Most farms are far away from the markets and farmer would benefit from transportation means supplied by private players or co-operatives

2.3 Marketing

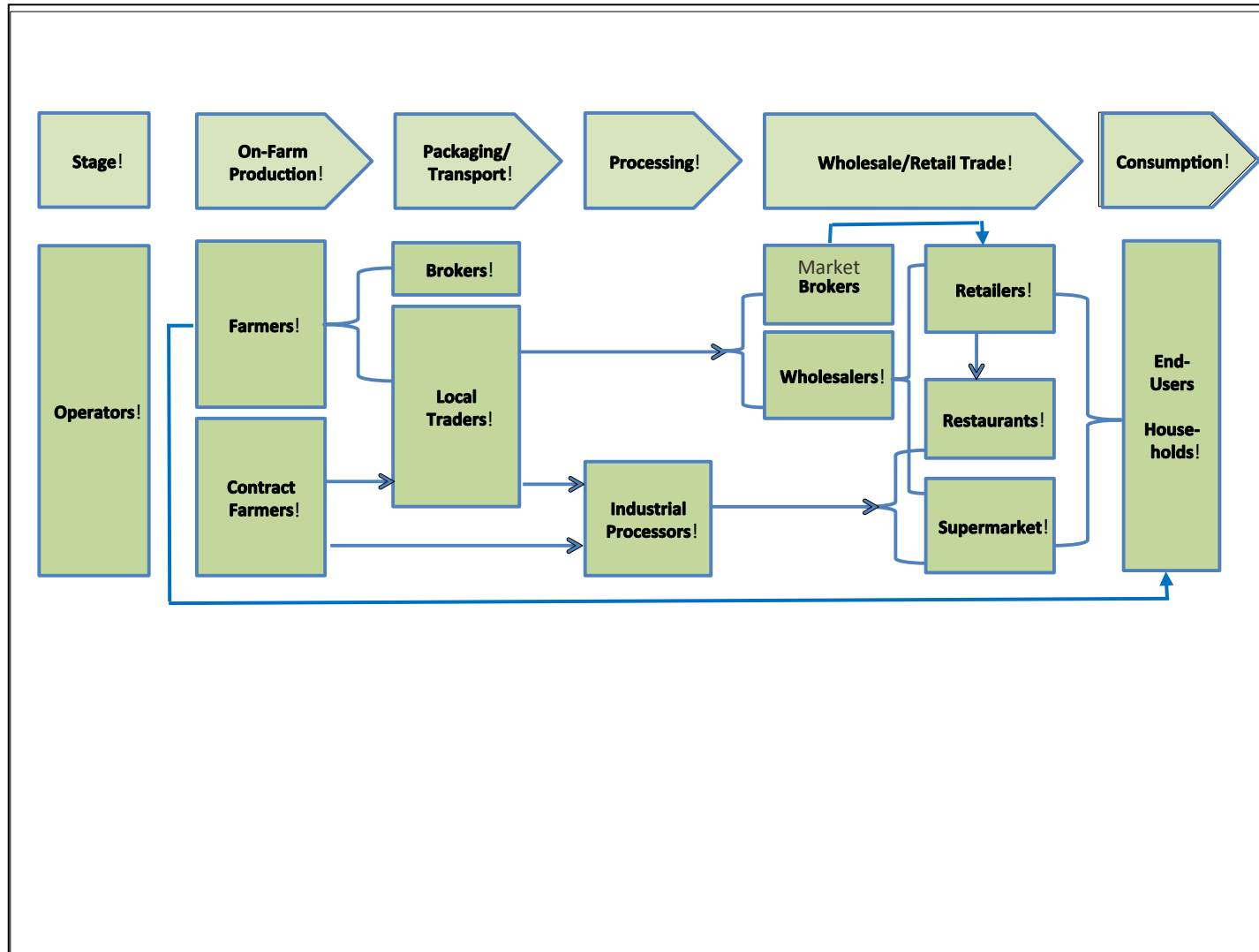


Figure 11 Potato Value Chain

Trading in potato starts at the farm gate. Of significant concern is that the farmer are price takers and plays a very little role in farm level marketing. The actual marketing activities of pricing, promotion, and search for buyer, are carried out by the local broker.

In rural areas, road network is very poor and brokers have difficulties in transporting potatoes from farms. The poor roads cause delays in transporting harvested potatoes, which sometime results to potatoes spoilage and deteriorating in quality. Prices are set every day depending on

supply. The participants at market places are able to project supply and demand based on their experience. Due to the improved communication infrastructure they are also able to influence pricing by creating artificial glut, through communicating to the traders who collect produce in the farms, and asking them not to supply for a specified time period.

Potato marketing has been the main focus of the stakeholders in Kenyan potato sub sector. It is characterized by many players without a universally accepted code of trading, resulting in unfair trade. While Kenya Government with support of development partners and other stakeholders has been developing policies to streamline and guide marketing of potatoes in the country, which has led to development of marketing legal frame work for potatoes, traders and brokers undermine the implementation and have even gone to court recently to block implementation. The implementation of the legal framework on which marketing standards is based has been slow. Though this process has been going forth and backwards from 2003, and standards are developed and in place, potatoes are still marketed in extended bags of between



Figure 12 Extended potato bags.

150 to 250 kg bags instead of the legalized weight of 50 kg bag. The recommended packaging is always used for a while and then quickly, traders and brokers revert to packaging in extended bags. There are many actors in the marketing of potatoes in the country. Each has crucial role to play. However the actors place personal interest first, especially brokers and wholesale traders. They determine the prices and leave no chance to the producer to have a say, reducing them to price takers. The price of bag of potatoes does not relate to its weight. A bag of 150 kgs will fetch the same price as a bag of 250 kgs since pricing is not done on weight basis.

Currently there is a fresh concerted effort from the National and County Governments through lobbying of the NPCK and farmers to implement the 50kg standard. Each of the potato growing Counties is seeking ways of ensuring that the standards are respected and implemented.

2.3.1 Challenges at marketing level

- Difficulties in implementing the set packaging standards due to undermining of the same by traders and middlemen.
- Farmers are price takers and do not have a chance to determine the farm level prices. This is determined by traders and middlemen. Farmers' loss a lot of their income from the crop through this.

- There is multiple taxation on produce as transporters pay cess⁵ in each County they travel through. Traders load these expenses on the cost of buying potatoes, and reduces the farmers margin farther

2.3.2 Opportunities at marketing level

The demand for potatoes for both fresh produce markets and for processing is increasing rapidly with increase in population and number of processing companies. Production that targets either of the two outlets will definitely earn more income for the producers the demand for ready-cut frozen potatoes mainly emanates from fast food restaurants, hotels, supermarkets and household consumers. With the demands increasing proportionally with urbanization, there exists an opportunity for the market to rapidly expand to meet the demand especially for processed ready-cut frozen chips Supply of ready-cut frozen chips in the domestic market is complimented by imports as there are fast food restaurants that do not source locally.

- Replacement of imported potatoes with locally produced
- Introduction of varieties that are demanded by various market outlets
- Development and Implementation of packaging standards to promote fairness in potato trade
- Better organization of marketing actors would promote trade in potatoes

2.4 Profiles of main actors

2.4.1 Brokers at Farm Level

Brokers act as intermediaries between farmers and local traders keeping close contacts with the farmers to be informed about quantities and varieties available. Brokers work in groups and each group can deal with 30-70 farmers. Brokers get a fixed fee per bag from local traders, but the amount varies each season

⁵ Type of levy or tax paid on produce intended for sale

Brokers are all young men. Women are not involved in the work of brokerage. The brokers alleged that women may not be able to cope with the hardships of this business, including lifting heavy bags. Brokers unlike the perception that they exploit farmers, work under very difficult conditions. They reported that the heavy bag lifting negatively affects their health; some suffered from injuries caused by loading and offloading extended bags. It was observed that many of them were in poor health condition.

Brokers consider failure to implement standards in potato marketing as a challenge to them. As intermediaries between farmers and traders, they have to convince farmers to accept extended bags for sale of their potatoes. Implementation of standard bags would facilitate their business and make it easier for them to negotiate with farmers as the standard package will already have been set by law. When brokers pack potatoes they avoid putting bad quality potatoes into the bags, but they do not grade or buy potatoes by grade.

During the wet season, brokers organise tractors to get the potatoes transported from the field to the road. Other times potatoes are transported using donkey or oxen carts or donkey back. Lorries/trucks or pickups are also used. Brokers normally load potatoes on to the truck. Depending on the bag size one bag is carried by 3-6 people or loaded on the shoulders of one broker who carries and throws the bag onto the track or other means of transportation.

In rural areas the road infrastructure is very poor and brokers have difficulties getting the potatoes



Figure 13 A broker carrying an extended bag in a market in Kenya



out of the farms. The poor roads lead to delay in collection of the bought potatoes that may also lead to spoiling of potatoes. This kind of loss is transferred to brokers, as the trader may not take

the spoilt ones. Brokers reported that damages on potatoes to be caused by extended bag sizes due to drugging and dropping and also delayed collection creates damages. Brokers estimate in average damages/losses of 5 kg per 10 kg of an extended bag, depending on size of the bag.

2.4.3 Wholesale and Retail Trade

Wholesale traders buy potatoes from farms and transport them to markets in various urban and rural centres in the country. They engage brokers who identify areas and farms from where they buy potatoes. Traders take the responsibility of packaging the potatoes, which done for them by the brokers and transporting them from the farms to the markets where they hand them over to market brokers who sell them for them. Wholesalers own tracks that they use to transport potatoes or they hire from transport owners. Wholesalers sell their potatoes in the main markets in the country. Some have contracts to supply hotels, institutions, processors etc. Wholesalers travel more than 300 km to transport potatoes from the main production regions to the main markets. Transport to the urban areas is done with larger trucks.

Distances from Markets to selling point ranges from 15km (i.e. a market within producing areas) to up to i.e. Mombasa or Kampala being the furthestmost point. Traders buying in the selected counties come from Wakulima⁶ Market in Nairobi, Kongowea Market in Mombasa or Northern Tanzania. Wakulima market in Nairobi is the largest terminal market handling estimated over 50% of total potatoes traded in Kenya.

Figure 14 Packaged extended bags of potatoes being loaded on Trucks

From here, the produce is mostly further distributed to other towns or markets or even to neighbouring countries. There is no storage at wholesale level; the produce is distributed and sold within a short period. Traders selling at Wakulima in Nairobi cooperate with brokers based on the wholesale markets. The brokers wait for the trucks to arrive at the market and inform their customers about the expected load. All transactions are in the hands of the wholesale

⁶ Wakulima Market- name given the wholesale fresh produce market in Nairobi. It means farmers' market

market brokers; finally the trader gets a receipt of the sold produce, quantities and price. This study findings show that brokers at Wakulima market get around KES 40-50 per bag (USD 0.39 - 0.49) as commission fee.

2.4.4 Retailers

Retailers mostly buy at wholesale from market brokers and sell them in small quantities using plastic buckets, or in some place weighing and selling on basis. Some retailers who may not have enough capital have special arrangements with market brokers who allow them to take produce on credit and pay later after they have sold to consumers.

- i. The packaging size of traded on bags is dependent on the season and availability of produce. The average weight of the mainly purchased nylon bags vary in weight. Nylon bags are cheap and able to carry large quantities in comparison to jute bags.

Retail market could be on the roadside where *Figure 10: Roadside retail market in Kiambu County* the traders target passing by motorists, within retail markets or they could be kiosks or shops. Retailers normally target small quantity buyers. When they buy the ware potato they buy in quantities that can be sold in short time to avoid losses through rotting. At the same time retailers do not own stores and so they buy quantities that they can dispose in 1 to 3 days.

2.4.5 Supermarkets

Supermarkets are of various sizes; some are quite small and individually owned while other are national or multinational retail chains. The large super markets chains such as Nakumatt, Uchumi and Tuskeys have branches in all larger cities in Kenya and some like Nakumatt and Uchumi have branches in the Eastern Africa region.

The average quantity sold per week per supermarket branch is estimated at about 120 kg. Supermarkets are not a popular source of fresh potatoes, as consumers prefer to buy from the open-air markets where they get the potatoes at lower prices and fresher.

Contracted traders supply the large supermarket chains with fresh potatoes on weekly basis. The potatoes are brought to the central distribution centre for further distribution to the branches countrywide.



Transportation to the supermarket branches remains in the hand of the supermarkets using crates and refrigerated trucks to avoid any losses during transport. Supermarkets buy graded potatoes. They buy big tubers and baby potatoes based on the demand of the consumers. The

potatoes are supplied already sorted and any defect potatoes found in the consignment delivered are returned to the supplier. This includes green, damaged or rotten tubers. However, returns are minimal as the supplies are expected to meet the contract standards that have been set by the supermarket management.

The purchase prices are more or less stable at all times due to contractual arrangements. Supermarkets are the only buyer at retail level rewarding quality supplies. Supermarkets do not experience seasonal fluctuations, since supply and demand is almost constant. Supermarkets sell fresh potatoes, frozen chips and potato crisps. Findings of this study show that potatoes in supermarkets are sold in kilograms. Selling price per kilogramme vary with variety and supermarket ranging on average from KES 30- 80 (USD 0.29 – 0.78) per kg.

Supermarkets do not store potatoes and no losses associated with storage are captured here. Losses occur in the shop in the display shelves through rotting, greening, weight loss through shrinking and sprouting. 'Shangi', the most common variety, is known for weight loss and sprouting, and 'Tigoni' for quickly turning green in the shelves. Supermarkets are interested to get potatoes of high quality with a long shelf life.

Supermarkets are mainly located in the major urban centres. Most supermarkets said that purchasing is centralized in the headquarters for many of the supermarkets and distribution is done to the branches on weekly basis. The pattern of purchasing agricultural produce is similar for most of the supermarkets with produce being supplied centrally by a contracted supplier on a weekly basis. A purposive selection of the three major supermarket chains, Nakumatt, Uchumi and Tuskeys was done for interview. Information was collected from one of the branches in Nairobi.

2.4.6 Processors

Crisps processing has been carried out in Kenya for more than four decades. Information on installed capacity for crisps processing from previous studies is scanty. The potato processing industry is expanding fast with many large manufacturing companies entering into potato processing. There is also a rapid growth of small processing companies that have gone into crisps and peeled, ready-to-cook potatoes that are supplied to hotels and restaurants. Despite the interest by both small and large companies there are many constraints that cut across all. The most conspicuous and pressing of these is a shortage of processing varieties. Companies making crisps say they do not have a potato processing variety that suits their requirements. The only variety available is an old Dutch variety, Dutch Robjin, which was introduced in Kenya some years ago. It is low yielding and susceptible to diseases, requires high maintenance, and as such is not very popular with farmers.

There are over 45 companies that process potatoes into a range of products. Most are in the form of snacks, sold in packs of - 200 gm and then packaged into larger units. The products include crisps, chevda,7 chips and other snacks. Potatoes are also processed into canned potato cubes, dehydrated potatoes or frozen chips. There are over 15 main fast food restaurants chains; some of them such as Kentucky Fried Chicken (KFC), Chicken Inn and Galito's are international. There are also quite a large number of hotels that use potatoes to make a variety of dishes for their guests.



50

Potato processing companies vary in size and the products they make. Large processing companies produce a variety of potato products for domestic, regional and international markets. Such companies have well established infrastructures, modern machines for processing, and the capacity to process and market large quantities of potatoes and products. There are other medium-sized companies, some with upward growth prospects. They process fewer products and only for the domestic market. The small processing companies process potato crisps and a few other products, including bananas, arrowroots, sweet potatoes, cassava etc.

Potato processing companies appear to face common challenges. Nearly all of them, except hotels and some restaurants, cited the lack of suitable processing varieties. The Dutch Robjin, although available, is grown by few farmers compared to the large number of potato producers in the country. Farmers shy away from this variety because it is low yielding (less than 10 tons per ha) and requires a lot of chemicals to protect it from diseases. The variety is considered expensive to grow, giving low returns due to its low yields.

Some of the companies have engaged in contracting farmers and have even paid for extension services and involved banks in financial services to the farmers. The main challenge is that despite signing a contract with processors, the potato farmers sell their harvest to brokers and traders, who entice them with higher prices. There is need to support contract farming to ensure that contracts are respected, processors get potatoes and the farmers are well paid.

Other companies talked of competition from imports. Companies that make frozen chips say that they are unable to compete with imported products made from superior potatoes that produce long chips, which are

Figure 11: potato grading in a processing plant

quality

7 A popular Indian snack made with crisped rice, broken potato chips, cereal and nuts

desired in the market and sought by fast foods restaurants. The only potato available in Kenya suitable for frozen chips is a variety called Tigoni. However farmers do not want to grow Tigoni as it is low yielding. Tigoni competes at farm production level with a variety called Shanghi, which is high-yielding and very popular in fresh produce markets. But the processors say it is not good for their purposes as it has low dry matter content and become hard when fried in oil. Tigoni is not the perfect variety for frozen chips either. Although it has some good qualities such as retaining colour and texture after being frozen, it produces short chips that are not wanted in the market. This leads to loss of business for some of the companies. These are the companies that process large quantities of potatoes into crisps as well as other snacks.

2.4.7 Small processing companies

These are small but upcoming processors who process crisps and other products. They source their potatoes from farmers and some of them buy from the main markets in their town. Many of the small scale processors are new in the industry and still learning the business of potato



processing. Some process crisps in their homes and sell in small packs around their home environment. Others have grown bigger and have set up small business premises where they process crisps and sell through retail outlets. Other small scale processors make ready cut chips or whole peeled potatoes that they supply to hotels, institutions such as hospitals or to restaurants.

2.4.8 Large Scale Processors

Potato processors who make crisps and other snacks such as chevda, are increasing in Kenya. The main processors are Deepa Industries, Norda, Pioneer and Propack, all located in Nairobi and Midlands, located in Nyandarua County and owned by shareholders, among them local farmers and Njoro Industries based in Nakuru County.

Many processors for potato in Kenya are concentrated in the urban centers due to proximity to physical infrastructure such as roads, running water and source of energy. As a result of the distance between the processing plant and source of raw materials, many processors cite high cost of production as most of them pay premium prices for supply of quality potatoes for processing. With supply sometimes being inadequate and unreliable, some processors are forced to either cut down on production by practicing alternate production days or shut down until supply stabilizes.

Figure 12: chips being fried in Kitchen

2.4.9 Fast food chain restaurants

These are mostly international fast food chains that sell chips as an accompaniment to other food items. They mainly consume imported frozen chips due to shortage of the potato varieties that they desire for chips. The restaurants go for potatoes that produce long chips that are white or cream in colour. They also like potatoes that give chips with uniform colour as well as size. The restaurants also emphasize traceability of the potatoes for quality standards and safety.

The demand for ready-cut and frozen chips is as a result of rapid growth of fast foods restaurants in Kenya for the past decade as well as the growth of urban population (KNBS, 2014) and to some extent, influence by the tourism industry. Expatriates from developed countries whereby potatoes are dominantly processed into ready-cut frozen chips also contribute to the increased demand for ready-cut frozen chips especially in towns of Mombasa and Nairobi.



2.4.10 Hotels

The hotels in Nairobi have capacity to absorb large quantities of potatoes. They mainly source their potatoes from appointed suppliers. Some hotels have contracted suppliers who supply them with either fresh potatoes or peeled. Others just go to the fresh produce market and buy either from an appointed broker or directly from the traders.

2.4.11 Local Restaurants

The local restaurants usually sell chips as accompaniments for various other. They these are found in practically all the urban centres. They normally buy the potatoes they use from the fresh produce markets closes to them. Depending on the volume of their business they use 20-120 kg per day. The local restaurants are not very specific on the varieties they use to make chips, mashed foods and roasted potatoes. They just buy whatever potatoes they find on the market. Market shares of different market channels in the potato value chain

Potato produced in Kenya is mainly consumed in major towns with Nairobi and Mombasa being the major markets. These towns are mainly supplied with potato from Nyandarua, Meru, Nakuru, Narok, and Bomet. Other major markets include Eldoret Kakamega and Kisumu which are mainly supplied by produce from Mt. Elgon, West pokot, Elgeiyo Marakwet and Uasin-gishu.

Potato produced in Kenya is mainly consumed fresh. Approximately 80% of the produce is sold in local markets within the country without any form of processing or preparation. The rest is

sold to mainly restaurants and institutions who cook it to various dishes such as *Kienyeji*, boiled, roasted and eaten as a starch, and to processing companies who further processes the potato into ready-cut fresh and frozen chips, crisps and other potato based snacks and other potato products like starch, flour and flakes. The volume of potatoes going into crisps processing increased from 9,171 MT in 2004 to 35,214 MT in 2014; indicating a 14.4 % annual increase in volume of potatoes processed into crisps (Kaguongo, et al., 2015).

The Table 3 below shows the estimated distribution of potato produce according to the various uses.

Table 3: Estimated end use of potatoes in Kenya

End use	Estimated %
Local markets	80
Supermarkets	1
Restaurants and Institutions	10
Processing	9
	French fries 5
	Crisps & other snacks 3
	Starch/potato flour/flakes 1

Source: (Kaguongo, Maingi, Ronoh, & Ochere, 2015)

Robjin-the potato variety most preferred for crisps processing-is mainly grown in Bomet county. About 81% of the marketed produce from Bomet County is sold in Wakulima Market of which 65% goes to crisps processing. Large scale crisps processor source large quantities of potatoes and hence can engage directly with farmers unlike the small scale processors who buy most of their potatoes for processing from major markets.

Various types of processing takes about 20%, (600,000 tons) of the 3m tons of potatoes produce per year in Kenya (Kaguongo, Maingi, Ronoh, & Ochere, 2015). This accounts for only 20 % of the demand from the processors as most are operating below capacity due to shortage of desired processing varieties. If this is projected to the processing subsector operating fully it would require 3 million tons of processing potatoes.

2.4.12 Challenges in the Potato processing

- ◆ There are serious shortages of the processing varieties. As result many factories are operating below capacity, and are not able to produce some of the products.
- ◆ Farmers tend to produce poor quality potatoes that do not suit the buyer’s purposes. They plant varieties such as shangi that produce high yields but not good for most of the processing jobs. They also harvest immature potatoes that have high sugars and high water content and so not suitable for cooking or even French fries.
- ◆ Contract arrangements are beneficial to both farmers and processors. However there is tendency on both sides to breach the contracts through side selling or buying

2.4.13 Opportunities in Potato Processing

- ◆ There is high demand for processing potatoes in Kenya, about 3million tons for existing processing companies. But the companies are expanding their businesses and other entrants are coming on board at high rate. There is there a good opportunity for farmers to produce and sell to these companies.
- There are opportunities for contract engagement that can be brokered by service providers if the farmers so desire.

Table 4: Buyers and Quantities needed and varieties desired

Company name	Contacts	Quantity of potatoes processed per month	Comments
Norda	info@norda.biz Tel. 020-2367881-2 Nairobi; Kenya	75 tons	Dutch Robjin variety is used in this factory. It is supplied by contracted traders or the company buyers directly from farmers and transports to their factory. Mode of payment is agreed on between the company and supply. The supply is done every day or weekly depending on agreement
Deepa	info@tropicalheat.co.ke Tel: 020. 3573000-3 Nairobi, Kenya	400 tons for all products	Dutch Robjin variety is used in processing. Company buys from contracted farmers. The company collects potatoes from the farmers (in Bomet county) and transports to the factory in Nairobi. Sometimes the company buys directly from non-contracted farmers or is supplied by contracted traders. Mostly potatoes are supplied daily, Payment is made depending on agreement
Propack	info@propack-kenya.com Tel 020.8561185 Nairobi, Kenya	400-500 tons	Buys directly from farmers in Meru and Bomet. Payment is made at the time of collection or as may be agreed with farmers.
Njoro Canning	info@njorocanning.co.ke Tel:051 2217751/2/3 Nakuru, Kenya.	900 tons for all products made by the Njoro Industries	Uses Tigoni variety to process frozen chips and other products. Contracted farmers supply them, Payment is on the basis of agreement. However the supplies are not reliable because farmers have turned to growing shangi variety that is not suitable for processing.
Java	P.O Box 21533- 00505, Nairobi Tel.+254(20)3504468 +254(20) 2166871 Nairobi,Kenya	60 tons for all products	Preference is Tigoni variety but it is in short supply. They are supplied by contracted traders who are paid as per agreement Supply is done on daily basis or as agreed with supply. They would be willing to buy a better variety with qualities for processing into chips Sometimes imports frozen chips from Holland or south Africa
Steers	P.O Box 49842, Muindi Mbimbu Nairobi Tel +254(20) 2214300 Email- customercare@steers.co.ke	75 tons	As above
Kenchic	Tel. +254 -(20) 557765, 554856, 555009 info@kenchic.com	75 tons	As above
Galitos	Tel: +254-2249859 http://www.innscorafrica.com	30 ton	As above
Debonairs	Tel. +254722206574	30 tons	As above
Panafric	Te.+254(20)2767000, 709111000 panafric@sarovahotels.com	3-5 tons	They buy any variety. Supply id by contracted traders who are paid as per agreement
Hilton	Address: Mama Ngina St, Nairobi, Kenya	4 tons	As above

Phone: [+254 20 2288000](tel:+254202288000)

Fresh Market

All over the Country

Takes estimated 80% of the potatoes produced in the country

Potato sold in fresh markets are from all varieties. Different regions grow different varieties. Supply is daily or on set market days. Prices are determined by supply and demand and vary from USD 12- 30

Source: This survey information

2.5 Potato Value chain service provision

2.5.1 Service provision for Value chain development

Provision of various services is critical in value chain development. Actors need to be supported with needed services to be able to carry out activities especially if the services are expensive. In the case of potatoes farmers, and investors in the subsector need services.

2.5.2 Research Services

Provision of disease-free seed tubers of high yielding varieties is one of the major objectives of the seed research programme at KARI Tigon. The industry continues to search for potato varieties with better processing qualities to replace the old traditional varieties (like Kerrs pink and Dutch Robyn for crisps; and Roslin Tana, and Nyayo for chips), which are susceptible to diseases like late blight and viruses, being the main factors that have lowered yields and product qualities.

The process involved in the release of new varieties following the conventional breeding procedure is a long one, as it takes 7-10 years and entails many stages. The development and release of a variety costs over USD 490,000 while germplasm preservation costs over USD 196,000 annually.

This National Potato research programme has in recent years developed new varieties that are now available. These include cherekea, Kenya mpyia, Kenya sifa, Kenya mavuno etc. and clean a farmer variety “shangi”

The National Potato research Center has had challenges for a long time that have contributed to its inability to meet the demand for basic seeds as required. The challenges include, inadequate staffing levels and office space, inadequate funding for research purposes, inadequate storage capacity, lack of irrigation facility, scarcity of land for research, inadequate cold storage facilities, old machineries that need repairs or replacement e.g boilers, graders etc and over reliance of the breeders on materials from CIP make it hard for them to breed for other priority like earliness, drought tolerant etc.

2.5.3 Provision of Financial services

Financial services have been left to the individuals. After piloting in 2008 a guarantee risk fund (GRF) scheme with Equity Bank was established by GIZ and extended to all value chains including potatoes. Loans to potato growers fitted very well with Equity Bank provisions because they are mostly short-duration of half a year. On the basis of GRF farmers borrowed and paid the loans easily.

The Government has several financial facilities from where the farmers can borrow. The potato enterprise requires high capital investment, due to its demand for inputs that are relatively expensive. If farmers could get affordable credit it would benefit very much the development of the industry. Producer Cooperatives arrangement would be ideal as farmers would get credit from the cooperatives and then it is recovered from their produce after sale. Another service option would be starting ware receipting system. Here farmers could bring their produce to a central collection, bulking and marketing centre which has storage. The produce is stored for a while before selling and pre-financing system is applied to enable farmers access the finances for their immediate needs and this is recovered after sales.

Strengthening business linkages is very key in the developing a value chain especially a commercial oriented enterprise. The operators need to find inputs, markets, capital and other services, for their business to operate smoothly. They need to find suppliers or buyers. Strengthening business linkages is done by service providers who broker vertical and horizontal collaboration among the value chain operators and by so doing foster business to business linkages.

Service providers engage public and private partners on behalf of value chain actors and by so doing foster public/private partnership and agreements to promote business growth

Service providers assess business services needs, such financial needs and broker financial service arrangement.

2.5.4 On farm storage

On -farm storage under the current market structure is not done largely due to unpredictable prices. Thus lack of a guarantee for better prices is a disincentive to storage at farm level. Other reasons hampering on-farm storage include: farmers' ignorance on benefits of storage and know-how; need for immediate cash; losses in quality due to pest and diseases attack;



Figure 14: Potato store at ATC Njabini Nyandarua County Kenya

mechanical damage; and weight loss and black heart including rotting in storage.

Potato storage presents challenges due to high perishability of the tubers especially when they are stored under high temperatures

and high relative humidity. Low cost, naturally cooled alternatives to cold storage have proved useful

with store designs that semi-skilled craftsmen can assemble from locally available materials.

Storage of potatoes in factories and restaurants and hotels is for short periods in concrete buildings prior to processing. Often the storage conditions are not ideal as there are possibilities damage by rodents and poor air circulation that may result in rotting.

2.6 National Potato Council of Kenya

2.6.1 Who is National Potato Council (NPCK)?

The NPCK is a Public Private Partnership and a multi-stakeholder organization, registered under the Companies Act (Chapter 486) of the Laws of Kenya and is limited by guarantee. With support from GTZ/PSDA and the ministry of agriculture, NPCK was launched on the 25th of Nov 2010 by the Permanent Secretary of the Ministry of Agriculture. The Council is mandated to plan, organize and coordinate activities of the potato value chains with the aim of transforming the subsector into a robust, competitive and self-regulating industry. The NPCK is a practical tool towards revitalization and development of the potato subsector and enhances standards and self-regulation through creating awareness, lobbying and advocating for appropriate policy and regulations. The Council is strategically placed to play the role of a catalyst, organizer and coordinator and also provide a pivotal role in enhancing synergies from subsector actors and players. The council has experienced allot of good will from the Government, private sector, public and other development partners.

The NPCK's strategic objectives include:

- i. To create an enabling environment for effective and efficient potato value chains for growth and development of a self-regulating potato industry
- ii. To build a cohesive potato industry in order to promote synergies and minimize duplication for efficient use of resources through enhanced public private partnerships
- iii. To promote best practices for quality standards, improved yields and enhanced value addition in order to thrive in local, regional and global markets.
- iv. To create a platform for information management and capacity building for the various potato value chain actors
- v. To mobilize and effectively manage resources for the organizations' financial sustainability
- vi. To identify and mainstream crosscutting and emerging issues within the potato industry

The Council engages policy makers at county, national and regional levels to ensure that policies made are in harmony and enhance activities planned for development and growth of a robust potato industry in Kenya.

2.6.2 Organization structure of the NPCK

The Full Council consists of representatives from subsector stakeholder organizations, associations and individuals, and forms the highest decision-making body. This is followed by the Council Executive Board, which is composed of nine executive board members and two ex-officials. Daily operations are handled by the Secretariat, which is composed of the Chief Executive Officer (CEO) and management team, all of whom are responsible to the Board, which, in turn, is answerable to the Full Council. Although the management team is structured to comprise Directors, Managers, and Officers, the positions of directors are not yet filled because the Council is yet to grow to full capacity.

The NPCK's management structure consists of the CEO who would supervises the Directors in the three NPCK divisions: the Director of Finance and Administration (F&A), Development Director, and Director of County Programmes. In turn, the Director of F&A would head three departments that include Human Resources; Accounting, Budgeting, and purchasing; The Director of Development heads four departments that include: Policy, Lobby, and Advocacy (PLA); Research and Development (R&D); Value Chain Support (VCS); and Public Relations, Marketing, and Communications (PR). The Director of County Programs supervises the Country Programme Officers (PCOs) and is responsible for NPCK's projects and programs at the county level. Below is the organogram for the organizational structure.

2.6.3 The NPCK organizational chart

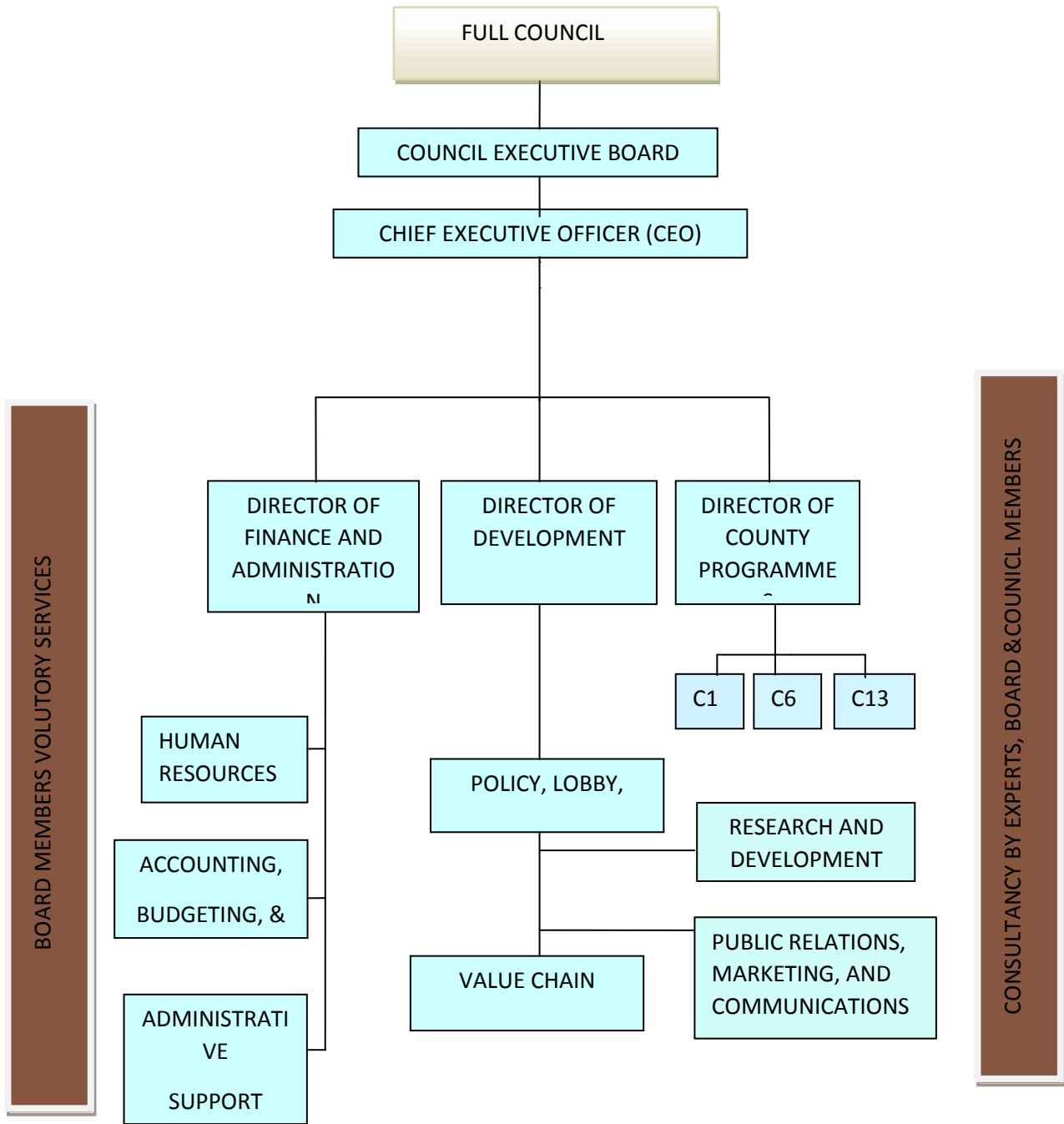


Figure 15: The NPCK organizational chart

2.6.4 Formation of NPCK

Since 2003 a number of development initiatives were undertaken that aimed at improving the potato subsector. Consultative processes and implementation of a number of key activities steered by the Ministry of Agriculture in collaboration with GTZ/PSDA, development agents and other stakeholders (CIP, KALRO, USAID, KENAFF just to mention a few) targeted the potato Value Chain (VC) mapping and interventions at policy, farm, research and marketing levels. Many challenges faced these initiatives:

- i. interventions lacked sustainability and long-term organization;
- ii. the subsector lacked organization, coordination and harmonization;
- iii. there lacked central point of reference on potato issues, and;
- iv. the subsector information was scattered.

2.6.5 Value Chain Development Committee

To help address challenges in the potato industry, the Value Chain Development Committee (VCDC) was formed in 2005 and comprised of key stakeholders in the industry such as seed and ware potato producers, processors, traders and brokers and facilitators such as researchers, government of Kenya's institutions, private organization and development partners. The VCDC was tasked with addressing the challenges in the industry and was expected to coordinate and lobby for the implementation of the potato value chain development. The committee specific roles were:

- ◆ To review the progress, identify challenges and make the potato industry function to its optimal level along the entire value chain i.e. from production to consumption.
- ◆ Lobby for support from value chain facilitators in government, private sector and development partners
- ◆ Build linkages between the various levels of the potato value chain, and at macro, meso and micro levels of implementation
- ◆ Regulate quality standards within the value chain
- ◆ Play a catalytic role in the development of the Potato value chain
- ◆ Regularly review the strategic plan as need arises.
- ◆ Take lead implementation of national potato development strategy that was made by stakeholders

The role of GIZ/ PSDA and other Value chain facilitators was limited to facilitation. The committee elected an executive committee that would deal with regular issues on more frequent basis. However, the VCDC had several setbacks; it faced some legal difficulties since it did not exist as legal entity, lacked professional structure and requisite commitment. As a result

VCDC failed to coordinate, lobby and advocate for issues within the value chain. It failed to give strong back-up to farmers and farmer groups and was not effective in addressing subsector issues.

Since the stakeholders' efforts were disjointed there was need for a strategic organization to that would replace VCDC and take over its envisaged functions that include coordination and implementation of the identified interventions, and further foster ownership and service development for the potato industry. To address the challenges, the Agricultural Secretary in the Ministry of Agriculture appointed a taskforce of key stakeholders in the potato value chains and development partners, which included ministry of Agriculture, GIZ/PSDA, KENAFF, CIP, KEPHIS, KARI(Present day KALRO) Ministry of Local Government and others. One of the key recommendations of the taskforce was the formation of an organization with sub-sectorial representation, under a Public Private Partnership (PPP) arrangement, hence formation of NPCK during a Potato Value Chain stakeholders' workshop held at the Kenya School of Monetary Studies in March 2010. Kenya is not the first country to form a body to safeguard the interests and foster the growth and development of potato industry. There are great success stories from UK and South Africa where potato industry is organized and managed by independent bodies mainly funded through statutory levies. The Potato council of UK is a division of the Agriculture and Horticulture Development Board (AHDB), which is a Non-Departmental Public body funded by the agriculture and horticulture industries through statutory levies. The AHDB is an independent, evidence-based organization with the duty to improve the efficiency and competitiveness of various agriculture and horticulture sectors in UK. Potatoes South Africa is an association incorporated under the Companies Act, whose main objective is to serve, protect and promote the interests of the South African potato industry.

2.6.6 Achievements

Since formation the Council has achieved several milestones and continues to work with stakeholders in addressing the subsector issues and providing relevant information for innovations and improvement of businesses. The main achievements include:

- i. Held Potato Round table meeting in 2012 that identified challenges and bottlenecks in the value chains and detailed on ways of transforming the subsector
- ii. Spearheaded implementation of Seed potato master plan that gives roadmap on how to develop the seed value chain
- iii. Coordinated development of Policymakers' guide to crop diversification: The case of the Potato in Kenya.
- iv. Spearheaded a project for enhancement of adoption of Harmonized regional seed standards for East and Central Africa Countries

- v. Successfully lobbied for inclusion of farmer selected variety called Shangi in formal Certification scheme
- vi. Successfully lobbied for Gazetting of regulation on maximum 50 kg potato packaging and pricing by weight
- vii. Has produced two Potato variety catalogues-2013 (3,000 copies), 2015 (6,000 copies)
- viii. Co-hosted 9th African Potato Association conference held in July 2013, in Kenya
- ix. Successfully lobbied for increased budgetary allocation to potato subsector by the government
- x. Has managed to create platform for stakeholders meetings and engagement

2.6.7 Draw backs in formation and operations of NPCK

The NPCK is a consultative platform for problem identification, articulation and resolution in the potato industry. However, in the endeavor to meet its objectives, NPCK has encountered several challenges in its operations:

- i. Insufficient operational funds and challenges in sustainability

The operations of the Council were mainly expected to be funded from the industry levies, cess and budgetary allocation from the exchequer; however this required institutionalization of the Council and an Act of parliament. With the change of government structure leading to devolvement and policy change on agricultural subsector funding the planned sources of funds did not materialize. This has led to the Council depending largely on donors and development partner's competitive grants. Furthermore the annual subscription fees paid by the members is far much little to support the council's mandated activities.

- ii. Funding levels from development partners are low

The PPP structure sometime possess a challenge with some donors regarding the Council as an arm of the government while the government departments view NPCK as a private company which is a disadvantage to the Council.

- iii. Lack of adherence to Council's mandate

The NPCK does not follow its mandate strictly because the funds available through the grants sometime may include tusks that are not relevant or priority to the subsector.

- iv. Lack of offices at the Counties

The Council does not have offices at the County levels hence its operations are limited and also becomes costly when there is need for the national staff to travel to the Counties. This has

slowed down the operations of the Council and its presence in potato producing Counties where they are need most.

v. Lack of stakeholder associations

Whereas the Council would work effectively with association membership of different levels of the value chains there are very few stakeholders organized into active and effective associations and groups. For example the apex farmer organization has not been active both at national and county levels forcing the Council to work with farmer groups and cooperatives at the county levels. This is both costly and not very inefficient.

vi. Conflicting interests among stakeholders

Different members of the Council have differing and conflicting interests. This has led to discontent of some members especially where some members are pursuing activities that are not beneficial to the entire industry for example i) importing and selling seed potato directly to farmers and, 2) Selling substandard seed potato to farmers by some registered seed merchants

2.7 The performance of potato farmer organizations in Kenya

2.7.1 Kenya National Farmers Federation (KENAFF)

Kenya National Farmers Federation, KENAFF is the umbrella body of farmers in the country, bringing together 60 farmers' associations at county level, 36 national commodity-based associations, 16 cooperatives and close to 8000 farmers' groups. KENAFF envisions an empowered Kenyan farmer with a strong voice. Since the federation started focusing on group based institutional members, the membership has grown to include commodity associations such as Kenyan National Potato Farmers Association, also known with its abbreviations as KENAPOFA. Its **mission** is to empower farmers to make informed choices for improved, sustainable livelihoods. The apex body maintains seven objectives:

2.7.2 Organization of farmers' groups in federations

- i. Effective intervention in farming matters to yield timely solutions
- ii. Encouragement of collaboration between actors for mutual gain
- iii. Policy review and participation in formulation to shape the farming environment
- iv. Creation of consultative platforms and promotion of consultation with other actors to improve agricultural practices

- v. Intervention in issues relative to agricultural products and the value chain in order to benefit farmers by effectively representing their interests
- vi. Strengthening of farmer institutions through various forms of capacity enhancement

KENAFF has chaired the potato task force since its inception and is instrumental in the realization of potato policies and strategic efforts. The federation was a key player in steering subsector stakeholders to form the National Potato Council of Kenya, NPCK.

2.7.3 Federations Success

- i. Has an elaborate and nationwide structure
- ii. Farmer initiation and management
- iii. Strong commodity focus – each enterprise is handled by a specific, commodity-based association
- iv. Excellent capacity for institutional development and organizational strengthening (ID/OS)
- v. Has a technically sound and countrywide personnel
- vi. Excellent professional capacity especially in lobbying and advocacy
- vii. Forged a good working relation with the government and other sector stakeholders

2.7.4 Challenges of the association

- i. Limited financial power, difficult to effectively influence key actors through targeted and progressive campaigns
- ii. Collection of membership fee annually with fewer commodity associations paying
- iii. The new constitutional dispensation with the county administrations. Most of the counties preferred to work with local farmer groups rather than umbrella national bodies

2.7.5 Kenya National Potato Farmers Association (KENAPOFA)

Kenya National Potato Farmers Association (KENAPOFA) was founded in 2003 and was formed with support of GIZ -Promotion of Private Sector Development in Agriculture (GIZ-PSDA), Ministry of Agriculture and the then Kenya National Federation of Agricultural Producers, KENFAP. There was a realization that a farmer-owned, farmer-controlled association was vital to represent potato farmers in all sectors of development and in particular on the activities of the potato value chain. Membership recruitment was done, capacity building, training the

association members on technical aspects of potato production and training officials on organizational development and management and agribusiness. Essentially, the potato farmers missed out the conglomeration into strong producer/marketing cooperatives. In 2004/5, KENFAP in collaboration with the GTZ/PSDA helped registration and reconstitution of the KENAPOFA. Through a tedious process of district level membership drives and the requisite tiered electioneering process, KENAPOFA was strengthened to achieve the preferred levels of governance and management to an extent that it was one of the very strong members of KENFAP.

Through GIZ- PSDA and with input of KENFAP, the Potato Value Chain was organized and had a standing committee of all stakeholders (producers, traders, processors). KENAPOFA mandate was to represent the potato farmers at various levels and where the association could not reach, then KENFAP took charge. Thus the two institutions/organizations were known to effectively champion and spearhead the issues of the potato farmers. Since its formation, with support of MoA and GIZ-PSDA, the association had spearheaded various activities aimed at improving the status of the potato industry. KENAPOFA was instrumental in lobbying for implementation standards that had been developed for the marketing and quality of potatoes which culminated in the development of Legal Notice Number 44 in 2005.

Success of the KENAPOFA

- i. Availability of membership base – with elected and credible officials in each of the major potato-growing areas, KENAPOFA could articulate and lobby on behalf of farmers
- ii. KENAPOFA collaborated with a good number of organizations such as Government of Kenya, GIZ, BAF, KENAFF and some potato processor companies. The Ministry of Agriculture, GIZ, and KENAFF facilitated training of members while Business Advocacy fund did both training and also facilitation of the secretariat.
- iii. There was ready market for farmers. Marketing of potatoes is sold through middle men who transport to markets in Nairobi, Mombasa, Kisumu, Sirare and other smaller markets.

2.7.6 Challenges of the farmer group

- i. Credibility undermined by failed standards implementation popularization campaigns. Sensitization and recruitment drives focused on the much-abhorred extended bag, and as an incentive to get farmers to join the association and pay membership fees, therefore farmers now reluctant to keep up annual membership payments since recruiters made unkept promise to get the extended bag abolished,
- ii. Lack of active officials and physical offices at county level made it difficult to coordinate KENAPOFA activities and sustain member recruitment

- iii. Absence of strong and technically qualified secretariat and leadership – fundraising and expansion are a challenge
- iv. Some of the donor conditions derailed KENAPOFA activities and led to disintegration of agreements.
- v. The KENAPOFA secretariat established was not able to drive their agenda hence was not successful in fundraising which also led to redundancy.
- vi. Mismanagement/misunderstanding in terms of information was also cited as one of the causes of sour working relations between KENAPOFA and stakeholders.
- vii. It was also noted that grassroots officials in some counties were did not remit membership recruitment funds hence creating animosity between them and farmers further hindering the functioning of the organization.

3 UGANDA POTATO SUBSECTOR

3.1 Introduction

Like other East and Central African countries, potato is a staple food for many rural and urban families in Uganda and is increasingly assuming importance as a cash crop due to urbanization and need for fast foods. Potato contributes highly to Uganda's economy through local trade and has high potential for export trade. In addition, potato production also contributes to national economy in Uganda in terms of; household food security, domestic income and employment creation.

Traditionally potatoes had been grown in the highland areas of Uganda, which include Kabale and Kisoro districts of south western Uganda that produces about 60% of total potatoes while the bulk of the rest is produced in Mbale and Kapchorwa districts on the slopes of Mt. Elgon (*Figure 16*).

Other areas that have started growing potatoes include the mid altitude areas such as Nebbi, Mubende and Masaka. However, major production is still restricted to a few districts due to among other production constraints, lack of sufficient quantities of clean seeds of improved varieties leading to low yields.

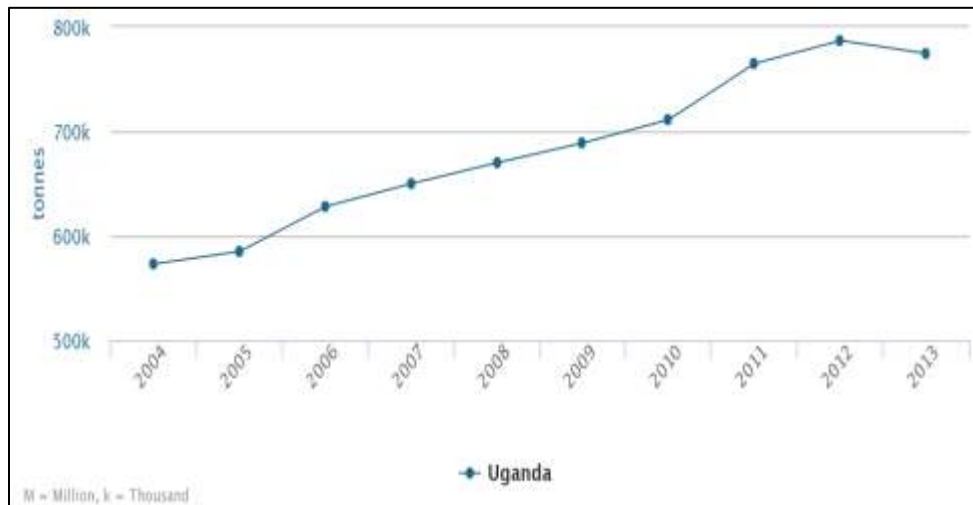


Figure 17: Potato production trend in past 10 years

Source: (FAO, FAOSTAT, 2015)

3.2 Potato production

There are over 460,000 farmers growing potatoes in an average farm size of 0.23 ha. Only a few farmers are organized in groups and selling potatoes collectively. The main consideration of farmers when choosing a variety is marketability, with other traits like disease resistance and taste, early maturity, disease tolerance, high yielding, skin color following behind (Kaguongo et al, 2008).

Most farmers obtain 'seed' from their own ware crops or buy from other farmers or the ware market. There are very few clean seed multipliers in the country compared to the demand. Apart from Kapchorwa district where over 40% of farmers use fertilizer in potato production, very few farmers use it in other districts.

3.3 Marketing

The main potato markets in central Uganda include; Nakawa market, Nakasero market, Balikuddembe (Owino) market, and Kalerwe market. Major buyers in these markets are traders, restaurant chains, and potato processing companies. In all the market the major varieties sold include Kisoro Kabale Singo, Mbale, Fortportal, which are named according to the districts they are obtained. The ware potatoes are brought to the markets mainly in nylon bags weighing 100 to 130 Kgs using trucks very early in the morning from 5am to 8am. The characteristics preferred for the potatoes bought by traders include;

- ◆ Good and healthy looking potatoes
- ◆ Well packaged potatoes
- ◆ The large size of potatoes is preferred

The common characteristics in the open markets were:

- i. Actors do not know the names of different varieties apart from imported varieties sold in supermarkets
- ii. Varieties sold are named by the district they come from, and are not mixed but sold based on the sources,
- iii. Different tuber sizes, cut, bruised, spotted or greening are not sorted
- iv. Ware potato is packed in extended bags of 100 to 130 Kgs which are mostly nylon bags.
- v. Prices fluctuate based on the time of the year
- vi. The variety from which imported frozen chips is made is not known.

In the three markets, Nakawa, Kalerwe and Balikuddembe, the prices of Kabale, Kisoro, and Fortportal varieties range from USD 24.2 to 40.3 (Ushs 90,000 to 150,000) for 100-130 kg bag while prices for Mbale and Singo varieties range from USD 22.8 to 26.9 (Ushs 85,000 to 100,000) per similar bag. However, traders at Nakasero market sell ware potato by weight (kilogram), with Kabale, Kisoro and Fortportal selling at USD 0.5 (Ushs 2,000) per kilogram and Mbale and Singo at USD 0.4 (Kshs 1,500).

3.3.1 Actors involved in potato marketing and their roles

The actors involved in marketing include farmers; traders and brokers etc. and they play different roles in the market.

a. Farmers

There are over 460,000 farmers who grow potatoes in an average farm size of 0.23 ha in Uganda. The farmers individually sell their produce after harvesting to whole sellers mainly through brokers while a few sell directly to wholesalers and the market. There are a few farmers organized in groups and selling ware potatoes collectively, and they include; Buginyanya and Masira Contract Farmers (BUMACOFA). The farmer group trains their members and provide marketing assistance by being linking them to buyers and traders although there are no organized farmers supplying potatoes to processors yet.

9 USD 1= Uganda Shilling (Ushs) 3,724

b. Brokers

There are two types of brokers, farm level brokers and market brokers. Market brokers may represent either the truck wholesaler (90% of the time) or the market wholesaler or retailer (10%). Market brokers provide information to the wholesalers on what quantities are required in each of the main markets thus making it easy for the wholesaler as they won't have to move from one market to the other in search of buyers. They also negotiate the prices for the truck wholesalers.

c. Traders

These are those persons who buy and sell the ware potato to other sellers or to consumers, and their operations end at or are mainly in the town markets. They can be classified into three based on the scale and place of operations; Truck wholesalers, market wholesalers and retailers. In most cases market wholesalers double as retailers.



Figure 18: Wholesale and retail trader in Uganda

d) Wholesalers

These are traders who buy ware potatoes in bulk from farmers and sell to other traders in urban and rural centers. They transport potatoes from rural areas of production to main market centers in towns. They may be divided into two categories as follows;

i. Truck wholesalers: They buy potatoes from the farmers in potato producing districts (Kisoro, Kabale, Singo, Mbale, Fortportal) and transport them in trucks. Each truck is filled with potatoes from one district and such potatoes varieties are named after that district. They then transport them at night by trucks to reduce damage by heat and arrive in the markets early in the morning to avoid cost of storage, hassles of other road users and traffic jams in towns.

ii. Market wholesalers: They buy potatoes from truck wholesalers at one of the main markets and sell them to retailers in the same market. Some act as both wholesalers and retailers, selling to retailers in bulk or to consumers in small quantities which are either weighed or packed in smaller containers such as basins and bucket of varying sizes. The retailers buying from the market wholesalers sell potatoes in the same market or transport and sell in other markets.



Figure 19: Truck carrying potatoes in Uganda

e) Market and shops retailers:

Retailers are traders who sell potatoes in small quantities in bowls, piles and tins. They sell each variety separately but they don't sort or separate the damaged, cut, bruised and greening tubers from good ones. Only on special request do buyers get sorted tubers but at a slightly higher prices.

f) Supermarkets:

They receive fresh potatoes from supply agents who supply on order. Some supermarkets also sell local and imported fresh potatoes and potato products. Once they receive the potatoes, they are washed but the cut, bruised & greening are not sorted out just like is the case of open market and shop retailers. Some supermarkets, such as Shoprite and Capital Shoppers, sell Baby potatoes. No supermarket visited was selling ready-cut frozen chips.

g) Hotels and restaurants:

These categories of market outlets buy potatoes from wholesalers in the markets or are supplied by supply agents just like the case of supermarkets. The Potatoes supplied to hotels and restaurant are normally not sorted or graded. The hotel owners do not know the names or attributes of different varieties but they prefer potatoes from Kabale and Kisoro for chips. They reported wastage of 5 to10 % due to the low grades of potatoes received. Some hotels buy imported ready-cut frozen chips for preparing French fries.

h) Importers & exporters:

They may be cross border, international traders or both. Importers import fresh potatoes & baby potatoes from Kenya (Alika) and South Africa (Red Pimpernel, Mondial) and supply to supermarkets. A few traders import frozen chips from Holland, Belgium, Egypt and South Africa and supply to hotels and restaurants.

j) Processors

There are very few established potato processors in Uganda. The characteristic of the processing segment is as follows;

- ◆ There are 5 to 6 cottage crisps processors operating from homes or in non-identified locations
- ◆ There are no ready-cut frozen chips processing company operating in Uganda. One frozen chips processing company is in the process of being established in Kisoro district.



Figure 20: Retailing market in Uganda

- ◆ There are no potato varieties suitable for processing released in Uganda. Only the variety called Kach port I was suitable for processing but farmers don't like growing it due to being low yielding and highly susceptible to bacterial wilt.

Most Cottage processors source from the open markets but a few source from Kabale & Masaka districts. The varieties referred to as Kabale and Masaka are most preferred for processing. Large proportion of potato crisps in supermarkets is supplied by Tropical Heats from Kenya. Tropical heat had established a processing branch in Uganda in 2011 but closed it later due to lack of supply of good quality processing potato variety.

3.3.2 Challenges facing potato marketing

The following are the main challenges in the potato marketing.

Item	Challenges
Varieties	<ul style="list-style-type: none"> ◆ Varieties are named by district of production ◆ There is lack of varieties suitable for processing
Harvesting	<ul style="list-style-type: none"> ◆ Many tubers are cut and bruised at harvest
Post-harvest handling	<ul style="list-style-type: none"> ◆ Use nylon bag for packaging ◆ Rough access roads cause delay & damages ◆ No sorting and grading damaged and spoilt tubers ◆ There are few organized marketing farmer groups
Marketing	<ul style="list-style-type: none"> ◆ Lack of organized farmer groups supplying potatoes collectively ◆ There are donor dependent processors ◆ There are several cottage industries that lack organization
Policy	<ul style="list-style-type: none"> ◆ Lack of policy guidelines and strategies for potatoes subsector development ◆ Lack of standards and regulation on marketing
Stakeholder forum	<ul style="list-style-type: none"> ◆ Lack of an organized, strong and independent stakeholders forum for lobby and advocacy, that would be reference point of potato issues, information, technology and innovations

3.3.3 Opportunities observed in the potato subsector

- i. Investment in ready-cut frozen chips processing offers a promising business opportunity for the regional market.
- ii. Large and formal crisps processing company also offers a business opportunity since most of the crisps in supermarkets is imported from Kenya
- iii. Seed production of ware potato and processing varieties is another business opportunity. Proven suitable processing varieties can be introduced from Kenya and multiplied
- iv. Contract farming also offers a business opportunity for organized farmer groups who could produce potato and supply to specific market outlets such as the 10 listed in table at include
- v. Storage of potatoes offers another business opportunity that can be used to take advantage of good prices during period of shortage which could also help to even out supply.

Table 5: Supply requirements for key market outlets

Name	Contact details	Tonnage	Comments
Fruit & Juices	Tel: +256 775961202 Email: shillingisimon@gmail.com	3 tonnes/ month of fresh potatoes	Fruit & juices supply 8 Nakumatt branches in Uganda 30% is imported from Kenya
Tropical heat		26.1 tonnes/ month of crisps	Supply supermarkets and other upper end outlets
KFC	Tel: +256794057503 Email: eben.odonkor@kfu.co.ug	13.3 tonnes/month of frozen chips	Import from Holland, Belgium, Egypt etc -Has 4 outlets in Uganda
Serana hotel	Tel: +256 414309000 Email:kampala@serena.co.ug	0.5 tonnes/ month of frozen chips	Import frozen chips from Holland and Denmark. -Other high end hotels use similar amounts per month
Mr. Tasty Fried chicken	Tel: +256 750598611 Email: mrtastyfriedchicken2gmail.com	22.5 tonnes/ month of fresh potatoes	Has 5 branches and 6 th branch is up coming. Finds ready-cut frozen chips more cost effective in terms of oil used and time for preparation.
Tuskys Supermarket	Tel: + 256 782192534 Email: customercare.ug@tuskys.com	29.0 tonnes/ month of fresh potatoes	Has 6 branches in Uganda
Cottage Processors	1.Tamcro Enterprises ltd- +256 701868917 2.Sheena Co Ltd-+256 773889240 3. Mummy Crisps-+254 781663052	10.0 tonnes/ month of fresh potatoes	There are about 6 cottage processors supplying crisp to the main supermarkets. Prefer potatoes from Kabale and Masaka
Café Javas	Tel: +256 393202296 Email: info@cafejavas.co.ug	16.8 tonnes/ month of fresh potatoes	Has 7 branches
Tasty Budz	Tel: +256 704222333 Email: tastebudsrestaurant@gmail.com	7 tonnes/ month of fresh potatoes	Have 5 branches
Olympus Foods	Tel: +256 755100100 Email: info@oly-foods.com	1.1 tonnes/ month of fresh potatoes	Supply ready-cut frozen chips to hotels and restaurants

4 ASSESSMENT OF POTATO MARKETS IN TANZANIA

4.1 National Importance of Potato in Tanzania

Round potato or Irish potato (*solanum tuberosum*) has emerged as one of the most important crops in the world. Irish potatoes, hereafter referred to as potato is among the major food crops grown in over 130 countries in the world and consumed by over 1 billion people all over the world after wheat and maize. China still ranks first in round potato production followed by Russia, USA, Ukraine, Germany and Poland all of which constitute about 62% of world's total production (BhaJantri, 2011). In 1961, potatoes produced in the developing countries accounted for only 10.5% of the global output, but today they amount to 47.2%. (BhaJantri, 2011). It is therefore not surprising that round potato has emerged as one of the most important food crops in Asia and Africa continents. The crop ranks fourth in the world as food after maize, rice and wheat. Potato provides roughly half of the world's annual output of all root and tuber crops, making it the largest non-cereal food and cash crop worldwide (FAO, FAO foastat , 2004). Potato crop is currently grown on an estimated 18 million hectares, with a global production of 314 million tons, whereby Asia and Europe are the two major potato growing areas (FAO, FAO foastat, 2010) . Potato contributes energy and substantial amounts of high



quality protein and essential vitamins, minerals and trace elements to the diet (Horton, 1987). A single medium sized potato tuber contains about half the daily adult requirements of vitamin C, more protein, and twice the amount of calcium than maize.

In Tanzania, potatoes are for many of the poorest households the primary or secondary source of food and nutrition. The crop produces large quantities of dietary energy and has relatively stable yields under difficult conditions (draught, floods, and disease outbreaks) in which other crops may fail. Potato crops are suited to places where land is limited and labour is abundant; these factors characterize many of the poorest developing countries like Tanzania.

Potato crops are highly adaptable to a wide variety of farming systems. Their short and highly flexible vegetative cycle, which brings in yields within 100 days, fits well with double cropping and intercropping systems. Apart from being ecologically adaptable, potatoes also produce

more nutritious food more quickly, on less land and in harsher climates than most other major crops. Up to 85 percent of the plant is edible human food, compared with around 50 percent for cereals (Prakash, 2010) In addition to its nutritional value, potato is a staple food that is insulated from international price shocks for two reasons. Firstly, unlike cereals, potatoes are traded much less in global markets. Only a fraction of global production enters foreign trade, so potato prices are determined by local demand and supply conditions. Secondly, due to its perishability potatoes are not at risk of the ill-effects of speculative activity (Prakash, 2010).

4.2 National production of potatoes

In Tanzania, potato is increasingly becoming an important cash and food crop especially in the Southern and Northern highlands of Tanzania (Mayona, 1992). Previously, the crop was grown by highland farmers for their own food, but recently it has become a favorite of many people in rural and urban centres. Potato is mainly grown in Southern and Northern Zones of Tanzania with altitudes ranging from 1500 to 3000 metres above sea level (m.a.s.l.) The Southern highlands zone of Tanzania, particularly Mbeya and Iringa Regions, are the highest producers of potato in Tanzania and larger suppliers in market places in other regions of the country (Andersson, 1996); (Kabugo, 2008) MOAC, 2001, URT (2003). Potato can be grown in three seasons in a year (each season being 3 – 4 months long), unlike maize which takes up to 10 months in those areas to mature. This makes potato



Figure 22: Potato stored

an important source of income and is grown for both food and cash. In the southern highlands of Tanzania, potato is the third most important starchy food and cash crop after maize and rice. Potato demand is fast increasing in rural and urban areas due to fast foods industry that is quickly developing in many Food Science and Quality Management urban centers. Tanzanian urban population growth is the main driving force for demand for potato. Currently, the major production supply is in the Southern and Northern Highlands of Tanzania where potatoes are produced for both cash and food. Smallholder farmers in Mbeya and Makete Districts recognise the potential of potato as a crop of choice contributing to household food security (Socio-Economic Profile, Mbeya Rural, 2003; Makete, 2007). The crop is compatible with their environment (good climate which favours production of the crop), suitable land for the crop and market access.

Figure 23 below illustrates Tanzanian potato production trends from the year 2004 to 2013. Seed production has been a challenge in the country but now this is getting attention from the

government and slowly the scarcity is being addressed. Evidently, the graph shows a sharp upward trend from 2012 to 2013 partly as a result of the focus and attention the government and private sector is in the sub sector

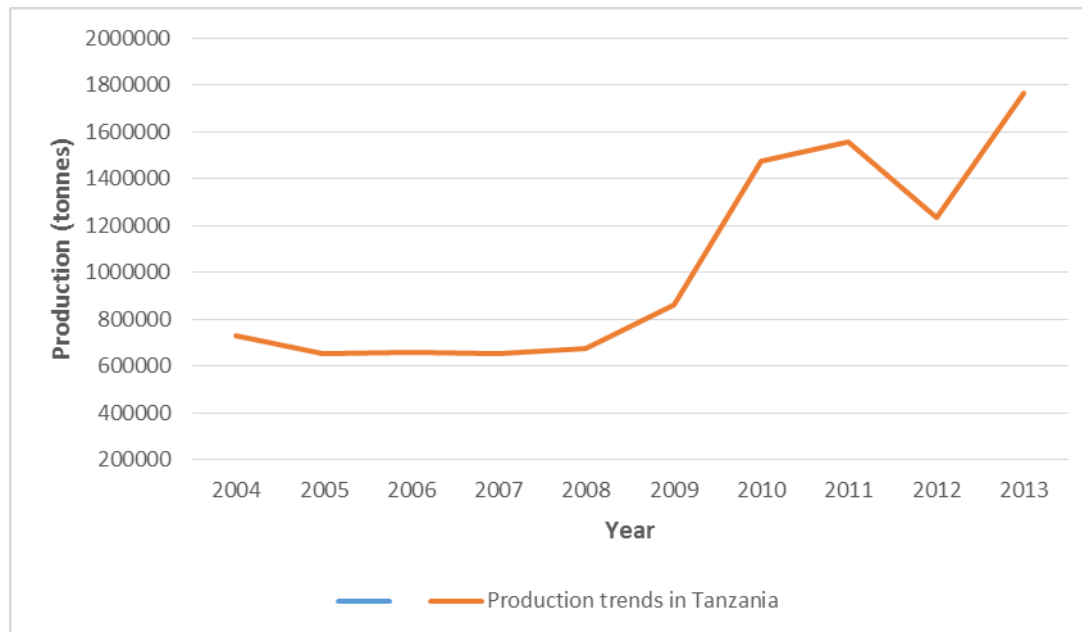


Figure 23: Potato Production trends in Tanzania

The map of Tanzania below shows three things:

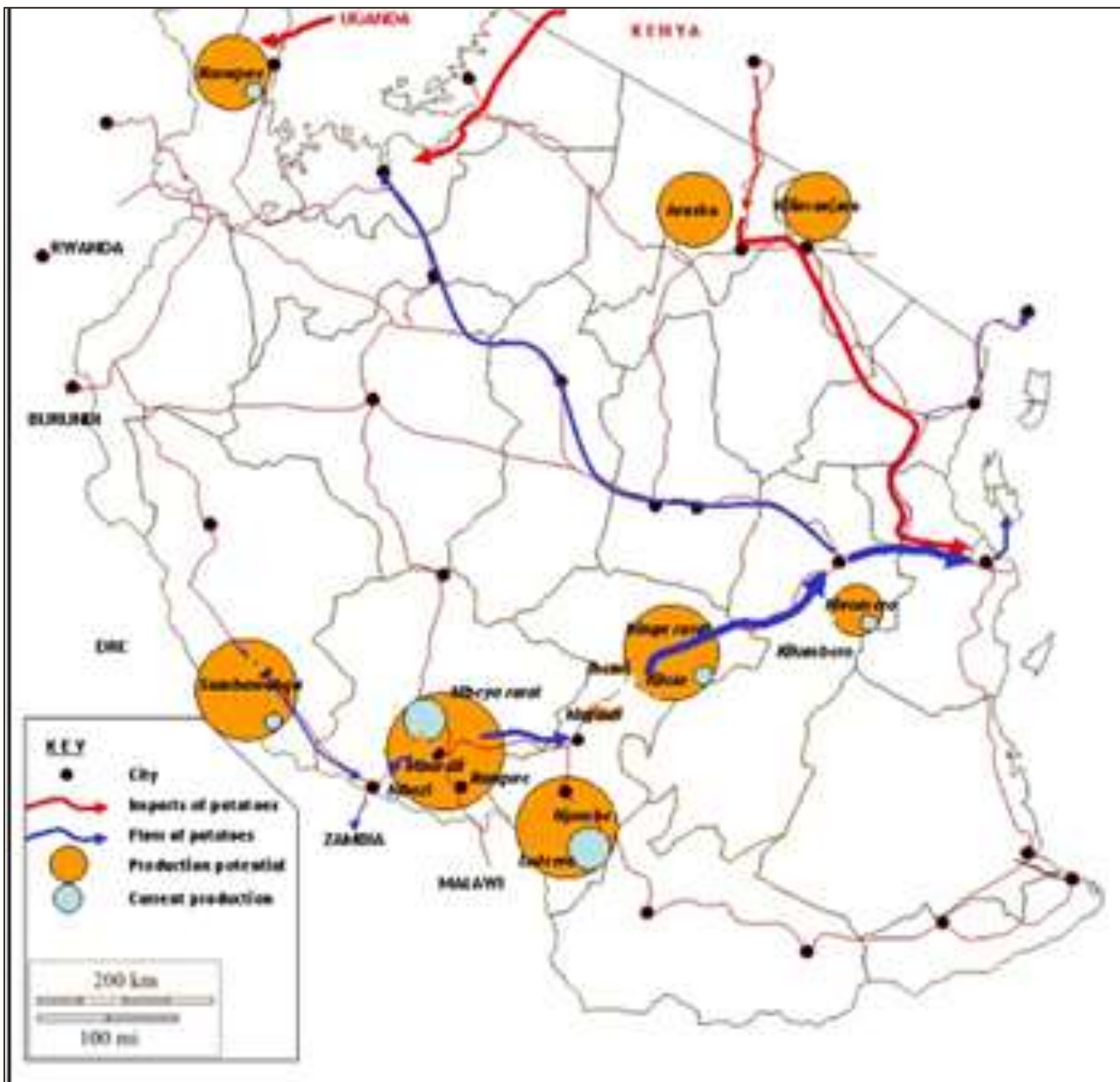
1. The areas where potato production occurs
2. The potential unutilized acreages
3. The trade movement of the ware potatoes.

There are occasional trade links with Kenya and Zambia but these movements are quite unregulated. Not much export occurs from Tanzania to her neighboring countries. Her neighbors seem to have enough ware production backed up by developed seed production development programs. The urban centers around Lake Victoria receive their ware potatoes from Kenya and

Uganda while poor road networks in Western part of the country deprives the urban centers from getting potatoes – perhaps a good opportunity for Rwanda and Burundi to focus on.

The map below shows that the country still has vast land for the expansion of potato production. At the moment, the acreage under potato is not even quarter of its potential. There

seems to exist an opportunity to export ware potato to Zambia especially if production in Mbeya region can be exploited to the fullest. Tanzania has four main production areas: the Kagera region in north-western Tanzania, Arusha near Mount Kilimanjaro, the Usambara



mountains in north and north-eastern Tanzania, and in the Southern Highlands of Tanzania.

4.3 Seed sub sector and varieties grown

Most of the seeds grown in Tanzania are Meru which is good for chips, tengeru which is good for boiling and mixing with other foods. Others are known as Asante and CIP Currently the

production and sales of seed potato in Tanzania is very limited with only Agriculture Research Institute's (ARI) Uyole seed farm in Igeri Njombe the sole supplier. The public sector are working on getting facilities to produce their own clean pre-basic seeds but at the moment supplies of tissue culture materials are obtained from the International Potato Centre in Nairobi, Kenya. Tanzania's investment in improved facilities to produce tissue cultured materials and basic seed will be of great benefit to the subsector and is an absolute essential first step in supporting increased production and improved tuber quality.

4.3.1 Marketing arrangements

Producers are the first link in the potato crop market chain. These farmers/producers sell their produce to any buyer of their own choice. Such buyers are local traders who may opt to sell locally or assemble/bulk for other traders, fellow farmers and local households on retail basis, other buyers/brokers from other regions or countries. When the producers have alternatives of whom to sell to, it widens the marketing choices for the farmer and this subsequently leads to the growth of potential marketing channels which in turn leads to better prices and high gross margins, (Sokoni, 2001). At the harvesting time and indeed at any time, very few farmers are able to hire trucks to ferry their produce to big and usually distant markets. Many of them opt to sell at local levels if not at the farm gate. (Mwakaje, 2010). By doing so, the farmer escapes other additional transaction costs.

An interview with a broker at Kirwa market – Ilala, Dar es salaam revealed that a lot of fresh potatoes are sold at the wholesale market where different buyers come every day for the produce. In a span of less than two months, this broker had already sold over 120 Lorries, with each lorry carrying 75 bags of 110 kilograms. Most of his customers prefer varieties from Kenya largely known by the name from where they are grown, e.g olkalau, meru and another one known as 'obama'. But he is happy that some of these varieties are already being grown within Tanzania and he now gets large quantities from the local farmers although their names remain so. This broker has employed various assemblers within potato growing



Figure 25: Brokers packaging potatoes in a farm

regions who bulk for him and send the produce to Dar es Salaam where he is stationed. Very few times he buy directly from farmers. His major customers are the small level chips and fast food joints who buy one to three sacks every day.

4.3.2 The actors along the potato value chain include the following,

a. Farmers/Producers

These are the first owners of the product. Tanzanian economy depends on agriculture and as a result agriculture is a major employer. These farmers apart from being producers, they are also consumers of potatoes. Usually farmers harvest after striking a deal with the buyer/broker. At the time of harvest, the farmer does the actual harvesting while the buyer provides bags and does the packaging. Often, the produce is sold at the farm gate even though some farmers sell their produce by the roadside and also in local markets. Brokers and traders buy from farmers on a cash basis

b. Village traders and assemblers

These are the guys with all the intelligence in potato trade. They know when the farmer planted and when the harvest is due. In some cases these village traders are also farmers themselves. Through phone calls, they are in contact with the wholesale markets and other outlets who constantly requires potato in medium to large quantities. They also sell to travelling traders from different towns like Dodoma and Dar es Salaam

c. Brokers

These guys are the link between farmers and traders. They are paid in commission form. Brokering is a very lucrative activity and most of these agents are people who are leading better lives than many in the potato value chain. There are two separate brokers, the rural brokers who link farmers with travelling traders and urban brokers who link travelling traders to wholesalers and urban retailers.

d. Travelling traders

These are the mobile potato traders. Either they own trucks or hire them for ease of assembling potato from producers or buying them straight from village traders/assemblers. These agents supply ware potatoes to wholesalers and retailers alike through urban brokers

e. Wholesalers

These agents assume ownership from travelling traders. Most of these wholesalers do not know the potatoes with their right names but give them names associated with the region where the variety is dominantly grown. They are in contact with the restaurants, hotels, crisps industries and even small kiosk vendors who sell chips. They therefore know and understand the variety of potatoes sought by different categories of customers.

f. Retailers

These are the agents who sell to the final agent who is the consumer. They are many in categories and range from supermarkets to urban and village retailers. The retailers sell potatoes in different hips that cater for every buyer's purchasing power. These retailers' sort and grade potatoes according to variety and level of freshness.

g. Processors

Fast food outlets, restaurants, hotels are the major business entities that process potatoes in to chips. Crisps industries also purchase fresh potatoes and process them in to crisps.

h. Consumption

Potatoes are largely consumed at the point of production and surplus sold to deficit regions that consume them. In the regions where potatoes are produced, households eat them as boiled or mashed potatoes or boiled and mixed with beans, meat or mixed with any other vegetable stew. In urban set ups, potatoes are consumed as chips and crisps with few eating it as mashed or just boiled potatoes

4.3.3 Common Characteristic of Markets

The Tanzanian potato value chain market is characterized by the dominance of traders and brokers. The farmers are the producers but by and large their ownership of the produce does not go beyond farm gate level or better still at the local production level. Farmers are organized in groups. For example in Njombe region, the following groups are very active in production and occasional collective marketing of potatoes;

- i. Mkombozi
- ii. Wiuligusa
- iii. Azimio
- iv. Twende na wakati
- v. Tuinue uchumi
- vi. Upendo

At harvest periods, potato producing regions are abuzz with assemblers and lorries running across villages and farms collecting, bulking and transporting the produce to bigger and better markets in towns and cities. The extended bags menace seems to be a very big problem in Tanzania. One of the officials of MVIWATA, says that they are working with the government to introduce weigh bridges in potato growing regions so that potatoes can be sold in kilograms and not in the extended bags as is the current case. Already some places have these weigh bridges but strict enforcement has been lacking and MVIWATA promises to work closely with all the stakeholders to ensure that this potato is sold per kilogram and that the weigh bridge intervention is fully enforced. Shangi is the dominant variety sold even though the presence of Meru, tengeru, asante cip are also felt.

Most of the potatoes are sold in to the ware market as ungraded fresh product. The marketing system is not well organized with producers being price takers. Most of Tanzania potatoes are consumed as food at household level with others ending up at the hotels, restaurants and street food vendors/fast food outlets. There is no doubt that significant amount of ware potato are consumed as chips in urban and peri-urban locations. Potato retailers in town and cities sell directly to household consumers with insignificant amounts ending up in small eating hotels known as ‘food kiosks’ or “mama ntilie”.

Tanzania has very limited range of processed potato products. Almost over 90 percent of potato crop is sold as ware and eaten either as boiled potatoes or as chips. Urbanization has seen the development of locally owned urban takeaway outlets also known as fast food kiosks in the major towns and cities and this has led to increased demand for potato for processing in to chips.

Apart from the proliferation of many small crisps industries, there are three major medium scale crisps processing companies in Tanzania. These are Crispo Snacks Foods (T) Ltd based in Iringa, and Jingles and Bingos based in Dar. These companies produce large quantities of crisps, but unfortunately they use relatively low volumes of fresh potatoes. The development of crisp market in Tanzania is also hampered by high volumes of imported crisps from processing giants like Lays and other brands imported from Kenya and South Africa.

Frozen chips are also attractive and appealing to the urban middle and high income population because of their taste and convenience. However, this marketing channel is still new in Tanzania and only big supermarkets and food chain stores like KFC deal on them. Tanzania is a developing economy and demand for crisps and fries are mainly for limited affluent urban population hotels, restaurants and supermarkets

4.3.4 Profile of main buyers of potatoes

Tanzania has great potential in terms of unexploited opportunities in the potato value chain. These potentials lie greatly in increasing production as well as linking producers to the big buyers. One of the striking opportunities lies with supplying KFC chains within East Africa region with the cut uncooked chips. The food chain imports its frozen chips from Pakistan but the ports bureaucratic nature at times sees the food chain go in to losses because of delayed clearance period. KFC managers in Dar es salaam says that they are more than willing to work with the local farmers to produce for them the kind of potatoes they require. Already, they are working with local farmers supplying them with poultry. They are ready to invite auditors from their headquarters in South Africa to come, train and audit farmers on the procedures of producing the right potatoes for them.

Tanzanian potato market is dominated by the brokers who collect produce from farmers at the farm gate and transport to big markets like, Dar es Salaam, Dodoma, Arusha and Mwanza.

Table 6: Profiles of some potatoes buyers in Tanzania

Name	Contact details	Monthly tonnage	comments
Nakumatt Holdings	Agnes Assey +255682126071	- 50	Weekly supply and strict on quality
Swagat Crisp Industry	Mr Rakesh - +2556844054954	20	Has no storage, requires weekly supply. Pays premium on quality
Macha Smart Crisps	Smart - +255782151652	28	Weekly supply
Rugantino Industries	Crisps sanjaymanek@hotmail.co, +255787136136	33	Will be happy to work with farmers
KFC Dar es salaam	Mr Russel Ebenezer +255783185621	100	Looking forward to working with local producers
Best Western Premier	Mr Amit - +255714207080	12	Daily supply
Tansoma Business Hotel	Henrico Aidan +255715955722	- 20	Direct supply
Akubu Hotel	Ms Fatima, no contacts. Wants to talk to producer	4.5	These are the majority small level chips outlets. Very many in numbers serving very many daily customers.

	directly		Requires daily supply
Uchumi supermarket	Mr Kessy - +25568472155	63	Strict on quality. After three days supply
Hango Traders/Exporters	Mr Mohammed Hango - +255716303031	41	Interested in working with farmers

These markets are wholesale green markets. Buyers to these markets are restaurants, crisps processors, household customers, hotels and arguably the largest one being the buyers from the small level chips outlets. These markets are characterized with long extended bags. Not any farmer or any stranger can come and sell potatoes in these markets. The usual traders/brokers would make such advances impossible and one would have to sell the ware to them or give them to sell on their behalf and collect proceed later. The crisp processors largely buy from the wholesale markets with very little price certainty. Many of these buyers interviewed would wish to have direct linkages with the producers and agree on contractual basis. Even the small level chips restaurants would wish to procure their day to day potatoes from the farmers directly. A vendor of one of such outlets said that if Cocacola Company supplies them directly with their soft drinks, why farmers can't also supply them directly with their produce. The following table shows different fresh potato buyers, their monthly fresh potato tonnage requirement and their contact addresses.

4.3.5 Main challenges in the sub sector

The sub sector is not void of challenges. Farmers produce under serious challenges and so are other value chain agents who also operate under myriad of stumbling blocks. These challenges can be summarized as follows;

a. Market integration

Market integration issues are causing high supply risks and high transaction costs. Tanzanian potatoes are usually marketed through fragmented chains that lack coordination and information exchanges.

b. Lack of seeds

There are not enough production initiatives. Average yields are too low for marketable surpluses. This means there is not a sufficient quantity of quality seeds for farmers to capitalize on the potential gains of it.

c. Producer groups and marketing

The third point is producer groups; the farm gate price of potatoes is often based on limited negotiation, and smallholders do not have the market savvy or access to necessary market information. Uneven bargaining leads to uneven pricing that, in turn, will deter the producers by responding to market incentives. This makes the formation of producer groups, to share expertise and strengthen the bargaining power within the chain, essential.

d. Public and Private support

Public and private support is lagging behind. Agriculture policies and resources have traditionally focused on cash crops for export and on cereals, leaving 37 potatoes and other root crops at the periphery. Correcting this imbalance and seeking substantial levels of public and private investment is critical. (Prakash, 2010) (Andersson, 1996) analyzed technical aspects of potato cultivation in a particular area in Tanzania. In the study, he writes that without proper equipment, potatoes can be hard to manage: they are prone to disease and subject to tuber degeneration (Andersson, 1996). Booth and Burton wrote in 1983 in their article that for such a perishable crop like the potato, appropriate post-harvest technology (mainly cooling systems) is not only required to reduce food losses, but also to maintain the perishable planting material from one growing season to the next (Booth & Burton 1983, 275).

e. Pest and diseases

Farmers suffer a great deal with the pest and diseases that challenge them during production stage. At this stage, they are required to spray seven to 8 times before the crops are harvested and this is a real cost driver in terms of overall cost of production.

f. Lack of appropriate post-harvest technologies

Pests follow the produce to the store after harvest. There has not been adequate farmer training on potato postharvest handling. Storage is such a big challenge to farmers and this sometimes causes the producers to sell at lower prices because they cannot store for long. Value addition trainings are necessary for the farmers to increase their revenues and offer incentives of producing more. Groups can be organized to have one storage facility that can help them store the tubers for a long period of time.

5 CONCLUSIONS AND RECOMMENDATIONS

Potato is an important crop in the east African countries (Kenya Uganda and Tanzania). It is grown mainly in the high and medium altitudes in the countries. The crop is grown both food and for economic reasons, indicating that it is a major source of livelihoods for the smallholder farmers who are engaged in the production of the crop. There is growing numbers of families in both urban and rural areas who are turning to potatoes as main food. There are therefore opportunities for people who are engaged in the activities along the potato value chain as either as traders both retail and wholesale, processors, and even input supplies, to meet the increasing demand for ware and seed potatoes for the growing numbers of producers and consumers.

On the other hand there are major challenges that Cut across the three countries that need to be addressed to make the potato subsector a more profitable enterprise for farmers as well as traders. The challenges are mainly at the production, trading and policy levels. There is serious shortage of quality seed potato across all the three countries. Seed distribution systems are inadequate, therefore even the little available quality seed is not easily accessible to potato farmers.

The potato value chain need to be supported with new technologies to improve its productivity in order to improve the livelihoods of those engaged in the enterprise. Farmer capacity building in foremost in the improvement of quality of potato products.

There is need for a policy framework that cuts across the east Africa region. Production and marketing standards need to be strengthened through guiding laws and regulations to make the potato value chain competitive in the region and in the international arena. Lessons learnt from Kenya on policy and legal frame work development, though not entirely complete could form the basis for development of such laws and regulations

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7 ANNEXES

7.1 Annex 1 Farmer group producer checklist

1. Farmer group producer checklist	
What to ask	Questions
a. Group data	<p>Name of the producer farmer group</p> <p>Telephone.....</p> <p>Ward.....</p> <p>Sub-county.....</p> <p>County</p>
b. Group information	<p>Number of members?.....</p> <p>Number of women?.....</p> <p>Number of men?</p> <p>Number of youth? (Below 35 years)</p> <p>Which year was the group formed?</p> <p>What is the main activities of the group?</p> <p>.....</p> <p>.....</p> <p>If you grow potato as group, is it ware or seed potato?</p> <p>.....</p> <p>What is the area under the potato crop?</p> <p>.....</p>
c. Growing potatoes	<p>Which year did you start growing potatoes?</p> <p>Why did you start growing potatoes?</p> <p>.....</p> <p>Which varieties of potato do you mainly grow?</p> <p>.....</p> <p>What type of seed have you been using mainly?</p> <p>“Ordinary” seed <input type="checkbox"/> clean seed <input type="checkbox"/> certified seed <input type="checkbox"/></p> <p>positively selected seed <input type="checkbox"/></p> <p>Where have you been getting your seed from?</p> <p>Own seed <input type="checkbox"/> Neighbours <input type="checkbox"/> Market <input type="checkbox"/></p> <p>Clean Seed producer <input type="checkbox"/> certified seed producer <input type="checkbox"/></p> <p>What is the distance from your farm to the nearest source of potato</p>

	<p>seeds?</p> <p>Has the source of seed changed since you started growing potatoes? If yes, what has been the changes?</p> <p>_____</p> <p>_____</p> <p>When you started growing potatoes were there difficulties in getting quality seed?</p> <p>If there was difficulties, do you still experience difficulties in getting quality seed potato?</p> <p>What do you think should be done to improve seed availability?</p> <p>.....</p>
	<p>Do you store potatoes? If yes what type of store do you use? _____</p> <p>If store used, from when and who did you obtain the knowledge about this technology?</p>
<p>d) Marketing</p>	<p>What do you do with the potatoes you produce?</p> <p>Domestic consumption.....</p> <p>Sold-----</p> <p>Where have you been selling the potatoes you produce?</p> <p>.....</p> <p>Who are your main buyers?</p> <p>How do you transport the potatoes to the buyer?</p> <p>.....</p> <p>Have you been involved in contract farming?</p> <p>.....</p> <p>What are the advantages?</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>What are the disadvantages?</p> <p>.....</p> <p>.....</p> <p>.....</p>
<p>e. Policies and regulations</p>	<p>Has there been changes in policies, regulations or availability of information that improved production of potato? If yes explain when and what is was</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Has there been changes in policies, regulations or availability of information that improved marketing of potato? If yes explain when and what it was</p> <p>_____</p>

	<hr/> <hr/>
f. Challenges/opportunities	<p>What challenges have you experienced in potato production?</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>How have you tried to deal with the challenges?</p> <p>.....</p> <p>.....</p> <p>.....</p>
g. Support received	<p>Have you ever gotten any support in potato production?</p> <p>.....</p> <p>Who gave you and other potato producers' support?</p> <p>.....</p> <p>What kind of support did you received?</p> <p>.....</p> <p>.....</p> <p>.....</p>
h. Benefits	<p>What benefits can you say you have obtained from the support given?</p> <p>.....</p> <p>.....</p> <p>.....</p>
j. Lessons learnt	<p>What experiences or lessons have you learnt that you would like to share with other famer potato producers?</p> <p>.....</p> <p>.....</p> <p>.....</p>
k. Recommendations	<p>What recommendation would you make for farmer potato producers in Kenya and African Regions</p> <p>.....</p> <p>.....</p> <p>.....</p>

7.2 Annex 2 Small Seed producer Checklist

2. Small Seed producer Checklist	
What to ask	Questions
a. Personal data	Name of the seed producer..... Telephone..... Ward..... Location..... County
b. Farm information	Farm size..... Area under potatoes..... Area under seed potatoes.....
c. Growing seed potatoes	Which year did you start growing seed potatoes? Why did you start growing seed potatoes? What type of seed have you been using? clean seed <input type="checkbox"/> certified seed <input type="checkbox"/> Where have you been getting your seed from? Research organization <input type="checkbox"/> certified seed producer <input type="checkbox"/> What is the distance from your farm to the nearest source of potato seeds? When you started growing seed potatoes were there difficulties in getting quality seed? Do you still experience difficulties in getting quality seed potato? What do you think should be done to improve quality seed availability?
d. Seed marketing and distribution	Where have you been selling the seed potatoes you produce? Who are your main buyers? How do you transport the seed potatoes to the buyer? Have you been involved in contract farming? What are the advantages?

	<p>.....</p> <p>What are the disadvantages?</p> <p>.....</p> <p>.....</p> <p>.....</p>
e. Challenges/opportunities	<p>What challenges have you experienced in seed potato production?</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>How have you tried to deal with these challenges?</p> <p>.....</p> <p>.....</p> <p>.....</p>
f. Support received	<p>Have you ever gotten any support in seed production?</p> <p>.....</p> <p>Who gave you and other seed producers' support?</p> <p>.....</p> <p>What kind of support did you received?</p> <p>.....</p> <p>.....</p> <p>.....</p>
g. Benefits	<p>What benefits can you say you have obtained from the support given?</p> <p>.....</p> <p>.....</p> <p>.....</p>
h. Lessons learnt	<p>What experiences or lessons have you learnt that you would like to share with other seed producers?</p> <p>.....</p> <p>.....</p> <p>.....</p>
j. Recommendation	<p>What recommendation would you make for seed potato producers in Kenya and African Regions</p> <p>.....</p> <p>.....</p> <p>.....</p>

7.3 Annex 2

Traders' Checklist

Name of interviewer -----

Designation -----

Date of interview -----

1. Details of the respondent

Name

Contact -----

Location (place) -----

2. Name of business if registered.....

3.What is your role in the market?

- a) Broker
- b) Loader
- c) Retail trader
- d) Wholesale trader
- e) Transporter

4. For how long have you been in the market of potatoes?

1. Years 2. Months

a. If transporter how many bags of potatoes do you transport weekly?

b. If traders how many bags of potatoes do you currently sell daily?

c. If traders how many bags of potatoes did you sell daily in the past (5, 10, years)?

5. How would say the potato business has changed overtime?

Decline Increase stagnate or any other

i. For traders only do you own a transporting vehicle?

- a) Yes
- b) No

ii. Where do you buy your potatoes?

- a) Narok
- b) Kinangop
- c) Molo
- d) Bomet
- e) Meru
- f) Shamata
- g) Ol kalou
- h) Others

iii. What varieties of potato do you sell currently?

- a) Zangi
- b) Tigoni
- c) Asante
- d) Golf/ Dutch Robjin
- e) Kenya karibu
- f) Others

iv. What varieties were you selling in the past (5, 10 years ago) ?

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.....

v. Is there a variety you would want introduced in the market?

.....

vii. Why?

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viii. What are the major challenges that your business has been experiencing?

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ix. How have these challenges changed in the course of time?

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x. Is there a traders association?

xi. Are you a member?

xii. If you're a member, what the benefits?

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.....
.....

xiii. If not a member, why?

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.....

xiv. What are your future plans as a trader?

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.....

xv. What do you think could help improve your potato business

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.....

What experiences would you like to share with other traders in the Country and other African Countries?

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7.4 Annex 4 Checklist for Farmer Group

4. Farmer groups	
What to ask	questions
a. Group data	Name of the group..... Telephone..... Ward..... County
b. Farm information	Year that the group was formed Number of members Composition of the group Conditions for joining the group Do you pay membership fee? Do you pay annual subscription?
c. Group activities	What the main activities of the group
d. Support to the group	Have received any support? If yes, who gave the support? What kind of support was it?
e. Benefits	What can you say are the benefits you have obtained from the support?
f. Future activities for group	What are the future plans for the group?

g. Lessons Learnt	What lessons or experiences that you have learnt that you would like to share with other seed producers?
h. Recommendation	What are the recommendation that you would make for seed potato producers in In Kenya and African Regions

