Volume 1: Analysis of Demand of Sweet Potatoes in Tanzania, Uganda and the Rest of East African Community
EXECUTIVE SUMMARY

1. In October 2012 Bill and Melinda Gates Foundation commissioned Kilimo Trust to undertake a survey and study, principally in Tanzania and Uganda, to investigate how developing markets for sweet potatoes and their processed products would contribute to food security, especially for low-income earners in both urban and rural areas, and enhance incomes and create wealth for producers and other operators along the value chain.

2. This report presents the finding from this work and it is presented in four parts – Volume 1 is a Demand Analysis (DA), Volumes 2 and 3 is a Value Chain Analysis (VCA) for Tanzania and Uganda respectively while Volume 4 is a Demand and Value Chain analysis for yams in both countries.

3. This is a summary of Volume 1 Demand Analysis which assesses market opportunities with respect to (i) demand for home consumption in the areas of production; (ii) rural markets in areas where the commodity is not produced; and (iii) urban markets at regional, national, and local levels. Regional markets are assessed because they will provide the incentives to improve productivity and/or expand production.

Key issues from the demand analysis

4. Sweet potatoes are an important food crop in Sub-Saharan Africa not only for food security but also for nutrition and income security. Vitamin A Deficiency (VAD) is widespread and affects 43 million children under age 5 in sub-Saharan Africa. It can lead to blindness, impaired immune systems, and premature death in children and pregnant women. Sweet potatoes contain considerable amounts of carbohydrates, minerals, and high levels of essential vitamins. Orange flesh sweet potatoes in particular are an excellent source of beta-carotene and vitamin A.

5. Most smallholder farmers grow sweet potatoes to improve their household food security. The crop has greater nutritional content than alternative crops such as cassava, yams, maize, and bananas. Producers mostly consume the sweet potatoes they produce. In Uganda producer households consume about 70% of their production and so benefit from all the nutrition they provide.

6. Women grow most of the sweet potatoes in home gardens both to feed their families and to generate cash for the family. Sweet potatoes are also grown to feed livestock and for industrial processes to make alcohol and starch.
7. Research is now producing new improved varieties. In 2007 the Ugandan Plant Variety Release Committee released five (5) new cultivars. These provide consumers and farmers with high quality sweet potatoes with cream and orange fleshed storage roots and moderate to high vitamin A content, with the potential to alleviate widespread vitamin A deficiency.

8. In Tanzania and Uganda, sweet potatoes are mainly traded in cities and large towns in wholesale and retail markets. In Tanzania, they are mainly traded in Dar es Salaam, Mwanza, Morogoro, Shinyanga, Dodoma, and Zanzibar. In Uganda, trading is done mainly in the districts surrounding and including the cities and towns of Kampala, Masaka, Jinja, Iganga, Mubende, and Soroti.

9. In Dar es Salaam sweet potatoes are mainly sourced from Gairo (Morogoro), Bagamoyo (Coast), Temeke (DSM), Songea (Ruvuma), and Kondoa (Dodoma region). The peak season is from March to September. Trade is mainly facilitated by brokers and middlemen who purchase from producers and supply to sellers. They agree on prices, amount, and time of harvest from numerous smallholder farmers located in diverse farming systems. A similar system exists in Uganda where brokers procure from smallholders and sell the produce for profit.

10. Market segmentation: The food markets for sweet potatoes can be segmented into urban (non-producers) and rural (producers and non-producers) consumers across low, medium, and high income earners. These are further divided into individual consumers, institutional buyers, and food vendors who prepare cooked forms of sweet potatoes for the “away from home” consumers.

11. Types and varieties of sweet potatoes preferred by consumers: There are three main types of sweet potatoes – white fleshed sweet potatoes (WFSP), yellow fleshed sweet potatoes (YFSP), and orange fleshed sweet potatoes (OFSP). Consumers across both urban and rural markets prefer WFSP and YFSP. In Tanzania preferred varieties include polista, shangazi, and ejumula (WFSP) and morogoro (YFSP). In Uganda they prefer dimbuka, bamunyombokere, silk, mbale, and osukut. Consumption is largely driven by taste, high dry matter content, availability, and nutritional benefits. WFSP types are consumed mainly because other types are not always available in the market. OFSP are least preferred across all consumers sectors both in the home and for food served by food vendors.

12. Awareness of OFSP by the learning Institutions: Among the institutional consumers, not all those surveyed were aware of the new orange fleshed sweet potatoes (OFSP). In Tanzania, 57% of secondary schools were not aware of them. There was more awareness in Uganda where 83% of primary schools
knew about OFSPs. In Tanzania, feeding menus are determined at high policy level while in Uganda they are determined by the school (local level). The demand for sweet potatoes was higher in primary and secondary schools than in nursery schools. About 83% of secondary schools interviewed in Tanzania and 77% in Uganda would like to introduce OFSPs in their menus.

13. Consumption patterns and trends: Sweet potatoes are a substitute for other staple foods such as rice, maize, cassava, bananas, yams, and Irish potatoes. They are consumed as a main meal in Uganda and Rwanda where they are served with a sauce of beans, fish, meat, vegetables, or chicken. In the other EAC countries they are consumed as a snack and an accompaniment to tea. However, as more people become “health” conscious, sweet potatoes are replacing bread as an accompaniment for tea especially among urban consumers. Similarly in the rural producing areas, consumers also eat sweet potatoes for breakfast. In Tanzania sweet potatoes leaves are also consumed as a vegetable and are a substitute for other types of vegetables such as pumpkin leaves, cassava leaves, kales, and amaranths.

14. Uganda has the highest per capita sweet potato consumption (kg/person/year) in Africa. In 2010 this was estimated at 73 kg/person/year. It is the third most consumed food staple in Uganda after bananas and cassava.

15. In Arusha in northern Tanzania, 51% of household consumers increased consumption between 2004 and 2009 while 8% reduced their consumption. Consumption in the country is high during the holy month of Ramadan and during school games festivals which have moved away from serving bread during such occasions.

16. Increasing consumption is due to increased household size brought about by population growth, availability of sweet potatoes in the market and among producers, and limited income which makes sweet potato roots an attractive option since they are cheap relative to some substitutes such as cassava.

17. Price trends: Prices have increased in the last 3 years. This is attributed to the seasonality of the crop, high demand among consumers, and low production volumes coming from producers. Consumers in Uganda, Kenya, and Burundi are price sensitive and will reduce the amount they buy if prices increase. But in Tanzania they tend to be less price-sensitive.

18. Consumer preference by forms: Sweet potatoes are consumed in many forms – boiled, fried, roasted, mashed or as crisps. Most consumers buy raw/fresh roots and boil them. But small quantities are consumed as dried chips, fried, and roasted. Other products available in the market include mashed sweet
potatoes, crisps, flour, juice, starch, and confectionaries. Sweet potato leaves are also consumed and are found in almost all cities and town markets.

19. In Tanzania, they are processed into two products – “Michembe”, where the roots are withered, cut into slices and dried; and “Matobolwa”, where the roots are boiled, sliced and dried. Both products can then be stored for 5-10 months.

20. Sources of supply: Different consumers purchase sweet potatoes from different sources such as open markets, retail shops, farmers, and supermarkets. Consumer buying behavior from these sources is driven by affordability, availability of different products, convenience, availability of credit facilities, and nearness of sellers.

21. Consumers generally prefer open markets where fresh roots are readily available and are affordable. Direct sales to consumers account for up to 40% of all sweet potatoes produced in Tanzania. Other important buyers are food vendors and institutions such as schools, hotels and hospitals. In Uganda some institutions buy from producers.

22. Sweet potato as animal feed: The market for processed animal feed using sweet potatoes as a raw material is not well developed. The feed market involves fresh vines and those fermented with chicken manure and which are said to have higher crude protein, dry matter (DM) and ash contents than the other silages. Sweet potatoes forage can be fed to dairy cows as a supplement to forage such as Guinea grass or sorghum silage.

Challenges and opportunities

23. The sweet potatoes subsector market chain in the East Africa Community countries is beset with a myriad of challenges as follows:

24. Individual consumers face challenges of unreliable supply, small size and damaged roots, high prices, difficulty in recognizing different varieties, flatulence, acidity/heartburn, spoilage due to the short shelf-life, and poor tasting varieties.

25. Institutional buyers face constraints such as poor quality, produce not readily available, easily spoiled, high price (expensive), long product preparation times, and budgetary constraints.

26. Food vendors face problems of easy spoilage attributed to the short shelf-life of roots, high purchase prices, unreliable supply, and scarcity, poor quality with high fiber content, limited storage facilities, theft, and high transport costs.
The challenges facing food processors include high production/processing costs, limited supply of raw materials, limited market and low quality raw materials.

27. There is very little processing and value addition being done. There is an increasing demand for sweet potato products and so there are opportunities for investing in crop processing and adding value.

28. There is no system in place to enforce quality standards for consumers and retailers. Opportunities exist because varieties are available which consumers prefer and relatively high yielding varieties which can increase the volume supplied to the market and can impact market prices. The main threats include price fluctuations, poor quality roots, short shelf life of fresh roots, perception as an inferior food relatively cheaper substitute value added products such as wheat flour.

Conclusions

29. It is concluded that the demand for fresh sweet potatoes roots is high among consumers. But current produce quality and market availability do not match consumer expectations. Addressing the issues of quality, quantity, and availability would expand current markets. The market for other sweet potato products is limited by a lack of available products, high prices due to high production costs, and limited awareness among consumers. This market needs further exploration in following dimensions:

30. New products for existing markets. Sweet potatoes, especially Orange fleshed sweet potato (OFSP), have many health benefits due to their inherent nutritional value. OFSP composite flour is a potential market product.

31. New markets for existing products. There are opportunities to develop sweet potatoes for animal feeds. They are currently used for poultry and pig feed but the low use is attributed to scarcity, limited technical knowhow/skills, and high price, all of which can be addressed. Also strategic promotion of existing sweet potato varieties and products may increase production and consumption.

32. New markets for new products. This may involve developing new and attractive products that may appeal to those who are not currently consuming or using sweet potatoes and its products.
Proposed Interventions:

33. Three main strategic interventions are proposed in order to activate market growth of sweet potato products in the East Africa Community. These are geared towards creating more awareness and promoting usage among both existing and potential consumers.

34. Expand the use of existing and new technologies from research, the primary processors, products, by-products, and practices to exploit markets starting with demand/market development and attracting investors. There is a strong market for fresh roots and an untapped market for other sweet potatoes products.

35. Develop a promotional strategy for fresh sweet potatoes roots (especially OFSP) and new products to create awareness among different consumer groups.

36. Develop and promote storage techniques to reduce losses. Sweet potatoes have a short shelf-life and spoil easily and rapidly. Consumers prefer roots that are fresh and have a “straight from the farm look”.

Recommended Actions:

37. Based on the survey results and need to activate sweet potato market in the region following actions are recommended:

38. Promote sweet potatoes consumption among consumers, including institutional buyers and non-consumers, by organizing campaigns to create consumer awareness (across all market segments) on their importance and benefits. Place emphasis on nutritional and health benefits, such as among diabetics; and food security, particularly the consumption of OFSP.

39. Create awareness and benefits of Orange flesh sweet potato with relatively high dry matter content that can compete favorably with existing White and Yellow fleshe sweet potatoes.

40. Promote sweet potatoes as an alternative raw material among the animal feed processors by providing technical skills and encouraging increased production among producers to ensure sufficient supply.

41. Influence national policy to adopt sweet potato feeding programs in schools and support schools directly to implement sweet potato feeding programs by providing vines and supporting the initial process for production and creating
awareness among school-going children who in turn may become future producers and consumers.

42. Develop and enforce standards on grading by size, packaging, and quality in order to meet consumer demands for better products.

43. Encourage processing and value addition during periods of high production to improve product shelf-life. Work with existing processors as an entry point to train value chain actors on the importance of sweet potatoes and to create demand.

44. Invest in incubation projects to try-out and promote processed products, for example working with Makerere University Food Science Incubation Unit.

45. Develop post-harvest handling technologies to improve crop quality and shelf-life of fresh roots.
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<tr>
<td>AfDB</td>
<td>African Development Bank</td>
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<tr>
<td>AIS</td>
<td>Agricultural Innovation Systems</td>
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<td>Agricultural Seed Agency</td>
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<td>Agricultural Sector Program</td>
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<td>BMGF</td>
<td>Bill and Melinda Gates Foundation</td>
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<td>CEO</td>
<td>Chief Executive Officer</td>
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<td>CGIAR</td>
<td>Consultative Group of International Agricultural Research</td>
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<td>International Potato Centre</td>
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<td>DEAS</td>
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<td>Dar es Salaam</td>
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<td>EAC</td>
<td>East African Community</td>
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<td>EACM</td>
<td>East African Common Market</td>
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<td>EAC SQM</td>
<td>East African Community Standardization, Quality Assurance Metrology and Test Act</td>
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<td>EZ</td>
<td>Eastern Zone</td>
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<td>FRI</td>
<td>Farm Radio International</td>
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<td>HIV/AIDS</td>
<td>Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome</td>
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<td>HKI</td>
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<td>International Institute of Tropical Agriculture</td>
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<td>MAFSC</td>
<td>Ministry of Agriculture Food Security and Cooperatives</td>
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<td>MDG</td>
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<tr>
<td>MKUKUTA</td>
<td>Mpango wa Kuratibu na Kukuza Uchumi wa Taifa</td>
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<td>NASPOT</td>
<td>Namulonge Sweet potatoes</td>
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<td>NARO</td>
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<td>NARS</td>
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<td>NGO</td>
<td>Non-Governmental Organizations</td>
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<td>NPT</td>
<td>National Performance Trial</td>
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<td>OFSP</td>
<td>Orange Fleshe Sweet potatoes</td>
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<td>PFMA</td>
<td>Product-focused Market Assessments</td>
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<td>RAC</td>
<td>Reaching Agents of Change</td>
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<td>SASHA</td>
<td>Sweet potatoes Action for Security and Health in Africa</td>
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<td>SHF</td>
<td>Small holder farmers</td>
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<td>SIDO</td>
<td>Small Industries Development Organization</td>
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<td>SP</td>
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<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<td>SPVD</td>
<td>Sweet Potatoes Virus Disease</td>
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<td>SWOT</td>
<td>Strength Weakness Opportunity Threat</td>
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<td>S&amp;T</td>
<td>Science and Technology</td>
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<td>SZ</td>
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<td>TAFSIP</td>
<td>Tanzania Agriculture Food Security Investment Plan</td>
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<td>TAHEA</td>
<td>Tanzania Home Economics Association</td>
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<tr>
<td>TCCIA</td>
<td>Tanzania Chambers of Commerce, Industries &amp; Agriculture</td>
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<tr>
<td>ToT</td>
<td>Training of Trainers</td>
</tr>
<tr>
<td>VAD</td>
<td>Vitamin A Deficiency</td>
</tr>
<tr>
<td>VC</td>
<td>Value Chain</td>
</tr>
<tr>
<td>VCA</td>
<td>Value Chain Analysis</td>
</tr>
<tr>
<td>WFSP</td>
<td>White Fleshed Sweet potatoes</td>
</tr>
<tr>
<td>YFSP</td>
<td>Yellow Fleshed Sweet potatoes</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

1.1 Objectives

1) In October 2012, the Bill and Melinda Gates Foundation retained the services of Kilimo Trust (KT) to conduct a Demand and Value Chain Analysis (D&VCA) for Sweet Potatoes (SP) and Yams in Tanzania and Uganda.

2) The main objective of this study was to determine the extent to which developing the markets (including consumption by producers themselves) of sweet potatoes and yams and their products would contribute to:

3) Increasing food and nutrition security, especially for the low income earners in both urban and rural areas; while

4) Enhancing incomes and wealth creation of producers and other operators along the value chain.

5) The results of this study are presented in four parts:

6) Volume 1 presents the results of a Demand Analysis to assess market opportunities with respect to: (i) demand for home consumption in the areas of production; (ii) rural markets in areas where the commodity is not produced; and (iii) urban markets at regional, national, and local levels. Regional markets are assessed because they will provide the incentives to improve productivity and/or expand production.

7) Volume 2 and 3 presents the results of a Value Chain Analysis (VCA) study in Tanzania and Uganda respectively conducted to quantify the benefits to value chain actors in terms of incomes, profits, and/or return on investment.

8) Volume 4 provides a general picture of production and consumption of yams in the region.

9) The VCA study was designed to support the process of seeking solutions to the core problem facing the sub-sectors in terms of the current inadequate attention given to market development by most agriculture for development programs for all food staples in general but more importantly for starchy commodities. While adoption of the value chain development approach is a significant step in the right direction, there is inadequate analysis done to guide this process. Thus, VCA should go beyond boxed diagrams to produce: (i) an in-depth assessment of the major components of the market and relevant value chain, (ii) a full description of the characteristics of the actors within each component, (iii) an identification and description of current and potential value-adding and/or value-losing processes, (iv) a critical assessment of volumes and quality of goods, information, benefits and costs that flow (and/or could flow) in the chain, (v) a clear identification of the anchors and drivers of the chain, (vi) an understanding of the institutions and support environment influencing the value chain and (vii) an identification of the overall SWOT of the whole sub-sector.

10) Experience and economic analysis of demand and supply (see for example, a study by IFPRI, 2003), has shown that increasing agricultural productivity in ways that are not linked to profitable market often lead to depressed commodity prices and hence lower incomes
for the producers. Therefore, “thin” agricultural markets (as described above), are the major constraint to growth in the productivity and production of sweet potatoes and yams.

11) In general, the purpose of building and/or upgrading value chains for agricultural commodities produced and/or handled mainly by smallholders, is to improve their access to profitable markets while enhancing their share of the benefits generated in those markets. Therefore, value chain development (VCD) is a process of harnessing positive attributes of market forces to achieve developmental changes such as wealth creation, reduction of hunger and malnutrition, social, economic and environmental sustainability. Value Chain Analysis (VCA) is about quantitative and qualitative description of the social and economic system organized to deliver a particular product to its consumers.

1.2 The Overarching Context

12) The 2009 Economic Report on Africa recommended that “the development of regional agricultural value chains” would be the main instrument for the transformation and enhancement of competitiveness of the agricultural sector in Africa, because such value chains are critical in:

a) Improving access to markets by smallholder producers and agro-enterprises,

b) Helping to increase profitability of optimal-sized investments in agro-processing because of the economies of scale made possible by regional markets,

c) Helping to keep jobs in agro-processing industries in Africa and

d) Enhancing commercial orientation and competitiveness needed for export markets.

13) The East Africa Community (EAC), for which Uganda and Tanzania are among the five Partner States, presents unique opportunities for the development of staple food sub-sectors. This is because implementation of the East African Common Market Protocol (EACM) would increase the feasibility of regional value chains that effectively utilize comparative advantages and economies of scale in the production and supply of food.

14) There are many challenges to putting the EACM to work for food and income security, but the most critical is the very short shelf life of most food commodities such as sweet potatoes, if not processed. In the EAC Region, more than 40% of such commodities is often lost at post-harvest and processing levels - only 28% of agricultural produce in the EAC region is processed and the proportion of processing is even lower for perishable commodities. However, the stable shelf-life of all the so called perishable commodities can be increased to several years through processing enabling them to be traded widely in space and time. This DA and VCA will pay a critical attention to this aspect.

15) Without adequate commercialization of perishable staples produced in Africa, it will be difficult to achieve MDG 1 (elimination of hunger, malnutrition, and poverty). This is because perishables, such as sweet potatoes, are among the top 10 food staples in Africa (Scott et al., 2000; Phillips et al., 2004; Nweke, 2004). Sweet potatoes for example, are an important secondary (food insurance) crop grown in many farming systems in East Africa (FAO, 2004) as well as globally. For example, sweet potatoes are seventh in the global league of food staples (FAO, 2002) and they constitute a substantial source of carbohydrate and carotene.
1.3 Food, Nutrition, and Gender Dynamics

In Uganda and Tanzania, sweet potatoes are considered by many farmers as a household food security crop that cushions families against food shortage especially in cases of adverse weather conditions resulting to crop failure. Sweet potatoes are mainly grown by rural women near their homes to feed their families and its sale can provide women an entry to cash economy (Kapinga et al., 1995). More important is the nutritional contribution of SP, especially to low income earners, as illustrated in Table 1. SP is superior to potential alternatives in several ways. In Uganda’s capital city, Kampala, spending US$ 1 on OFSP will provide a household with 825, 240, 95, 25, 17 and 2.5 times more Vitamin A compared to similar expenditure on cassava, yams, tomatoes, milk, cooking bananas, and carrots, respectively. OFSP is highest in Vitamin A RAE and second to beans in provision of potassium in comparison to other BMGF’s priority value chains.

Table 1: Relative nutritional benefits of spending US$ 1 on sweet potatoes

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Energy</th>
<th>Carbohydrates</th>
<th>Protein</th>
<th>Total fibre</th>
<th>Iron</th>
<th>Potassium</th>
<th>Zinc</th>
<th>Vitamin A RAE</th>
<th>Vitamin C</th>
<th>Thiamine</th>
<th>Vitamin D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>Kcal</td>
<td>Gg</td>
<td>g</td>
<td>Mg</td>
<td>mg</td>
<td>mg</td>
<td>ug</td>
<td>ug</td>
<td>ug</td>
<td>ug</td>
<td>IU</td>
</tr>
<tr>
<td>Banana</td>
<td>2745</td>
<td>717</td>
<td>29</td>
<td>52</td>
<td>18</td>
<td>11224</td>
<td>3</td>
<td>1260</td>
<td>414</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Rice</td>
<td>3066</td>
<td>672</td>
<td>60</td>
<td>11</td>
<td>7</td>
<td>966</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sweet potatoes (OFSP)</td>
<td>3233</td>
<td>666</td>
<td>59</td>
<td>113</td>
<td>23</td>
<td>12608</td>
<td>11</td>
<td>26651</td>
<td>90</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Yams</td>
<td>2300</td>
<td>558</td>
<td>31</td>
<td>82</td>
<td>11</td>
<td>16320</td>
<td>5</td>
<td>140</td>
<td>542</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Cassava</td>
<td>3312</td>
<td>1264</td>
<td>45</td>
<td>60</td>
<td>9</td>
<td>8997</td>
<td>11</td>
<td>31</td>
<td>584</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Maize grain</td>
<td>7146</td>
<td>1515</td>
<td>192</td>
<td>55</td>
<td>55</td>
<td>3835</td>
<td>45</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Maize flour</td>
<td>3897</td>
<td>1149</td>
<td>104</td>
<td>109</td>
<td>36</td>
<td>4709</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Beans</td>
<td>3831</td>
<td>1034</td>
<td>414</td>
<td>437</td>
<td>144</td>
<td>24703</td>
<td>49</td>
<td>0</td>
<td>79</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Sorghum grain</td>
<td>8068</td>
<td>1776</td>
<td>269</td>
<td>150</td>
<td>105</td>
<td>8330</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sorghum flour</td>
<td>6600</td>
<td>1429</td>
<td>177</td>
<td>122</td>
<td>55</td>
<td>5738</td>
<td>27</td>
<td>0</td>
<td>4</td>
<td>0</td>
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</tr>
<tr>
<td>Chicken</td>
<td>350.7</td>
<td>0</td>
<td>32.1</td>
<td>0</td>
<td>1.6</td>
<td>323.9</td>
<td>2.3</td>
<td>76.7</td>
<td>2.8</td>
<td>0.1</td>
<td>17.2</td>
</tr>
<tr>
<td>Beef</td>
<td>431.3</td>
<td>0</td>
<td>61.7</td>
<td>0</td>
<td>7.6</td>
<td>1830.3</td>
<td>23.2</td>
<td>6.1</td>
<td>0.2</td>
<td>12.4</td>
<td>0</td>
</tr>
<tr>
<td>Dairy</td>
<td>381</td>
<td>41.5</td>
<td>30</td>
<td>0</td>
<td>0.2</td>
<td>1237.1</td>
<td>3.3</td>
<td>438.1</td>
<td>0.4</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>Goat</td>
<td>251.7</td>
<td>0</td>
<td>25.5</td>
<td>0</td>
<td>6.3</td>
<td>889.1</td>
<td>9.2</td>
<td>0</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Millet</td>
<td>4447</td>
<td>857</td>
<td>130</td>
<td>100</td>
<td>35</td>
<td>2294</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Millet flour</td>
<td>2154</td>
<td>481</td>
<td>71</td>
<td>23</td>
<td>26</td>
<td>1474</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>2601</td>
<td>74</td>
<td>118</td>
<td>39</td>
<td>21</td>
<td>8234</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

2. SITUATION ANALYSIS

2.1 Marketing and Consumption

17) Demand is about knowledge of consumer requirements in order to enhance the formulation of programmes and strategies for production, processing, and marketing of the most preferred varieties, products, by-products, and post-harvest handling. Consumer demand categories include individual households and institutions, such as hospitals, prisons, hotels and schools.

18) Sweet potatoes are grown for food, for livestock feed, and for industrial processes to make alcohol and starch (Harvest Plus, 2006). Whereas information is available showing food consumption there is only limited information on use for animal feed and in industrial processes.

19) Sweet potato attributes that consumers consider during purchase correlate with those varieties that are highly preferred by producers. These include low fibre content, colour, sweetness and high dry matter content. Hence, the types/varieties produced are influenced by consumer preference - those dictated by the market.

20) There has been an increase in demand which may have been influenced by changes in price, consumer income, tastes, and consumer preferences. However, the main reasons for regular consumption included good taste, improved health/nutrition, and high availability. This result suggests that nutritional campaigns have resulted in increased consumer awareness of the nutritional benefits of sweet potatoes among consumers (KT, 2010).

A) TANZANIA

21) In Tanzania, sweet potatoes are consumed in many forms – boiled, fried in oil, roasted, and mashed. They are processed into two main products – “Michembe”, where the roots are withered, cut into slices and dried; and “Matobolwa”, where the roots are boiled, sliced, and dried. These products can be stored for 5-10 months (Gichuki et al., 2005). Some novel products prepared from sweet potatoes include cakes, chapattis, doughnut, meal flour, porridge, and crisps. Sweet potatoes leaves are also consumed and are found in almost all cities and town markets in the country.

22) In coastal Tanzania, sweet potatoes are prepared into a meal called Futari, which is famous during Ramadan month. OFSP is used to make niche products such as crisps, juice, mandazi (buns), and porridge from flour. However, sweet potato dishes are limited in variety. Diversifying consumption could help to increase the demand for sweet potatoes.

23) From the consumers surveyed in Arusha, Tanzania 90% had a preference for white-fleshed sweet potatoes (WFSP) (KT, Technical report, 2010). But in Dar-es-Salaam consumers preferred yellow/cream fleshe sweet potatoes (YFSP) among households, vendors, traders, and school children (Ndunguru, 1992). These patterns may well be associated with availability of different varieties and socio-cultural factors rather than price.

24) Consumers mainly consider attributes such as tastes, preferences and quality in terms of colour, size, shape, and texture. Temu et al., (2003) studying sweet potatoes marketing in Tanzania showed that some of the attributes preferred by consumers were big size roots,
low fibre content, sweetness, high dry matter content, and skin colour. The consumers largely purchase sweet potatoes from the open market, few buy from the supermarkets.

25) Urban consumers are more diverse in terms of their socio-economic status. And this influences consumer buying behavior. In Tanzania 67% of consumers surveyed preferred pre-packed sweet potatoes. Factors influencing them are cleanliness at selling point, root quality, and price (KT, 2010).

26) From the supply side, producers prefer varieties that are high yielding, resistant to common pests and diseases, of medium maturity with good in-ground storability characteristics, suitable for piece-meal harvest with no fibers, good marketability, medium sweetness, and powdery texture. Around the Lake zone region, the polista variety is highly preferred because the roots are mealy, tasty, high yielding, early maturing and good for commercial purposes. Chile is liked by children because of its orange colour and good taste.

27) In Arusha, between 2004 and 2009, sweet potato consumption increased for 51% of household consumers but declined among 8% of consumers, (KT, 2010). This finding suggested that the market demand for sweet potatoes increased substantially over the five year period.

28) A study of institutional sweet potato consumption in Tanzania showed that hospitals and prisons did not consume sweet potatoes, while hotels and schools consumed to some extent (Ndunguru, 1992).

29) Trading records show that sweet potatoes are mainly traded in cities and large towns in wholesale and retail markets. They are mainly traded in Dar es Salaam, Mwanza, Morogoro, Shinyanga, Dodoma and Zanzibar.

30) A study in 23 public markets in Dar es Salaam indicated that sweet potatoes marketed in the city was mainly from Gairo (Morogoro), Bagamoyo (Coast), Temeke (DSM), Songea (Ruvuma) and Kondoa (Dodoma region) with the peak period from March to September (Ndunguru, 1992).

31) There are end-user markets for sweet potatoes all over Tanzania and countries around Eastern (Kenya, Uganda, and Burundi) and Southern Africa. However, the market opportunities for the sweet potatoes products is not fully exploited and local production cannot meet the demand.

32) Private brokers or middlemen often purchase sweet potatoes. They agree on prices, amount, and time of harvest from numerous smallholders located in diversified farming systems (Thiele et al., 2009).

33) The price difference at the farm gate between low and high season is significant in all the zones. The price is higher during the low season but there is minimal market price variation between low and high season, (Ndunguru, 2012), (Appendix 3).

34) In general there are no regulatory systems which enforce grades by size and quality standards in value chain. Sweet potatoes are usually bought and sold on the basis of estimated volume, rather than weights. In most urban markets sweet potatoes for retail are sold in heaps. In Mwanza, a heap of 5-7 roots was sold at fixed prices. Heaps are sorted into small, medium, and large size roots which are sold at different prices. An evaluation
showed that broken, cut, and weevil infested roots are sold at discounts of 12%, 14% and 36% respectively (Ndunguru, 2001).

**B) UGANDA**

35) In Uganda sweet potatoes are consumed boiled, raw, steamed, roasted, fried, and mashed with beans. They are also processed into local products such as “inginyo” where roots are crushed into pulp and sun dried, and “amukeke” where roots are dried in the sun for 1-2 days, peeled, sliced into thin horizontal stripes, sun dried, and then stored. Other products include juice, porridge, ugali, kwon, chapatti and mandazi (Harvest Plus, 2006), (Appendix 1).

36) New Kawogo, Tanzania, and NASPOT 1 varieties have gained importance in local markets and in export trade to Europe, especially the UK and The Netherlands.

37) FAO Statistics (2013) show that Uganda is one of the highest consumers in Africa, estimated at 73 kg/per person in 2010 - more than bananas and cassava. Sweet potatoes come third in per capita consumption (kg/yr) and providing kilocalories per person per day compared to other staples (Harvest Plus, 2006). Low income urban populations tend to consume sweet potatoes rather than cassava. The latter is more expensive, (Heyi, 2012), (Appendix 2).

38) In Uganda, sweet potatoes are mainly traded in the districts surrounding and including the cities and towns of Kampala, Masaka, Jinja, Iganga, Mubende and Soroti. The main markets are local rural outlets (centres) where they are produced, schools, processors, prisons, and urban supermarkets such as Uchumi and Nakumatt for chips.

39) In urban areas supermarkets predetermine prices for food items and all the other products. Regional market prices are also determined by supply and demand which is often unfavorable for producers if the markets are flooded with the same commodity. Sweet potatoes products, such as inginyo, fresh sweet potatoes, and Amukeke dominate the local and regional food markets during the rainy season. Thus market prices are determined by location/market, quality, and size of the roots, season, and negotiations.

**2.2 Animal Feed**

40) The green parts of sweet potatoes are valuable as livestock feed. Fresh vines can be fed to livestock or used to make silage. The vines can also be dried and fed to cattle, sheep, goats, pigs, rabbits, and goats. The by-products of processing can also be fed to livestock. According to Lebot (2009), sweet potatoes make very palatable silage with a pleasant fruity smell and may be fed fresh, dried, or ensiled. Sweet potatoes forage can also be dried, ground, and mixed with sugarcane by-products.

41) Sweet potato vines can also be fermented with chicken manure resulting in higher crude protein, dry matter, and ash contents than the other silages. This can be fed to dairy cows as a supplement to forage such as Guinea grass or sorghum silage (Etela et al., 2009; Etela et al., 2008b; Ashiono et al., 2006).
2.3 Nutritional Importance

42) Nutrition refers to the intake of an adequate amount of energy and nutrients in relation to needs for normal growth, development, active, and a healthy life (WHO, 2002). Vitamin A Deficiency (VAD) is one of the most widespread deficiencies in developing countries affecting 43 million children under age 5 in sub-Saharan Africa. This can lead to blindness, impaired immune systems, and premature death in children and pregnant women.

43) An estimated 127 million pre-school children worldwide suffer from VAD. Between 250,000 and 500,000 children go blind every year, and over 600,000 annual child deaths may be attributed to VAD (West Jr. and Darnton-Hill, 2001; Black et al., 2008). VAD mainly results from inadequate intake of foods rich in vitamin A/vitamin A precursors and recurring infections increasing vitamin A requirements (MoHSW, 2010).

44) OFSP are an excellent source of beta-carotene and vitamin A with 100 g root providing 14187 IU of vitamin A and 8509 µg of β-carotene which is one of the highest values among the root-vegetables categories. Vitamin A is an essential nutrient for sharpness of vision and is also required to maintain healthy mucus membranes and skin. Further, consumption of natural vegetables and fruits rich in flavonoids helps protect against lung and oral cavity cancers. Sweet potatoes leaves are more nutritious than the root itself. Sweet potatoes contain no saturated fats or cholesterol and are a rich source of dietary fiber (Nutritional data.com, 2012).

45) Sweet potatoes contain large amounts of carbohydrates and are one of the average calorie starch foods providing 90 calories/100g in comparison to 70 calories/100 g for Irish potato. Sweet potatoes contain high amylose which raises the blood sugar levels in comparison to simple sugars and are therefore recommended as a healthy food supplement even for diabetics (Nutritional data.com, 2012). In addition sweet potatoes provide vital minerals such as iron, zinc, calcium, magnesium, manganese, and potassium that are essential for enzyme, protein, and carbohydrate metabolism.

46) Sweet potatoes have many essential vitamins such as C, B group (thiamin – B1, Riboflavin – B2, Folic acid, pantathenic acid - B5, pyridoxine-B6), niacin, and E, which function as co-factors for various enzymes during metabolism. Vitamins are essential since the body requires them to replenish (Owori et al, 2007, Nutritional data.com 2012).

47) One medium-size boiled sweet potato piece of about 200-300g consumed per day, contributes about 10-15% of daily energy needs. Weight per weight, 100 g of fresh leaves contain more iron, vitamin C, folates, vitamin K, and potassium but less sodium than the roots. In addition, about 100g of sweet potato leaves consumed daily provides approximately 10% of daily protein requirements (Kapinga et al., 2009, Nutritional data.com 2012).

48) A study conducted in South Africa by Van Jaarsveld et al (2005) revealed that daily consumption of OFSP provided about 2.5 times the recommended daily allowance (RDA) of vitamin A for 4-8 year old children thus improving their vitamin A status. The consumption of 50g of OFSP a day is enough to provide a child’s recommended dietary needs.
49) Orange-fleshed sweet potatoes are an important source of beta-carotene, the precursor to Vitamin A. 125g of most OFSP varieties can supply the recommended daily allowance of Vitamin A for children and non-lactating women (300-700 μg retinol activity equivalents).

50) Both Tanzania and Uganda are among the 90 countries worldwide categorized by the World Health Organization (WHO) as having a very severe vitamin A deficiency.

51) Tanzania: VAD is a chronic and widespread public health problem affecting mainly children, adolescent girls, and women of reproductive age. According to the TDHS (2010), the prevalence of VAD among children aged 6-59 months is 33% while among adolescent girls aged 15-19 it is 37%.

52) Uganda: According to the 2001 Uganda Demographic and Healthy Survey, 30% of children and 50% of women in the country were deficient in vitamin A (UBS and ORC Macro, 2001). Annually, between 10,000 and 60,000 children in the country die from vitamin A deficiency related illnesses. Vitamin A deficiency also impacts major diseases like measles, malaria, and diarrhea.

53) In Uganda, five sweet potatoes cultivars namely NASPOT 7, NASPOT 8, NASPOT 9 O (Namulonge Sweet potato 9 orange-fleshed), NASPOT 10 O, and Dimbuka-Bukulula were approved for release by the Ugandan Plant Variety Release Committee in July 2007 (Mwanga et al., 2007a). These provide farmers and consumers with high-quality sweet potatoes with cream and orange-fleshed roots with moderate to high pro-vitamin A contents (Jaarsveld et al., 2005; Low et al., 2007; Ruel, 2001; UDHS, 2001) and contribute to food security (Mwanga et al., 2007a).

54) It is estimated that consumption of bio-fortified OFSP could eliminate between 40-66% of the burden of VAD (Harvest Plus, 2005). On average, about 100g (0.1kg) of OFSP is sufficient to provide the daily vitamin A requirements compared to 6,000g (6kg) of white fleshed potatoes (Harvest Plus, 2005).
3. METHODOLOGY

3.1 Data Needs, Sources, and Limitations

3.1.1 Secondary data

55) This study began with a review of secondary data and information. The aim was to i) identify what has already been done to improve sweet potato value chains in Tanzania and Uganda in order to avoid duplication of interventions, ii) identify important gaps which need filling using primary data to ensure that the study contributes to existing knowledge and iii) widen understanding of the sub-sectors in the two countries.

56) The following data and information were collected from secondary sources:

a) **Demand for sweet potatoes** in the EAC region. The specific data collected included:
   i) The different segments of consumers (individual and institutional) of sweet potatoes in the region,
   ii) The varieties, types, and forms they prefer and the reasons for preference,
   iii) The amount (on weight basis) they consume,
   iv) The sources of demand and market prices, and
   v) The challenges facing consumers including lack of availability, high prices, and long distances between the source and the point of supply.

b) **Trade in sweet potatoes.** The data collected included:
   i) The main actors, their scale of operation as well as their geographical coverage,
   ii) Sources of supply and the target end markets, how much they source and trade,
   iii) The costs they incur and the margins reported,
   iv) Means of transportation and the forms of post-harvest handling including storage technologies and value addition, and
   v) Their geographical coverage.

c) **Production.** This formed the supply side of the value chains. The specific aspects considered were:
   i) Varieties grown and why they were preferred,
   ii) Land size under cultivation and volumes produced,
   iii) The percentage sold to assess the level of commercialization,
   iv) The target markets and the form in which they sell produce,
   v) Modes of operation (individual farmers vs. groups) and the implications of this in terms of production costs incurred as well as gross margins realized from the enterprise, and
   vi) The challenges faced by the suppliers

57) Sources of literature included, but were not limited to, district agricultural offices, ministries of trade and agriculture, ministries of cooperatives, country bureaus of statistics, country bureaus of standards, relevant organizations’ websites and sweet potatoes value chain reports. However, not all information required was available from the secondary sources reviewed, necessitating primary data collection to fill the gaps.
3.1.2 Primary data

58) A plan to collect primary data was designed in consultation with sweet potato experts from across all the EAC partner states (see annex 1). The consultation produced the following results:

a) Validated initial findings from secondary sources by explaining some of the discrepancies noted during the secondary data collection,

b) Validated the identified gaps by highlighting similar gaps as identified from the secondary data,

c) Provided guidance on how to fill the gaps by:
   i) Supplying data to beef-up the secondary information already collected,
   ii) Recommending organizations/individuals to help collect the primary data required,

d) Established the criteria to guide the exercise of sampling and collection of relevant data to fill in the gaps. The criteria used the following parameters:
   i) Volumes produced (as informed by secondary information) were used to sample the geographic areas where the production of sweet potatoes was significant. Producers and producer groups then formed the population from which respondents were sampled.
   ii) Volumes traded (as informed by secondary information) were used to sample the geographic areas where sweet potato trade was significant. Traders and consumers in such areas formed the population from which respondents were sampled.

59) The actors interviewed along the value chain and the primary data collected from them is discussed below.

a) **Input suppliers**: These included vine suppliers (research organizations and farmers), fertilizer and chemical suppliers, and equipment suppliers most of whom were running agro-veterinary shops. Data collected from the respondents in this category included but was not limited to:
   i) Input sources and the terms of accessing inputs including price, costs, and margins.
   ii) Target customers and terms of accessing the inputs including price.
   iii) Geographical spread, business relations with their customers (such as the existence of contractual arrangements), and willingness to enter into contractual arrangements in case a supplier did not have contracts with his/her customers, benefits and disbenefits of contracts.
   iv) Enterprise formality as evidenced by an operation licence, benefits of running a legal business entity, and disadvantages of not formalizing the enterprise.
   v) Number of employees disaggregated along gender and terms of engagement (whether casual or permanent).
   vi) The legal framework governing the supply of inputs and the impact (positive or negative) it has on the sector.

b) **Producers**: Both individual farmers and farmer groups were interviewed to collect the following data:
   i) Preferred varieties and their desired characteristics.
ii) Area of land under cultivation, inputs and agronomic practices, harvesting and post-harvest technologies accessed.

iii) Volumes produced, percentage marketed and where it is sold.

iv) Production costs incurred including accessing inputs, support services, transportation, and marketing, and margins realized.

v) Number of employees segregated along gender and terms of engagement (casual or permanent).

vi) Production challenges including post-harvest handling, their suggested solutions, and the stakeholders who could be tasked with the responsibility.

c) **Traders:** The traders interviewed included processors (Feed and food), middlemen, transporters, wholesalers, and retailers. The following data were collected:

   i) Sources of supply and existing supply gaps in terms of volumes expected against actual volumes purchased.

   ii) Varieties traded and why, forms in which they trade and why.

   iii) Main customers and their location, prices, and pricing mechanism.

   iv) Their geographic scope of operation, legality of their enterprises, and support services availability and accessibility.

   v) Challenges incurred during trade, losses incurred and their causes, competition, handling technologies, value addition and employment.

   vi) Operational costs incurred and the margins accrued.

d) **Consumers:** Individual and institutional consumers and food vendors were interviewed and data collected on:

   i) Income brackets and location.

   ii) Size of households for individual consumers and the population in the case of organizations, amount consumed and sweet potato substitutes.

   iii) Main suppliers, varieties consumed and why, proportion of total food budget going to purchase sweet potatoes.

   iv) Demand response to changes in prices, challenges they face in accessing sweet potatoes for consumption, and any possible ways of addressing them.

e) **Non-consumers of sweet potatoes:** They included individual non consumers and processors not using sweet potatoes as raw materials: The following data was collected:

   i) Income brackets and location.

   ii) Size of households for individual consumers and the population in the case of organizations, amount consumed and sweet potato substitutes.

   iii) Reasons as to why they are not consuming/ using sweet potatoes

   iv) Willingness to consume sweet potatoes

   v) What should be done for them to consume or utilize

f) **Business Support Service Providers** including market information providers, finance providers and researchers were interviewed and data collected on:

   i) Target clients, products, and services and the terms of offer.

   ii) Geographic scope including where customers are located, mode of service delivery, challenges faced in delivering products and services, and any possible opportunities.

   iii) Information on the legality of their businesses.
3.2 Sampling Techniques and Sample Size

60) Guided by the criteria (see paragraph 49 d), appropriate sampling techniques (census, purposive, and simple random sampling) were selected and used as described.

a) Census was conducted on research institutions and experts, because these categories had few players hence, results from sampling would not have given representative results. For instance, government research organizations are almost the only ones conducting research on improved varieties of sweet potatoes. In other cases, a single research organization would cover more than one administrative area e.g. Namulonge research institute in Uganda covers the whole country.

b) Purposive sampling was applied to select the targeted areas. This was to ensure that only relevant areas with respect to the objectives of the value chain were included in the sample. The same approach was also used to sample consumers, wholesalers, retailers, and transporters because in addition to targeting relevant and specific respondents for the sample, this technique overcomes the challenge of lack of sampling frame which is a common phenomenon in market research (Kothari, 2004). Specifically for consumers, every fourth consumer was intentionally interviewed from the same location in order to systematize the process.

c) Lastly, simple random sampling was applied to sample farmer groups, financial institutions, and BDS providers (market information providers). The sampling frames used were farmer registers in the agricultural offices for farmers and farmer groups, business registers with the local authorities for BDS providers, and district commercial offices in Uganda and Business Registration and Licensing Agency (BRELA) in Tanzania financial service providers were used.

61) The following areas and respondents in Tanzania, Uganda and the rest of the EAC were sampled, (Tables 2 A and B).
Table 2: Target areas and number of respondents per area

A) Sample Distribution (places visited)

<table>
<thead>
<tr>
<th>Uganda</th>
<th>Rural producing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mbale town</td>
<td>Nabumali</td>
</tr>
<tr>
<td>Jinja central</td>
<td>Bulumbi</td>
</tr>
<tr>
<td>Butalega town</td>
<td>Nakaloke</td>
</tr>
<tr>
<td>Iganga town</td>
<td>Nakanyonyi</td>
</tr>
<tr>
<td>Kampala</td>
<td>Bugbaja</td>
</tr>
<tr>
<td>Masaka town</td>
<td>Busolwe</td>
</tr>
<tr>
<td>Luweero town</td>
<td>Luraka</td>
</tr>
<tr>
<td>Nakasongola town</td>
<td>Budondo</td>
</tr>
<tr>
<td>Masindi town</td>
<td>Kibumba, Mukungwe, Kabonera, Bwungo, Kahuny &amp; Kamaany - Kyabakuza</td>
</tr>
<tr>
<td>Mulende town</td>
<td>Zarebwe, Kamila, Katikamu, Butumumula, Kakuto and Kakyusa</td>
</tr>
<tr>
<td>Soroti town</td>
<td>Naktionera, Kakonye, Kahuny, Nakitum, Siku, Wabenyonyi, Sasa &amp; Momac</td>
</tr>
<tr>
<td>Kayunga town</td>
<td>Bwijanga, Kiguria, Mira, Bujenje, Mutumula, Akaagly, Kisaizi &amp; Pakanyi</td>
</tr>
<tr>
<td>Mukono town</td>
<td>Bageza, Busale, Kisindizi &amp; Kibulina</td>
</tr>
<tr>
<td>Kumi town</td>
<td>Gweri, Mukura &amp; Arapai</td>
</tr>
<tr>
<td>Kalarole town</td>
<td>Kayunga rural, Kayouza, Gaza</td>
</tr>
<tr>
<td>Lira town</td>
<td>Seeta, Namaganga, Niqerri, Bukunja, Ngogwe, Kasowo,</td>
</tr>
<tr>
<td>Adjumani town</td>
<td>Ngora &amp; Kapir</td>
</tr>
<tr>
<td>Kwegega town</td>
<td>Kuramba, Kisonomo, Kikwamba</td>
</tr>
<tr>
<td>Kyenjojo town</td>
<td>Bar, Amachi, Ngeta, Te Olam &amp; Ardekoakwok</td>
</tr>
<tr>
<td>Ciforo, Ukusijoni, Ofta, Acora, Itirikwa, Pakele &amp; Obulikongo</td>
<td></td>
</tr>
<tr>
<td>Hungyo, Mpura, Kabweza, Hakahaya &amp; Rwetuba</td>
<td></td>
</tr>
<tr>
<td>Buagaaki, Katooke, Nyabuhama, Mirongo, Busanza, Butiti &amp; Kyarusozi</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tanzania</th>
<th>Urban (Producing)</th>
<th>Rural (producing)</th>
<th>Rural (non-producing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shinyanga</td>
<td>Shinyanga urban</td>
<td>Shinyanga rural</td>
<td>Mboya rural</td>
</tr>
<tr>
<td>Bukoba</td>
<td>Kahama urban</td>
<td>Kahama rural</td>
<td>Gairo rural</td>
</tr>
<tr>
<td>Mitya town</td>
<td>Misenyi district</td>
<td>Kshapa district</td>
<td>Hai District</td>
</tr>
<tr>
<td>Makambako town</td>
<td>Meatu district</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nyombi town</td>
<td>Maswa district</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morogoro</td>
<td>Karagwe district</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gairo urban</td>
<td>Bukoba Rural</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mvomero urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mwanza Municipal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magu town center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Msungwe town center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sengerema town center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muhuka Municipal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moshi Municipal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Burundi</th>
<th>Urban (Producing)</th>
<th>Rural (producing)</th>
<th>Rural (non-producing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bujiambura capital</td>
<td>Bujiambura-Rural province</td>
<td>Kirindo province</td>
<td></td>
</tr>
<tr>
<td>Bururi province</td>
<td></td>
<td></td>
<td>Muramunya province</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kenya</th>
<th>Rural (producing)</th>
<th>Rural (non-producing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mombasa town</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mera town</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nakuru town</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nairobi city</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starehe constituency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Langata constituency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roysambu constituency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Westlands constituency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rwanda</th>
<th>Rural (producing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kigali city</td>
<td></td>
</tr>
<tr>
<td>Gakenke</td>
<td></td>
</tr>
<tr>
<td>Gatsibo</td>
<td></td>
</tr>
<tr>
<td>Rusanga</td>
<td></td>
</tr>
</tbody>
</table>
B) Sample Distribution (number of respondents)

<table>
<thead>
<tr>
<th>Country</th>
<th>Consumers</th>
<th>Food vendors</th>
<th>Institutional buyers</th>
<th>Food processors</th>
<th>Sweet potatoes Feed processors</th>
<th>Feed processors not using Sweet potatoes as a raw material</th>
<th>Non-consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>318</td>
<td>44</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Kenya</td>
<td>191</td>
<td>145</td>
<td>25</td>
<td>15</td>
<td>15</td>
<td></td>
<td>91</td>
</tr>
<tr>
<td>Rwanda</td>
<td>170</td>
<td>189</td>
<td>30</td>
<td></td>
<td>2</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Tanzania</td>
<td>464</td>
<td>220</td>
<td>27</td>
<td>7</td>
<td>40</td>
<td></td>
<td>99</td>
</tr>
<tr>
<td>Uganda</td>
<td>281</td>
<td>169</td>
<td>98</td>
<td>2</td>
<td>6</td>
<td></td>
<td>89</td>
</tr>
<tr>
<td>EAC</td>
<td>1,424</td>
<td>767</td>
<td>182</td>
<td>7</td>
<td>2</td>
<td>61</td>
<td>346</td>
</tr>
</tbody>
</table>

3.3 Tools and Data Collection

62) Different tools were used to collect and record data from different respondents as were deemed appropriate. Structured questionnaires were used with producers, processors, traders, and consumers because their activities were specific. Interview guides were administered to BDS providers and experts since they cut across several activities along the value chain.

63) Data was collected using interviews, focus group discussions for farmer groups as well as observations by the field staff. Observations were recorded and reported to the analysis team in an insights reporting session.

3.4 Data Analysis

64) The data were captured using Census and Survey Processing (CSPro) system. The system captures both qualitative and quantitative data. This makes it a more powerful tool especially if the data are to be referred to in the future. After capture, the data were exported to the SPSS on need basis for cleaning and analysis. Data analysis involved editing, recoding, verification, and interpretation so as to ensure data accuracy. Both qualitative and quantitative data analyses approaches were used. Results from descriptive analysis were presented in form of tables, graphs, and charts to provide trends and patterns. A SWOT analysis was used to analyze the strengths, weaknesses, opportunities and threats as reported by the respondents and the results presented in form of a matrix.

65) Quantitative analysis involved calculating trends e.g. costs, prices, and gross margins along the value chains. Value chain mapping was also used. Maps produced included value chain actors, processes, and activities. The aim was to visualize existing networks in order to get a better understanding of connections between actors and processes in the value chains, demonstrate interdependence between actors and processes, and create awareness of the stakeholders to look beyond their own involvement in the value chain. The results from this section were presented in the form of tables and value chain maps.
3.5 Limitations of the Data

66) Due to the nature of the study, the primary data collected was cross-sectional in nature. Therefore, the results on trends borrowed heavily from secondary literature. However, in most cases this literature was not up to date with current social developments especially on markets which have become highly dynamic.

67) In Tanzania and in some parts of Uganda the study was conducted during the off-peak season and it is recognized that prices will be different had the study been undertaken during a peak season.

68) Similarly, it was difficult to come up with prices per region during both off-peak and peak seasons since the respondents only provided prevailing market prices during the data collection exercise.

69) There was the challenge of missing categories of respondents in some areas, for example a lack of processors.

70) Transporters were not commodity specific since they transported other commodities such as bananas alongside the sweet potatoes.
4. SURVEY RESULTS

71) The principal sweet potato markets locally (districts/county), nationally (in-country of focus), and regionally (EAC) were segmented into urban (non-producers) and rural (producers and non-producers) markets. These were further categorized into individual consumers, institutional buyers, and food vendors who prepare cooked forms of fresh sweet potatoes for the “away from home” consumers.

Section A: Tanzania

4.1 Individual consumers

4.1.1 Socio-economic and demographic characteristics of individual consumers

72) A total of 464 consumers were interviewed from Tanzania. The individual consumer market was segmented into urban who are non-producers and rural with some being producers and others non-producers (Table 3). The majority (59%) of the consumers in Tanzania was from urban areas who were also non-producers indicating a substantial popularity of sweet potatoes as a snack among them. The respondents were from diverse age groups between 20 and 50 years and had different educational backgrounds ranging from primary to post graduate (Appendices 4 and 5). The study noted that sweet potatoes are consumed by people across all age groups and with diverse educational backgrounds.

Table 3: Number and gender of respondents in Tanzania

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of Consumers</th>
<th>Rural N, (%)</th>
<th>Urban N, (%)</th>
<th>Rural Male N, (%)</th>
<th>Rural Female N, (%)</th>
<th>Urban Male N, (%)</th>
<th>Urban Female N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanzania</td>
<td>464</td>
<td>188 (41%)</td>
<td>276 (59%)</td>
<td>100 (53%)</td>
<td>88 (47%)</td>
<td>143 (52%)</td>
<td>133 (48%)</td>
</tr>
<tr>
<td>Total</td>
<td>464</td>
<td>188 (41%)</td>
<td>276 (59%)</td>
<td>100 (53%)</td>
<td>88 (47%)</td>
<td>143 (52%)</td>
<td>133 (48%)</td>
</tr>
</tbody>
</table>

73) The consumers were further segmented into low income earners comprising those who earn US$60 and below, medium income earners those who earn between US$61-160 and high income earners getting US$161 and above per month. These categorizations were based on the national median income. Information on income is sensitive among people and therefore some respondents did not provide this information (Table 4). Among those consumers who provided the income data, majority (45%) were medium income earners in the rural areas and 42% in the urban areas.

Table 4: Income levels of the respondents

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of consumers</th>
<th>Location N, (%)</th>
<th>Low income (USD 60 &amp; below) N, (%)</th>
<th>Medium income (USD 61 - 160) N, (%)</th>
<th>High income (USD 161 &amp; above) N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanzania</td>
<td>441</td>
<td>Rural 182 (41%)</td>
<td>62 (31%)</td>
<td>82 (45%)</td>
<td>38 (21%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 259 (59%)</td>
<td>54 (21%)</td>
<td>109 (42%)</td>
<td>96 (37%)</td>
</tr>
<tr>
<td>Total</td>
<td>441</td>
<td>Rural 182 (41%)</td>
<td>62 (34%)</td>
<td>82 (45%)</td>
<td>38 (21%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 259 (59%)</td>
<td>54 (21%)</td>
<td>109 (42%)</td>
<td>96 (37%)</td>
</tr>
</tbody>
</table>
4.1.2 Preferences by type and by-products of sweet potatoes

74) The number of rural consumers perceiving sweet potatoes as a staple food is higher for the rural (51%) than the urban (42%) consumers. Several reasons for the preference of sweet potatoes over other staples include liking by consumers, affordability and the ease of preparing as was reported by 17% of the consumers. Nutritional value and the proximity to suppliers was also an important factor as reported by 13% of the consumers (Figure 1).

![Figure 1: Reasons for preferring sweet potatoes to other food staples by consumers (N=264)](Image)

75) Three types of sweet potatoes were consumed namely: orange fleshed, yellow fleshed and white fleshed (Figure 2). Consumers across all income segments mainly consume white fleshed sweet potatoes. Yellow fleshed sweet potatoes are also common with all categories of incomes. However, orange fleshed is not common across all the market segments. In addition, it is consumed more by the medium and high income categories of consumers (Figure 2). Consumption preferences were attributed to taste followed by high dry matter content. However it is important to note that most of the time, WFSP is the only type available in the market and so consumers have few options.

![Figure 2: types of sweet potatoes consumed by various consumer segments (N=264)](Image)

76) Some of the commonly consumed sweet potato varieties in Tanzania include: Polista, Mbatata, Morogoro Shangazi and Dudugala. Consumption is largely driven by taste,
powdery texture associated with the high dry matter content, availability (what is available in the market at the time of purchase), and nutritional benefits to a lesser degree.

77) The main sweet potato products purchased include raw/fresh roots, dried chips, fried, roasted, and leaves which are popular in Tanzania as a vegetable. Other sweet potato products available in the market include mashed sweet potatoes, crisps, flour, juice (on a smaller scale at the households), starch, confectionaries and livestock feeds (damaged roots, vines and leaves). The highly preferred form is fresh sweet potato roots by 39% of the respondents in Tanzania which indicates consumer preference for preparing sweet potatoes in their homes. The least popular are mashed sweet potatoes, flour, juice, starch and livestock feed.

78) The key parameters that the consumers look out for when purchasing fresh roots are price of substitute products, cleanliness of the roots, free from spots and diseases, high dry matter content, taste which should be sweet, big sized roots, low fibre content, freshness and competitive prices. However, consumers indicated that they do not always get the products they want from the market. They attribute this to scarcity, non-production in the area, and high prices. The main reason is product scarcity which suggests that if the range of sweet potato products was wide, then they may be willing to buy them and try them out.

4.1.3 Sources of supply of sweet potatoes and by-products

79) Different marketing channels for sweet potatoes exist within the country. Consumers interviewed from Tanzania largely purchase their sweet potatoes from open markets\(^1\) as reported by 64% of the consumers interviewed with 20% purchasing from farmers. Other sources include small groceries/retail shops\(^2\) (9%) and food vendors (Figure 3). None of the consumers interviewed in Tanzania purchased from processors. This is as a result of the minimal processing taking place in the country.

80) The driving factors contributing to consumption of sweet potatoes include affordability, convenience, provision of different varieties of products by sellers, availability of credit facilities based on trust and proximity to the sellers.

81) Convenience is a key determinant for those who purchase from supermarkets, food vendors and wholesalers. Open markets and farmers (farm gate) are preferred mainly because they sell at an affordable price while short distance to suppliers is what drives those who purchase from the retailers.

---

\(^1\) Open market refers to a freely competitive market operating without restrictions and widely accessible to all investors or consumers

\(^2\) Retail shop refers to a small, temporary, stand alone booth used in high-foot-traffic areas for marketing purposes normally manned by one or two individuals who help attract attention to the booth to get new customers.
Measurement is currently a major problem due to lack of standards. Consumers purchase sweet potatoes in heaps or in tins (Figure 4). Price differentiation is based on size or depending on the unit of measurement. “Heaps” is the most common unit of measurement of sweet potatoes across all consumer segments with each being priced differently depending on the size of the roots. This is very common especially in open air markets and on the road sides.

**Figure 4: Sweet potatoes on sale using tins and heaps**

### 4.1.4 Fresh sweet potato roots price differentiation per region

The price of fresh sweet potato roots differs across the regions and seasons. However, this study was only able to capture the prevailing market prices per region at the time of data collection which was in January 2013. Average prices then ranged between US$ 0.44 and US$0.61 per kg. The highest price was in Dar es Salaam (Figure 6) perhaps due to its distance from the farms, the fact that it is a trade hub and also the high demand. Market prices are a bit lower in the areas where sweet potatoes are produced such as Zanzibar.

---

82) Measurement is currently a major problem due to lack of standards. Consumers purchase sweet potatoes in heaps or in tins (Figure 4). Price differentiation is based on size or depending on the unit of measurement. “Heaps” is the most common unit of measurement of sweet potatoes across all consumer segments with each being priced differently depending on the size of the roots. This is very common especially in open air markets and on the road sides.

**Figure 3: Sources of supply and reasons for preference of the sources (N=264)**

83) The price of fresh sweet potato roots differs across the regions and seasons. However, this study was only able to capture the prevailing market prices per region at the time of data collection which was in January 2013. Average prices then ranged between US$ 0.44 and US$0.61 per kg. The highest price was in Dar es Salaam (Figure 6) perhaps due to its distance from the farms, the fact that it is a trade hub and also the high demand. Market prices are a bit lower in the areas where sweet potatoes are produced such as Zanzibar.

---

1 US$= Tshs 1,585 as at January, 2013 (Source, Bank of Tanzania)
4.1.5 Consumption trends of sweet potatoes, by-products, and drivers of change

84) Sweet potatoes are consumed regularly – at least twice a week by 23% of the interviewed consumers. The most common forms in which sweet potatoes are consumed across all income levels in both urban and rural markets are boiled, leaves, and fried (Figure 7). The leaves are consumed as a vegetable and are a substitute for other types of vegetables such as pumpkin leaves, cassava leaves, kales and amaranths.

85) While sweet potatoes are not part of the daily menu for most consumers, they are gaining popularity as a snack or an accompaniment for tea. For example, in Gairo, sweet potatoes are commonly referred to as the “Gairo burger” due to their high and frequent consumption.

86) Consumption trends whether increasing, decreasing, or remaining constant are influenced by household size, availability, income levels, production (low or high), prevailing prices and presence of other substitutes such as cassava, Irish potatoes and bananas. Majority of
the consumers (53% rural) were of the opinion that consumption has been increasing over the last 3 years. This is attributed to three key drivers, increased household size brought about by high population growth rates, availability in the market and among producers, and limited income which makes the sweet potato roots an attractive option since they are relatively cheaper when compared to some substitutes such as cassava.

4.1.6 Substitute products for sweet potatoes and consumer responsiveness to changes in price

87) Consumers substitute sweet potatoes with other foods such as rice, maize, cassava, bananas, yams, and Irish potatoes. In Tanzania the main substitutes for urban and rural consumers are maize and rice while across both market segments (rural and urban) yam is the least important. Other important substitutes for rural consumers include Irish potatoes, rice, and cassava.

88) About 78% and 72% of the interviewed consumers in the rural and urban areas respectively said that the commodity's prices had been increasing for the past 3 years. This was attributed to factors such as seasonality of the crop whereby during off-season, the prices are driven high by the low supply, low production and inflation. High demand also makes prices go up (Figure 7).

89) Consumers in Tanzania are not price sensitive and will buy the same volumes even with increased prices. This shows the importance of the commodity among the consumers.

Figure 7: Reasons for the perceived price trends of sweet potatoes by consumers in Tanzania (N=264)

4.1.7 Challenges in sweet potatoes consumption and proposed recommendations

90) Some of the challenges faced by consumers are unreliable supply, high prices, difficulties in differentiating varieties due to lack of a system in the subsector to enforce standards hence no foolproof system for consumers and retailers, damaged roots, heartburn/acidity and short shelf-life.
91) Unreliable supply is the main challenge faced by 34% of consumers in Tanzania, which could be attributed to the seasonality nature of the crops and low production volumes reaching the market. The least important challenges faced by consumers are price fluctuation, perception that it is a poor man’s food and bulkiness during transportation (Figure 8).

![Figure 8: Major Challenges faced by sweet potato consumers (N=264)](image)

4.1.8 Recommendations

92) Consumers suggested that to increase consumption, there is need to increase production and productivity (Figure 9). This way, the supply of sweet potatoes for the market will increase consequently driving prices down and contribute towards making the commodity more affordable. The consumers also suggested that the capacity of the producers on post harvest handling should be strengthened to ensure that the sweet potatoes supplied are of acceptable quality. Other suggestions were to set standard with an aim to structure trade in sweet potatoes as well as deepening markets.

![Figure 9: Suggestions to addressing identified challenges (N=264)](image)
4.2 Institutional Consumers

93) Institutional consumers were categorized into learning institutions, hospitals, hotels, religious institutions and orphanage centers. A total of 27 institutions were interviewed in Tanzania most (13) of who were learning institutions (schools) followed by 11 hotels while the rest were one each. These institutions are therefore treated as cases rather than representative samples.

![Figure 10: Type of institutions interviewed in Tanzania (N=27)](image)

4.2.1 Consumer preferences by types and by products

94) WFSP is the most preferred type by all institutions interviewed with orphanage centres and religious institutions purchasing only WFSP (Figure 11). This is due to the availability of the WFSP as well as its affordability as is dictated by supply. Most learning institutions prefer serving yellow fleshed because the learners like it.

![Figure 11: Types of sweet potatoes purchased by the different types of institutions (N=27)](image)

95) All institutions interviewed prefer fresh sweet potato roots. Hospitals, religious institutions, and orphanages only purchase fresh sweet potatoes roots. Few learning institutions (4) also purchase sweet potatoes chips but mostly for special occasions. It is only learning institutions and hotels that buy other sweet potatoes products such as juice, chips, flour and
cakes but also in very small quantities and for specific occasions e.g. price giving days and end of term parties.

4.2.2 Sources of supply

96) The main sources of supply are open markets, farmers, and retail shops (Figure 12). Religious institutions, orphanage centers and hospitals purchase their SP’s entirely from open air market. Eight learning institutions purchased SP from farmers. The biggest driving factor was proximity, convenience and low prices.

4.2.3 Purchasing, consumption patterns and drivers of change

97) The purchasing behavior of institutions is determined by various factors including availability, having own production, nutritional value, preference by the students/customers/prisoners/patients, ease of preparation, affordable price and proximity to the supplier.

98) In Tanzania, affordability, consumer preference, and ease of preparing are the most important factors in schools and religious institutions, hotels, and orphanages.

99) When making purchases, institutions consider attributes such as price of substitute products, affordability, root shape, disease free (clear of spots), cleanliness (washed), type, taste (sweetness), high dry matter content/ texture (powdery), low fibre content, color, size - large roots are preferred, availability in the market, packaging, and branding.

4.2.4 Consumer response to price change

100) Hospitals, prisons, and barracks interviewed will reduce the volumes purchased if prices increase. This is due to the high cost they would incur to feed the large population in these institutions hence they would go for cheaper substitutes. Religious institutions, orphanage centres, learning institutions, hotels on the other hand would continue to buy the same volumes even though the price increases. This could be attributed to the fact that
most of them have menus that they observe and adhere to. For the hotels, they would then pass this to their consumers in form of increased prices.

4.2.5 Challenges facing consumption

101) The different challenges in the consumption of sweet potatoes in Tanzania are shown in Figure 13. These include bulkiness affecting transportation, limited availability of the commodity leading to high prices, poor quality of available roots (mixed types, insect infested, high fibre content, low dry matter content) and the long time they take to cook considering the scarcity and high costs of firewood among other sources of energy.

![Figure 13: Challenges facing the consumption of SP by institutions in Tanzania (N=27)](image)

4.3 Schools

4.3.1 Importance of Sweet Potatoes in school feeding programs

102) The study went further to find out the level of consumption of sweet potatoes particularly OFSP in schools, nursery schools, primary schools, and secondary schools. A total of 9 secondary schools were sampled and interviewed. On average, the learning institutions interviewed had an average population of 574 students. All provided meals for their students – an average of 2 meals per day for 6 days in a week.

4.3.2 Drivers of sweet potatoes consumption patterns in schools

103) Most of the schools interviewed do not include sweet potatoes in their menus. Budgetary constraints coupled with high prices, long hours of cooking, limited access and a low student preference were the major constraints (Table 5).

104) In Tanzania the public schools are provided with a menu which they must adhere to. This includes foods such as rice, ugali and beans, and “makande” (a mixture of boiled maize and beans). As they are government funded they cannot use the budget on food to purchase other foods outside the given menu. However, if they raise funds from elsewhere they can purchase sweet potatoes or produce it themselves in the school gardens. Consumption of SP was common during special occasions including the Islamic holy month of Ramadhani and during games due to its high energy characteristics.
The few schools that do include sweet potatoes in their menus attribute this to drivers such as school’s own production, good taste, relatively low prices in comparison to other substitutes such as cassava, and the high satiety value in comparison to bread.

**Table 5: Drivers of sweet potatoes consumption in schools**

<table>
<thead>
<tr>
<th>Reason for not including sweet potatoes in the meals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not part of the menu (public schools)</td>
</tr>
<tr>
<td>Not easily available</td>
</tr>
<tr>
<td>Budgetary constraints</td>
</tr>
<tr>
<td>Not preferred by students</td>
</tr>
<tr>
<td>Other substitute products such as ugali and bananas preferred</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason for including sweet potatoes in the meals</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a special dish during holy month of Ramadhan by the Muslim students (furari)</td>
</tr>
<tr>
<td>High satiety value; Very filling for the students during games’ competitions at district, regional and zone levels</td>
</tr>
</tbody>
</table>

Most of these learning institutions interviewed purchased more of YFSP than WFSP whose preference was due to their taste. However, these two types are usually the only ones available in the market. The least purchased type is orange fleshed sweet potatoes. This is mainly due to low awareness on OFSP especially its nutritional value.

### 4.3.3 Awareness of Orange Fleshe Sweet potatoes (OFSP)

The study noted that 5 of the schools interviewed were not aware of OFSP and the benefits associated with it. Only 4 institutions in Tanzania were aware of the nutritive value of OFSP. This was seen as a contributing factor to the low consumption of OFSP in addition to its relative unavailability and high prices.

The biggest challenge in the adoption of OFSP seemed to be around how the type was introduced. The observation by the study was that, the OFSP was mostly available in areas where projects promoting the same had been undertaken. In addition, there seemed to be a wrong perception and stigmatization of OFSP with it being associated with malnutrition related diseases and hence, consumers who are healthy did not want to consume them. These factors seem to have impacted negatively on the consumption of OFSP in some communities.

Nutritional benefits of the OFSP are relatively understood by some schools. It was revealed only 4 secondary schools in Tanzania were aware of the nutritive value of OFSP. This contributes to low consumption of OFSP products and preference to OFSP varieties. Reasons for low level understanding of the OFSP could be attributed to the long time prevalence of the white and yellow fleshed sweet potatoes and low promotion of OFSP among secondary schools.

The results further indicate that schools in Tanzania were willing to adopt OFSP in their school feeding program. All the secondary schools interviewed would like to have sweet potatoes in their feeding programs. This further demonstrates the opportunity for interventions in sweet potatoes production and market penetration in this market segment.
111) The main strategy to improve the consumption of sweet potatoes particularly OFSP in schools in Tanzania would be to educate the students on the importance of consuming sweet potatoes and establish sweet potato gardens in schools. This further provides an opportunity to increase production in schools. These are strategic institutions for awareness creation, adoption, and building a consumption culture among young people.

112) The key challenges facing institutions include poor quality produce, high fiber content, lack of standard measurements, high prices, low supply, late delivery by suppliers, high transportation costs, too much time spent in peeling sweet potatoes, and their highly perishable nature.

4.4 Food Vendors

4.4.1 Description and characteristics of food vendors

113) Food vendors included those selling cooked sweet potatoes in small restaurants, kiosks, by the road sides and in open markets. They cater for “away from home” consumers.

114) A total of 220 food vendors were interviewed across the country (Table 6). Among the food vendors 59% were from urban markets and 41% from rural markets. Food vending is undertaken by mainly women at 71%. Most food vendors have attained primary and secondary levels certificate and this seem sufficient to enable them to run their businesses.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Total Respondents N, (%)</th>
<th>Rural N, (%)</th>
<th>Urban N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanzania</td>
<td>220 (100)</td>
<td>91 (41)</td>
<td>129 (59)</td>
</tr>
<tr>
<td>Total</td>
<td>220 (100)</td>
<td>91 (41)</td>
<td>129 (59)</td>
</tr>
</tbody>
</table>

115) An average of 70% of food vendors considers sweet potato as a staple food for their customers. Sales are determined by client preference, affordability, how often sweet potatoes is eaten with other foods, palatability, availability, ease of cooking and nutrition values.

4.4.2 Forms of sweet potatoes traded

116) Boiling and steaming is the common form of preparation of sweet potatoes with 74% of the urban vendors and 84% of their counterparts in the rural areas reporting to be boiling. On the other hand, 23% of the urban vendors and 12% of rural vendors fry their SP roots. Other forms of preparation include roasting.

117) The main sources of supply for sweet potatoes among the food vendors include open air markets, farmers, retail shops, wholesalers, own production, processors and importers/exporters. In both rural and urban areas of Tanzania, most food vendors (49% and 51% respectively) source their sweet potatoes from the open air markets. This is because of the convenience, relatively low prices coupled with the wide range of other commodities in the market. About 27% and 17% of the vendors’ source from the farmers with the main driving force being the relatively low price of sweet potatoes at the farm gate. There were minimum sweet potatoes supplied by processors and importers/exporters since sweet potato processing is at minimum levels (Figure 14).
4.4.3 Drivers of Purchasing and selling patterns by food vendors

In both urban and rural areas the key factor influencing purchasing and selling of sweet potatoes by food vendors is customer preference (Figure 15). Nutrition has little influence in rural areas. This may reflect a lack of nutritional knowledge among most rural food vendors.

In the urban areas nutrition is the second most (13%) important factor considered by vendors.

4.4.4 Consumer preference by types and drivers of consumption

White fleshed sweet potatoes (WFSP) are the most preferred by consumers served by food vendors followed by yellow fleshed sweet potatoes (YFSP). The orange fleshed sweet
potatoes (OFSP) are the least preferred in both urban and rural areas. The white and the yellow fleshed are readily available in open air markets and due to their availability, their prices are relatively low. According to food vendors the important factors that determine demand by their consumers include good taste, high dry matter content and price.

![Figure 16: Types of sweet potatoes highly demanded by consumers served by segment of food vendors (N=220)](image)

### 4.4.5 Challenges faced by food vendors and suggestions to address them

121) Food vendors face several challenges in the sweet potatoes vending business in order of importance- easy spoilage attributed to the short shelf life, high purchase prices, unreliable supply and scarcity, poor quality with high fibre content, limited storage facilities, theft and high transport costs from the source of purchase.

122) In order to address some of these challenges the food vendors recommended increasing production through good agronomic practices, introducing better varieties that have low fibre content, price reductions and stabilization, improving storage and storage facilities, creating awareness among consumers of the crop’s benefits to improve demand and improving access to finance so that food vendors are able to improve their businesses.

### 4.5 Processors

123) The processors were categorized into food and feed and the study sought to interview both food categories. However only 7 food processors who use sweet potatoes as raw materials were interviewed. The small sample size was due to the small number of processors in Tanzania. They processed sweet potatoes into crisps, confectionaries, flour, and starch.

124) The food processors require specific attributes of sweet potatoes as a raw material. These include; low moisture content, large roots, well-shaped, mature, fresh (not rotten), deep orange colored and good aroma. These are qualitative and quantitative attributes whose desirable range values need to be determined in future.

125) Food processors purchase raw materials from three main sources: individual farmers, traders, and open markets. Individual farmers are the most preferred of the three sources of supply because of the low prices. Increasing awareness will create more business.
opportunities for farmers but the key issue will be meeting the quality requirements of the processors.

126) The main marketing channel for food processors is local consumers. Other markets include supermarkets and traders. This demonstrates that processors normally sell their produce to local consumers and create consumer loyalty for their products. This can create opportunities for processors to introduce new products to loyal consumers.

127) Half of the processors interviewed indicated that they are not happy with the quality of the current raw materials they are receiving. There is clearly room for improvement on farmers to produce roots that meet stipulated quality standards.

128) The selling price of raw materials is determined by either the supplier or through negotiations with the processor. The suppliers play a key role in price determination and are not absolute price takers.

4.5.1 Challenges faced and suggestions on how to address them

129) The key challenges faced are high production costs during the processing, limited supply of raw materials, limited market for processed products due to inadequate consumer awareness on the same and low quality raw materials with high fibre content and insect and disease infestation.

130) A majority of the food processors interviewed indicated that the key challenge is the heavy costs incurred during the production process. This is often passed on to consumers by way of higher prices. Ultimately this makes the consumer prefer other cheaper substitute products.

131) In order to address these challenges the food processors recommend support in the production process which could reduce the costs of production, to increase raw materials supply through increased production by the farmers and market expansion by way of creating consumer awareness on the sweet potatoes processed products and the inherent nutritive values.

4.6 Non-Consumers as Potential Markets

4.6.1 Individual non-consumers of sweet potatoes

132) A cross section of sweet potato non-consumers in both the urban and rural market segments across Tanzania were interviewed in order to evaluate the possibility of creating new markets for existing sweet potato products. The question of why they were not consuming was investigated. Of the 99 non-consumers interviewed in Tanzania, 48% were from rural and the rest from urban market segments. Reasons given by respondents for not consuming sweet potato products are shown in Figure 17.

133) Non-consumers currently eat substitutes. In Tanzania the main substitute for urban and rural consumers is Irish potatoes and cassava which are relatively cheap and readily available. Non-consumption was also attributed to acidity which causes discomfort. Other non-consumers just disliked sweet potatoes without giving any tangible reason for the dislike. There was a portion of non-consumers who expressed concerns about how it
impacts on the health of people with diabetics and allergies. It may be useful to follow up on some of these concerns in future in order to get a scientific explanation while building consumer awareness on the importance of sweet potatoes for the diabetics.

![Figure 17: Reasons for not consuming sweet potatoes in Tanzania (N=99)](image)

To create a market for sweet potatoes among the non-consumers, suggestions from respondents are presented in Figure 18. Most suggested strategy involve the introduction of new varieties that are of better quality and have acceptable consumer attributes. The quality referred to included characteristics like less acidity causing stomach upset, high percentage of dry matter content, and consumer acceptable colour of the flesh and skin. OFSP varieties can be among materials to be introduced. The non-consumers also suggested increased supply which result to reduced prices making the commodity affordable and probably make it compete with the existing substitutes.

![Figure 18: Suggestions on how to improve sweet potatoes consumption in Tanzania (N=99)](image)
135) Non-consumers are willing to purchase sweet potato products and they desire them to be of good taste, clean, branded/packaged, appealing colour, preservable, fresh (not withered/stale), nutritious, high dry matter content, and high yielding (for consumers who produce sweet potatoes) (Figure 19).

![Figure 19: Desired characteristics for sweet potatoes in Tanzania (N=99)](chart)

136) Feed processors who were not using sweet potatoes as raw materials were interviewed to find out why they did not and if they would be willing to do so in the future. A total of 40 feed processors were interviewed and were categorized into pig, dairy, poultry, and goat feed processors.

137) The study noted that different types of animal feeds are processed using raw materials such as maize, millet, sunflower seeds, bones, and rice. Some of the final processed feed products include maize germ, bran, and chicken mash. The low use of sweet potatoes was attributed to scarcity and unsuitability of raw materials for some feeds, limited technical knowhow/skills, and high price.

138) The processors suggested that training, increased production, research in processing and value addition, lower prices, promotion of the nutritional value of the sweet potatoes and increased government support through promoting sweet potato transformation technology could reverse the trend.

**Section B: UGANDA**

4.7 Individual Consumers

4.7.1 Socio-economic and demographic characteristics of individual consumers

139) A total of 281 consumers were interviewed across the country. The individual consumer market was segmented into urban who are non-producers and rural with some being producers and others non-producers (Table 7). The respondents were from...
different age groups between 20-50 years and above and had different educational backgrounds ranging from primary to post graduate (appendices 4 and 5). The study noted that sweet potatoes are consumed by people across all age groups and with diverse educational backgrounds.

Table 7: Number and gender of respondents in Uganda

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of Consumers</th>
<th>Rural N, (%)</th>
<th>Urban N, (%)</th>
<th>Rural Male N, (%)</th>
<th>Rural Female N, (%)</th>
<th>Urban Male N, (%)</th>
<th>Urban Female N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda</td>
<td>281</td>
<td>159 (57%)</td>
<td>122 (43%)</td>
<td>86 (54%)</td>
<td>73 (40%)</td>
<td>49 (40%)</td>
<td>73 (60%)</td>
</tr>
<tr>
<td>Total</td>
<td>281</td>
<td>159 (57%)</td>
<td>122 (43%)</td>
<td>86 (54%)</td>
<td>73 (40%)</td>
<td>49 (40%)</td>
<td>73 (60%)</td>
</tr>
</tbody>
</table>

140) The consumers were further segmented into low income earners comprising those who earn US$60 and below, medium income earners those who earn between US$61-160 and high income earners getting US$161 and above per month which was based on the national median income for consumers in the country. Those who fall below this were perceived as low income earners while those who fall above it were considered high income earners. Information on income is very sensitive among people and therefore some respondents did not provide this information (Table 8).

Table 8: Income levels of the respondents

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of consumers</th>
<th>Location N, (%)</th>
<th>Low income (USD 60 &amp; below) N, (%)</th>
<th>Medium income (USD 61 - 160) N, (%)</th>
<th>High income (USD 161 &amp; above) N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda</td>
<td>266</td>
<td>Rural 153 (58%)</td>
<td>95 (62%)</td>
<td>42 (28%)</td>
<td>16 (10%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 113 (42%)</td>
<td>39 (35%)</td>
<td>45 (40%)</td>
<td>29 (25%)</td>
</tr>
<tr>
<td>Total</td>
<td>266</td>
<td>Rural 153 (58%)</td>
<td>95 (62%)</td>
<td>42 (28%)</td>
<td>16 (10%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 113 (42%)</td>
<td>39 (35%)</td>
<td>45 (40%)</td>
<td>29 (25%)</td>
</tr>
</tbody>
</table>

141) Sweet potatoes are widely consumed in Uganda by both the rural and urban consumers. Consumption in urban areas could be attributed to urbanization and changing consumer lifestyles with the fad of preferring “healthy foods” while in the rural areas it could be due to the availability brought about by local production.

4.7.2 Preferences by type and by-products of sweet potatoes

142) Segmentation by geographic location (urban/rural) indicates that more (61%) rural consumers than urban consumers (46%) perceive sweet potatoes as a staple food (Figure 20). The reason for this could be that most rural consumers get sweet potatoes from their own farms and are able to consume them any time so long as they are in season; while those from the non-producing areas purchase them from fellow producers or local markets but at relatively lower prices. Urban consumers can substitute alternative foods based on preferences and income levels.
Consumer preference for sweet potatoes over other staples is largely driven by factors such as affordability, taste, ease of preparing, nutritional value, short distance from supplier, having own production, availability of diverse products from supplier and their availability. Affordability is the most important factor cited by 20% of respondents demonstrating that some consumers are price sensitive. Availability has the least influence on purchasing behavior (Figure 21).

Consumers across all income levels in both urban and rural markets prefer WFSP more than any other type (Figure 22). In Uganda preference for WFSP was 70% and 55% among the high income earners in rural and urban areas respectively. Consumption preferences were attributed to taste followed by high dry matter content. However, it is important to note that most of the time, WFSP is the only type available in the market and so consumers have few options.
Consumers in Uganda consume different varieties. Key varieties commonly consumed include: *dimbuka, bamunyombokere, silk, mbale* and *osukut*. Consumption is largely driven by taste (sweet), high dry matter content, availability (what is available in the market at the time of purchase), and nutritional benefits (Figure 23).

The main sweet potato products purchased include raw/fresh roots, dried chips, fried, roasted and leave. Other sweet potato products available in the market include mashed sweet potatoes, crisps, flour, juice, starch, confectionaries and livestock feeds. The highly preferred form is raw/fresh sweet potato roots by 46% respondents in Uganda while those least preferred are mashed sweet potatoes, flour, juice, starch and livestock feed. The key parameters that the consumers look out for when purchasing the raw/fresh sweet potatoes roots are price of substitute products, cleanliness of the roots, free from spots and diseases, high dry matter content, taste which should be sweet, big size roots, low fibre content, freshness, and competitive prices.
147) However, consumers indicated that they do not always get the products they want from the market. They attribute this to scarcity, non-production in the area, and high prices. The main reason is product scarcity which suggests that if products were available then consumers may be willing to buy and try them out.

4.7.3 Sources of supply of sweet potatoes and by-products

148) Different marketing channels for sweet potatoes exist in Uganda. Consumers interviewed largely purchase their sweet potatoes from open markets farmers, retail shops (small shops), and food vendors (Figure 24). None of the consumers interviewed purchase from processors and supermarkets.

149) Factors that contribute to purchasing sweet potatoes from the different sources include affordability, convenience, provision of different varieties of products by sellers, availability of credit facilities and proximity to the seller.

150) Open markets remain the most preferred source of purchase for sweet potatoes among 68% of the consumers interviewed due to the relatively affordable prices offered, proximity/short distance from the seller, and convenience (Figure 25).

151) Convenience is the most important factor that drives consumers who purchase from retailers and wholesalers. Those who purchase from food vendors, producers, and open markets are driven by affordability.

Figure 24: Sources of supply (N=266)

Figure 25: Reasons for preference of the sources of supply (N=266)

152) Consumers purchase sweet potatoes in kilograms, heaps, pieces and tins (Figure 26). There is price differentiation based on size or weight depending on the unit of measurement. The average price of sweet potatoes is US$ 0.43/kg. However the units of measurement are not standardized, thereby contributing to weight differentiation at similar prices by different sellers within the same market. For example, a seller may pack sweet potatoes in a 4kg tin and fill it to the brim while another may pack them in a similar tin but overfill above the brim then both will sell at US$ 1.49. “Heaps” is the most common unit of measurement of sweet potatoes across all consumer segments with each being priced

1 US$≈ UGX 2,684 as at January, 2013 (source: Bank of Uganda)
differently depending on the size of the roots. This is very common especially in retail shops and open markets.

**Figure 26: Sweet potatoes on sale in tins and heaps**

153) The price of fresh sweet potato roots differs across countries, regions, and seasons. However, this study was only able to capture the prevailing market prices per region at the time of data collection which was in January 2013. In Uganda, prices ranged between US$ 0.10 and 0.59 per kg and were highest in Kampala (Figure 27). Kampala is a major city with no local production and roots must be sourced from other areas. Market prices are much lower in areas such as Luweero, where they are produced.

**Figure 27: Retail prices of fresh roots of sweet potatoes**

4.7.4 Consumption trends of sweet potatoes, by-products, and drivers of change

In Uganda sweet potatoes are consumed regularly and twice a week by 23% and 28% of consumers, respectively. They are mainly consumed boiled, roasted, and fried.
Sweet potatoes are consumed as a main meal. In a typical Ugandan home, sweet potatoes are part of the main meal which consists of other staples such as matooke (banana), “posho” (maize meal) and rice served with a sauce of either beans, meat, fish, or vegetables. The leaves are consumed as a vegetable and are a substitute for other types of vegetables such as pumpkin leaves, cassava leaves, kales, and amaranths.

Consumption trends (increase, decrease, or remained constant) are influenced by household size, availability, income, low production, increased prices and presence of other substitutes. Across Uganda 50% and 60% of respondents from urban and rural markets respectively perceived that consumption trends over the last 3 years have increased.

This is attributed to three key drivers, increased household size brought about by high population growth rates, availability in the market and among producers, and limited income which makes the sweet potato roots an attractive option since they are cheaper when compared to some substitutes such as cassava.
4.7.5 Substitute products for sweet potatoes and price elasticity of demand

157) Consumers substitute sweet potatoes with other foods such as rice, maize, cassava, bananas, yams, and Irish potatoes. In Uganda the key substitute for both urban and rural consumers is bananas. Other important substitutes for rural consumers include Irish potatoes, rice, and cassava. The least preferred is yam.

158) Consumers in Uganda are price sensitive and will reduce the volumes that they purchase if prices increase.

159) Over 75% and 74% of both urban and rural consumers respectively perceive the prices of sweet potatoes to have increased in the last 3 years (Figure 30). Despite this increase they still continue to purchase and consume sweet potatoes albeit in different volumes.

![Figure 30: Perception on the price trend of sweet potatoes in the last 3 years (N=266)](image)

160) The perception on the different price trends for the last 3 years is attributed to factors such as seasonality of the crop, low production, inflation, demand (high/low), variety of other foods, and high costs of living. However, most respondents attribute the increased prices to three key factors, seasonality of the crop whereby prices are relatively high during off-peak, high demand for sweet potatoes among consumers, and low production volumes by the producers.

![Figure 31: Reasons for the perceived price trends of sweet potatoes by consumers in Uganda (N=266)](image)
4.7.6 Challenges in sweet potatoes consumption and proposed recommendations

161) Some of the challenges faced by consumers are unreliable supply, damaged roots, high prices, lack of a system in the subsector to enforce standards hence no foolproof system for consumers and retailers, high sugar content, mixed varieties, heartburn/acidity, short shelf-life, small sized roots and poor tasting varieties.

162) Unreliable supply is the main challenge faced by 38% of consumers in Uganda, which could be attributed to the seasonality nature of the crops and low production volumes. The least important challenges are small sized roots, a perception that it is a ‘poor man’s food’, and bulkiness (Figure 32).

![Figure 32: Challenges faced by sweet potato consumers in Uganda (N=266)](image)

4.7.7 Recommendations

163) There are opportunities to increase production. To do this most respondents recommended promoting production, training farmers and traders on post-harvest technologies, and promoting variety diversification.

164) Consumers recommended promoting production, training farmers and traders on post-harvest technologies, and stabilizing prices (Figure 33).

![Figure 33: Recommendations to addressing identified challenges (N=266)](image)
4.8 Institutional Consumers

165) Institutional consumers are categorized into learning institutions, hospitals, prisons, hotels, barracks, religious institutions and orphanage centers (Table 9). A total of 98 institutions were interviewed across the country. Most (77) of the responding institutions were learning institutions.

Table 9: Type of institutions interviewed

<table>
<thead>
<tr>
<th>Type of institution</th>
<th>Number, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barracks</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Hospitals</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Hotels</td>
<td>16 (16)</td>
</tr>
<tr>
<td>Learning institutions</td>
<td>77 (79)</td>
</tr>
<tr>
<td>Prisons</td>
<td>3 (3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>98 (100)</strong></td>
</tr>
</tbody>
</table>

4.8.1 Consumer preferences by types and by products

166) WFSP is the most preferred type by all institutions interviewed. YFSP is also purchased but in relatively smaller amounts than WFSP. Preference for WFSP and YFSP was attributed to taste and the fact that most of the times they were the only types available in the market. Orange fleshed sweet potatoes (OFSP) were the least purchased type mainly due to low awareness among institutions especially its nutritional value.

167) All institutions interviewed prefer raw/fresh sweet potato roots. It is only learning institutions and hotels who buy other sweet potatoes products such as juice, chips, flour and cakes. Barracks, hotels, and prisons only purchase raw/fresh sweet potato roots. Learning institutions purchase diverse sweet potatoes products namely fresh roots, flour, chips, pancakes and juice.

4.8.2 Sources of supply

168) The main sources of supply are open markets, farmers, and retail shops (Figure 34). Farmers are the main source of supply for barracks, hospitals, prisons and learning institutions interviewed. Hotels purchase from open markets.
4.8.3 Purchasing, consumption patterns and drivers of change

169) The purchasing behavior of institutions is determined by various factors including availability in the market, having own production, nutritional value, preference by the students/customers/prisoners/patients, easy to prepare, affordability especially in relation to the price of substitute products and short distance to the supplier.

170) In Uganda, affordability drives the buying behavior of prisons, learning institutions, and hotels. Hospitals equally consider affordability, consumer preference, nutritional benefits, short distance from supplier, and availability.

171) When making purchases, institutions consider the following sweet potato attributes: root shape, disease free (clear of spots), cleanliness (washed), type, taste (sweetness), high dry matter content/texture (hard), low fibre content, color, size – large roots are preferred, packaging, and branding.

4.8.4 Consumer response to price change

172) Hospitals, prisons, and barracks interviewed will reduce the volumes purchased if prices increase. Religious institutions, orphanage centers, learning institutions, hotels, and barracks will continue to buy the same volumes even though the price increases. This could be attributed to the fact that most of them also have menus that they observe and adhere to.

4.8.5 Challenges facing consumption

173) In Uganda, poor quality is the biggest challenge that the hotels, learning institutions and hospitals interviewed are facing (Figure 35). The main challenge that the barracks and prisons interviewed face is scarcity of the sweet potatoes.

Figure 34: Source of supply of sweet potatoes
(N=98)
4.9 Schools

4.9.1 Sweet potatoes importance in school feeding programs

The study went further to find out the level of consumption of sweet potatoes particularly OFSP in schools. A total of 21 schools were sampled and interviewed in Uganda (2 Nursery schools, 6 primary schools & 13 secondary schools). All provided meals for their students - an average of 2 meals per day for 6 days in a week.

4.9.2 Drivers of sweet potatoes consumption patterns in schools

Majority of the schools interviewed (57% i.e. 12 schools) included sweet potatoes in their menus. This is attributed to drivers such as school’s own production, good taste, relatively low prices (Table 10) in comparison to other substitutes such as cassava, and the high satiety value in comparison to bread. In Uganda, some Universal Primary Education Schools (UPES) request parents to pack SP for lunch especially in the Eastern & Central regions.
Table 10: Drivers of sweet potatoes consumption in schools

<table>
<thead>
<tr>
<th>Reason for not including sweet potatoes in the meals</th>
<th>Reason for including sweet potatoes in the meals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not preferred by students</td>
<td>Change of diet</td>
</tr>
<tr>
<td>Expensive</td>
<td>Cheap</td>
</tr>
<tr>
<td>Time consuming in peeling</td>
<td>High satiety value: easily satisfies students</td>
</tr>
<tr>
<td>Poor quality</td>
<td>Good taste and delicious</td>
</tr>
<tr>
<td></td>
<td>School own production</td>
</tr>
</tbody>
</table>

176) Both WFSP and YFSP are mainly consumed by most learning institutions but at varying levels. These two types are preferred due to their taste. However, they are usually the only ones available in the market. The least purchased type is orange fleshed sweet potatoes. This is mainly due to low awareness on OFSP especially its nutritional value.

4.9.3 Source of purchasing sweet potatoes

177) In Uganda, nursery schools normally purchase sweet potatoes from traders, primary schools from farmers and open markets, and secondary schools source directly from farmers, open markets, and traders.

4.9.4 Awareness of Orange FlesheSweet potatoes (OFSP)

178) The study noted that some of the schools interviewed are not aware of OFSP. In Uganda 11 secondary schools and 1 nursery school reported not to be aware. Only 5 primary schools were aware of OFSP. This may be one of the reasons for low consumption and priority in school feeding programs.

179) Nutritional benefits of the OFSP are relatively understood by schools. Low level understanding of nutritive value of OFSP contributes to low adoption of the same. Reasons for low level understanding of this type could be attributed to the prevalence of the white fleshed and low promotion of OFSP among schools.

180) The results further indicate that schools in the country would like to adopt OFSP in their school feeding program. Demand was found to be higher in secondary and primary schools compared to nursery schools. In Uganda 10 secondary schools, 5 primary schools and both nursery schools interviewed would like to have sweet potatoes in their feeding programs. This further demonstrates the opportunity for interventions in sweet potatoes production and penetration in this market.

4.9.5 Proposed strategies to improve consumption of sweet potatoes in schools

181) The main strategy to improve the consumption of sweet potatoes in schools is to establish sweet potato gardens by 5 of secondary schools and support farmers to produce more by 4 schools. Nursery schools interviewed in Uganda also suggested establishing school gardens and provision of vines. This further provides an opportunity to increase
production and consumption in schools. These are strategic institutions for awareness creation, adoption, and a consumption culture among young people.

182) The key challenges facing the learning institutions include poor quality produce, high fiber content, lack of standard measurements, high prices, low supply, late delivery by suppliers, high transportation costs, too much time spent in peeling sweet potatoes, and their highly perishable nature.

4.10 Food vendors

4.10.1 Description and characteristics of food vendors

183) A total of 168 food vendors were interviewed in Uganda (Table 11). Among the food vendors 55% were from urban markets and 45% from rural markets. Food vending is undertaken by both men and women but mainly by women (71%). Most food vendors have reached primary and secondary education levels and this seem sufficient to enable them to run their businesses.

Table 11: Number of respondents across Uganda

<table>
<thead>
<tr>
<th>Countries</th>
<th>Total Respondents N</th>
<th>Rural N, (%)</th>
<th>Urban N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda</td>
<td>168 (100)</td>
<td>75(45)</td>
<td>93(55)</td>
</tr>
<tr>
<td>Total</td>
<td>168 (100)</td>
<td>75(45)</td>
<td>93(55)</td>
</tr>
</tbody>
</table>

184) Averages of 60% of food vendors consider sweet potato as a staple food for their customers. Sales are determined by client preference, affordability, complement to / eaten with other foods, palatability, availability, easy to cook and nutritious value.

4.10.2 Forms of sweet potatoes traded

185) Food vendors prepare and sell sweet potatoes in various forms such as boiled, roasted, fried, and steamed. In Uganda rural food vendors largely prepare and sell boiled and steamed sweet potatoes. In urban markets vendors prepare similar foods (92%) in Uganda. (Figure 36).

Figure 36: Roasted sweet potatoes being sold by food vendors
4.10.3 Sources of supply

The main sources of supply for sweet potatoes among the food vendors include open markets, farmers, retail shops, wholesalers, importers/exporters and home gardens (Figure 37). In both the urban and rural areas, food vendors in Uganda largely purchase their sweet potatoes from open markets and farmers. A very small number purchase from wholesalers, exporters and importers in addition to own gardens especially among the urban food vendors.

4.10.4 Drivers of Purchasing and selling patterns by food vendors

In both urban and rural areas the key factor influencing purchasers is customer preference (Figures 38 and 39). Nutrition has little influence in rural areas. This may reflect a lack of nutritional knowledge among most rural food vendors.

In the urban areas nutrition is the second most (13%) important factor considered by vendors.
4.10.5 Consumer preference by types and drivers of consumption

189) Consumers served by urban and rural vendors in Uganda prefer WFSP. The OFSP are the least preferred types (Figure 40). According to the food vendors, important factors that determine demand and purchase by their consumers include good taste/palatability, nutrition content, price, and preference (size of the roots, organically produced, high dry matter content and used as an accompaniment for tea). The study suggests that consumers prefer YFSP and WFSP.

![Figure 40: Types of sweet potatoes highly demanded by consumers segment served by food vendors (N=168)](image)

4.10.6 Challenges faced by food vendors and suggestions to address them

190) Food vendors face the following challenges in order of importance – easy spoilage attributed to the short shelf-life, high purchase prices, unreliable supply and scarcity, poor quality with high fibre, limited storage facilities, theft, language barrier, and high transport costs from the source of purchase among others.

191) In order to address some of these challenges the food vendors recommended increasing production, introducing better varieties, price reductions and stabilization, improving marketing and supply, improving storage and storage facilities, improving quality through use of improved varieties, good farming and harvesting practices, creating awareness among consumers of the crop’s benefits, and improving access to finance so that food vendors are able to improve their business management.

4.11 Processors

192) Only 1 food processor was interviewed in Uganda and therefore this is provided as a case study (Box 1). There are few sweet potato processors in Uganda. This may reflect low consumer awareness of processed products and high consumer preferences for fresh sweet potatoes roots.
Box 1: Sweet potatoes Processing: The Case of Ms. Rahama Nakalyawo in Zirobwe, Luweero District

Ms. Rahama is the chairperson of Tusitukire Wamu Kaburanaka Farmers Association based in Zirobwe - Luweero District. The association consists of 25 active members who normally come together to receive production inputs and trainings on good agronomic practices as well as sweet potato value addition from different service providers. The rest of activities such as production, marketing and accessing of finance are done individually.

In 2002, the members received training on “Sweet Potato Value Addition” from the Department of Food Science and Technology - Makerere University. They were trained on how to make products like Sweet potato juice, bread (buns) and confectionaries like cakes, cookies, chapatti, dough nuts and “bhagia”.

Despite the fact that all the 25 group members received this training, it was only Ms Rahama who took on this knowledge. However she also does it on a small scale which is mainly driven by the demand for these products and lack of preservatives (especially for juice) which can aid in prolonging its shelf life allowing her to supply to clients beyond her locality. Currently she only processes around 1 bag (130kg) of raw sweet potatoes a season.

She only uses the Orange Fleshed Sweet Potatoes (OFSP) in making these products due to its high Vitamin A content with Naspot 10, Naspot 9, Naspot 8, Naspot 7 and Ejjumula as the main varieties used. She relies on family labour (4 individuals) in the making of these products. The raw sweet potatoes are sourced directly from her 5 acres garden. The quality parameters that she looks out for include: Colour (Orange Fleshed), not fibrous and not diseased (free from pests and disease spots). Depending on the product to be made, she at times uses either raw roots or flour.

Her main customers are individual customers, schools e.g. Bukimu primary school and Zirobwe C/U primary school within her location. At times she displays her products on trade shows such as the Agricultural Trade Show that is always held in Jinja each year.

4.11.1 The distribution channel of the Sweet potato products
The key challenges identified were: Limited markets for the value added sweet potato products, high production costs and limited working capital to purchase inputs like preservatives to prolong the shelf life of her products.

However, she recommended the need for strategies that create and promote consumer awareness about the current value added products from sweet potatoes. This will lead to expansion of the already existing markets as well as creation of new ones.

A total of 2 feed processors who use sweet potatoes as raw materials were interviewed. Feed processors produce poultry feeds from sweet potatoes which provide high levels of potassium (4kg of SP = 12668mg) and contributes to strengthening egg shell and bones. This nutrient is especially important for broilers which have limited movement. Sweet potatoes are also high in beta carotene (4kg of SP = 26651 ug) which is critical for vision.

The feed processors require specific attributes from the sweet potato as raw material. These include; low moisture content, large roots, well-shaped, mature, white and red flesh, freshness/not rotten and deep orange colored. The most important attribute that the feed processors desire is that the raw materials should have low moisture content.

Processors purchase raw materials from three main sources, individual farmers, traders, and open markets. Individual farmers are the preferred source of supply. Increasing awareness will create more business opportunities for farmers but the key issue will be meeting the quality requirements of the processors.

The processors interviewed indicated that they are not happy with the quality of the current raw materials they are receiving since they have low moisture content and are
sometimes spoilt and rotten. There is clearly room for improvement on farmers to produce roots that meet stipulated quality standards.

199) The selling price of raw materials is determined by either the supplier or through negotiations with the processor. The supplier plays a key role in price determination and is not just a price taker.

4.11.2 Challenges faced and suggestions on how to address them

200) The most important challenge that the two feed processors face is the low quality of raw materials. This shows that sweet potato leaves and the peeling which are the main raw materials used by the feed processors and which are preferred raw, hardly meet their quality parameters. This could be associated with poor post-harvest handling and technologies used during processing.

201) In order to address these challenges the feed processors recommend support in the production process to reduce costs of production, increased production among farmers so as to increase raw materials supply, and expanding the market. Product development is a key opportunity that is foreseen by the feed processors.

4.12 Non-Consumers as Potential Markets

4.12.1 Individual non-consumers of sweet potatoes

202) A cross section of sweet potato non-consumers in both the urban and rural market segments across Uganda were interviewed in order to evaluate the possibility of creating new markets for existing sweet potato products. The question of why they did not consume them was also investigated. A total of 89 non-consumers were interviewed (Table 12).

Table 12: Non Consumers of Sweet Potatoes across Uganda

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Respondents, N (%)</th>
<th>Rural, N (%)</th>
<th>Urban, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda</td>
<td>80 (100)</td>
<td>43(48)</td>
<td>46(52)</td>
</tr>
<tr>
<td>Total</td>
<td>80 (100)</td>
<td>43(48)</td>
<td>46(52)</td>
</tr>
</tbody>
</table>

203) Non-consumers currently eat substitutes. In Uganda the key substitute food is banana since it is a staple food and largely produced. In the rural sector consumers also eat Irish potatoes, rice, and cassava.

204) Non-consumption is mainly attributed to stomach upsets such as acidity. Other important reasons include dislike for sweet potatoes, and concerns about how it impacts diabetes and allergies. Non-consumers also feel that the sweet potatoes do not taste good, are too expensive, too sweet, and of poor quality (high fibre content, low dry matter content and bruised) (Figure 41).
To create a market for sweet potatoes among the non-consumers, most suggested is introducing new varieties that would not cause stomach upsets/acidity. Others recommended promoting sweet potato consumption, improving quality, affordability, and availability. Another suggestion was to look at ways of complementing other foods for those who do not see sweet potato as part of a main dish in their culture (Figure 42).

Non-consumer awareness of sweet potato products is relatively high. For instance, among the respondents, awareness of fresh sweet potato roots is relatively high across all the market segments but there is limited awareness of their use for pancakes, starch, mandazi, juice, and bread.
Non-consumers willing to purchase sweet potato products desire them to be of good taste, clean, branded/packaged, preservable, fresh (not withered/stale), nutritious, high dry matter content, and high yielding (for consumers who produce sweet potatoes) (Figure 43).

![Figure 43: Desired characteristics for sweet potatoes in Uganda (N=89)](image)

4.12.2 Feed processors not using sweet potatoes as a raw material

Feed processors who were not using sweet potatoes as raw materials were interviewed to find out why they did not and if they would be willing to do so in the future. A total of 6 feed processors were interviewed and were categorized into pig, dairy, poultry, and goat feed processors.

The study noted that different types of animal feeds are processed using raw materials such as maize, millet, sunflower seeds, bones, and rice. Some of the final processed feed products include maize germ, bran, and chicken mash. The low use of sweet potatoes was attributed to scarcity and unsuitability of raw materials, limited technical knowhow/skills, and high price.

The processors made the following suggestions to increase sweet potato processing for feed: training on processing, increased production to ensure supply of raw materials and lower prices, research into improved varieties and other relevant technologies, promotion of the nutritional value of the sweet potatoes, and government support through promoting sweet potato transformation technology.

Sweet potatoes are currently used for poultry and pig feed. If constraints are removed opportunities exist to improve both the quality and quantity of animal feed.
Section C: EAC

4.13 Individual Consumers

4.13.1 Socio-economic and demographic characteristics of individual consumers

212) The sample size for the individual consumers was 1424 respondents; majority (53%) was from rural areas and the remaining 47% from urban areas which was intended to compare the geographic market segments. Among both the rural and urban individual consumers, the majority interviewed were men at 51% and 45% respectively. Majority of these were rural dwellers (33%) between 21 and 30 years and only 5% percent were below 20 years. This was a good distribution since, most consumers in the EAC are households slightly above 20 years and hence the survey treated the respondents to be representing household behavior. The level of education of individual consumers was sought and 46% had attained primary certificate while only 1% had post graduate degrees.

213) The consumers were further segmented into low income earners comprising those who earn US$60 and below, medium income earners those who earn between US$61-160 and high income earners getting US$161 and above per month (Figure 44). The responses showed that 47% of the rural consumers are low income earners with only 19% being high income earners. On the other hand, a majority (36%) of urban consumers are middle income. Generally, consumers in the urban areas earn better than those in the rural areas which could be due to white collar jobs that pay better.

![Figure 44: Categorization of consumers along income levels (N=1,424)](image)

4.13.2 Preferences by type of sweet potatoes and products

214) White fleshed, yellow fleshed and the orange fleshed sweet potatoes are the main types consumed across the region by both rural as well as urban consumers across all the income categories (Figure 45). Among the rural consumers, 57% of the medium earners consume WFSP. Interestingly, the largest percentage (27%) of the low income earners consume OFSP across all income levels both in the rural and urban areas. This is due to the efforts of donor projects that have promoted the OFSP among the rural poor to enhance their nutrition. Such efforts have also made the OFSP available in the markets near such areas. Among the urban consumers, low income earners mostly consume WFSP because they are...
available and relatively affordable. On the other hand, the high income earners mostly (44%) consume the YFSP.

Figure 45: Consumption of sweet potatoes in the EAC by type (N=1,424)

Sweet potatoes are mostly purchased fresh as was reported by 53% of the consumers (Figure 46). This is because they are readily available and relatively affordable especially for those preparing their meals at home. The away from home consumers purchase roasted and boiled roots mostly from food vendors as was reported by 10% and 9% of the consumers. Due to the low levels of processing in the region, processed products are not readily available and the few in the market are expensive with 1% of the consumers reporting to be accessing sweet potato flour, chips, starch and sweet potato juice.

Figure 46: Sweet potato products purchased by consumers across the EAC (N=1,424)
4.13.3 Frequency of consumption and consideration of SP as a staple

The importance of sweet potatoes was captured in terms of those who considered it as a staple as well as the number of times they consumed in a month (Figure 47). The larger percentages considering SP as staple from both the rural and urban areas are the low income earners. The reason for this finding is probably that the low income earners have fewer options to choose from. About (56%) in the rural areas consider SP a staple compared to 46% in the urban areas. High income earners both in the rural and urban areas do not consider SP a staple for the reverse reason that they have a wide range of options to choose from due to their relatively high purchasing power. Majority of the respondents consume sweet potatoes twice a week.

Figure 47: Consumers considering sweet potatoes a staple
(N=1,424)

4.13.4 Sources of supply and reasons for purchasing from the different sources

About 60% of consumers source their sweet potatoes from open markets and 17% from farmers (Figure 48). Other sources include food vendors, wholesalers, processors and supermarkets. Affordability is an important driver in sourcing from farmers and open markets as reported by 34% and 35% of the consumers. Proximity to the sellers is also important to the consumers making 10% of the consumers purchase from retail shops because they are near them. The least important factors considered include availability of variety and availability of credit facilities. This could be because most consumers buy what is readily available. Almost all the purchases of food including sweet potatoes is on cash basis since most traders do not know the consumers and hence availability of credit is not a major factor that determines purchase.
4.13.5 Consumption trends of sweet potatoes, by-products and drivers of change

The study sought to find the general trend of SP consumption for the past 3 years (Figure 48). Three years were referred to enable consumers remember their consumption behavior. There is a general increase in consumption of SP in the rural segment of consumers as evident by 47% against 32% who reported a decline. Over the same period in urban areas, there was constant consumption as evident by 44% compared to 41% who reported an increase. This could be associated with more availability of SP in the market as production has been on the raise, increased household sizes due to high population growth and change of eating habits in the urban areas with more consumers preferring “healthy eating”.

![Figure 48: Reasons for consumers sourcing from the different suppliers (N=1,424)](chart)

![Figure 49: Consumption trend of SP for the past three years (N=1,424)](chart)
4.13.6 Response of consumers to changes in price

219) A rise in price will cause a decrease in the volumes consumers purchase since they shift towards cheaper substitutes. However, there was 43% that will still consume the same amounts even with an increase in price because they have a weekly menu that they adhere to and the family size is the same. Interestingly, 3% of the consumers will increase the absolute amount of SP even with an increase in price which they attributed to an expected growth in family size either because of young ones borne, employing an extra person or they had started living with their old parents. On the other hand, 50% of consumers will purchase the same amount with a decrease in price because ideally the per capita consumption will remain the same ceteris paribus. Notably, 43% will purchase more implying that they currently do not access adequate volumes which could be hindered by the price (Figure 50).

220) There is no strong relationship between those who consider SP as a staple or otherwise and their behavior in relation to price change. For instance, a price change will lead to 53% of consumers reducing the volumes they purchase compared to 56% who do not consume SP as a staple. Similarly, the difference between those who will increase the volume of SP they purchase with a price fall is 5% against expectation in relative terms.

Figure 50: Expected response to change in prices by consumers (N=1,424)

4.13.7 Marketing

221) Prices have generally been on the rise as reported by 75% and 81% of consumers in urban and rural areas. However, prices differ across markets and geographical locations. As a result, some consumers reported a decrease over the same. Also, prices are seasonal and hence will differ within short periods of time.

222) The study noted that there is no standard unit of measurement of sweet potatoes in the market. The common unit is a heap which differs from one market to another with regard
to size and number in each heap, and the freshness of the roots. (Figure 51 and 52). In some instances, kilograms are used with the least common unit being pieces.

Figure 51: Units of measurement
(N=1,424)

Figure 52: Heaps of sweet potatoes priced differently in an open market in Kenya

4.13.8 Challenges in sweet potatoes consumption and proposed recommendations

Consumers of sweet potatoes face numerous challenges with the most important being inadequate and unreliable supply of quality sweet potatoes (Figure 53). As a result, demand exceeds supply driving the price of sweet potatoes up. In addition, due to the inadequate supply, consumers do not have a wide range to choose from hence end up opting for whatever is available in the market which is mostly of low quality (damaged roots and mixed varieties).
To address the challenges and especially that of inadequate supply, consumers suggested that productivity should be promoted to optimum (Figure 54). This will solve the dual problems of supply and prices. They also suggested value addition to increase the range of options for the consumers to select from but also increase the shelf life of the sweet potatoes. Other suggestions included introducing standards to ensure accurate weighing.

Institutional Consumers

4.14 Type of institutions

A total of 182 institutions were interviewed across the EAC with 74% of these being learning institutions and 17% hotels (Figure 55). This is because schools are the largest...
institutional consumers of sweet potatoes in the region. Other institutions included army barracks, prisons and religious institutions forming small percentages of the sample because they are few in number.

Figure 55: Type of institutions interviewed from the different EAC countries 
(N=182)

4.14.2 Consumer Preference by type and by-products

WFSP is still the common type even among the institutions (Figure 56). It is readily available and relatively affordable. OFSP was reported as a common type by 40% hospitals. Preference for OFSP by hospitals could be explained by their knowledge on its nutritional benefits and the on-going extensive campaigns on the importance of this type due to its high beta-carotene content which is important for children, invalids, pregnant women and HIV and AIDS patients. However, most hospitals still provide their subjects with WFSP again because of their availability and relatively low price. Prisons also consume OFSP. The least of the institutions purchasing OFSP are the hotels. The two main reasons are the unavailability and low demand due to their low dry matter content.

Figure 56: Preference by type of sweet potatoes 
(N=182)
During the purchase of SP, the most important attribute considered by institutions is affordability as reported by 24% of the religious institutions and 26% of the barracks (Figure 57). Availability is also important especially to learning institutions and orphanage centers as reported by 17% respectively. Other factors include size of roots with institutions preferring large sized roots.

![Figure 57: Attributes considered by the different natures of institutions when buying sweet potatoes & sweet potato products in the EAC (N=182)](image)

### 4.14.3 Sources of the sweet potatoes

The two main sources of sweet potatoes are farmers and open markets as reported by all the institutions (Figure 58). Several reasons are attributed to this including fair price, availability of adequate amounts and proximity to the supplier. Prisons and barracks also purchase from retailers who are mostly given a tender to supply specific volumes for a specific period of time.

![Figure 58: Sources of sweet potatoes by institutions (N=182)](image)
229) Almost all the institutions purchase fresh root with only 5% of schools and 10% of hotels reporting to also be purchasing SP chips. The rest of the products - flour, juice and pan cakes formed 5% of the products purchased by learning institutions.

4.14.4 Responsiveness to price change

230) A rise in price will result to a decrease of the volume of SP purchased by most of the institutions (Figure 59). The hospitals and prisons will reduce the volumes because the population (patients and prisoners) does not change significantly and they could feed them with something else. Interestingly, 11% of the hotels will increase the volumes of sweet potatoes they purchase after which they may increase the price of SP meals.

231) A decline in prices will also cause mixed reaction among the institutions. This finding was limited by the small number of institutions interviewed. As a result they are taken as cases other than a representative sample. Religious institutions and orphanage centres will buy the same amount. Some hotels and learning institutions will increase the volume they purchase.

Figure 59: Changes in volume purchased with change in price
(N=182)

4.14.5 Challenges facing consumption

232) Several challenges were reported by the institutions with the main ones being limited availability and poor quality of sweet potatoes namely mixed types, insect infested, high fibre content and low dry matter content (Figure 60). Religious institutions also find high price to be a key challenge for them.
4.15 Food vendors

4.15.1 Demographics

A total of 767 food vendors were interviewed across the EAC, 41% being sampled from rural areas and 59% from urban areas (Figure 61). Out of the total vendors, 29% and 71% were men and women respectively. About 60% of the food vendors in the EAC consider sweet potato as staple. A comparison between the specific EAC partner states on the same parameter indicate that Burundi has the largest percentage (96%) of food vendors in the rural areas considering sweet potato a staple with the least percentage being in Kenya. The study concludes that economic development has a relationship on how consumers consider food commodities. However, no analysis was conducted to determine the relationship. In urban areas, this relationship was not found to exist probably because of the diversity of the population.
Figure 61: Proportion of rural food vendors considering sweet potatoes as a main food staple for their customers (N=767)

4.15.2 Forms of sweet potatoes traded by vendors

Seventy two percent (72%) of the vendors boil and steam their sweet potatoes (Figure 62). This method is quick, and saves on energy since a vendor can boil many roots at a time. It is also the form in which the sweet potatoes are mostly demanded. Along the road sides, roasting is common since roasted sweet potatoes are tastier and convenient for passersby. However, they are relatively expensive. Other forms of preparation include frying. The challenge with this kind of method is that, the ready roots are expensive due to the high cost of frying oil. Also with the increasing awareness on healthy eating, consumers demand less of the fried sweet potatoes.

Figure 62: Forms of sweet potatoes traded (N=767)

4.15.3 Sources of supply

Open markets are the main source of supply with 56% and 47% of urban and rural vendors purchasing from them (Figure 63) due to the availability of the relatively high volumes and affordable prices. Other sources include farmers, retailer, wholesalers, own production and processors.
4.15.4 Drivers of purchasing and selling patterns of food vendors

The most important driving force in the vending business is demand by consumers with both rural and urban food vendors indicating that most consumers like sweet potatoes. Other reasons include sweet potatoes being a source of income to the vendors and its consumption as a complimentary/accompaniment food to tea and stews (Figure 64).
Figure 64: Reasons for selling of sweet potatoes (N=767)

4.15.5 Preference by types and drivers of consumption

White fleshed sweet potatoes are common with rural food vendors as was reported by 52% of them (Figure 65). They are readily available and affordable. In the urban areas, a majority 47% of the vendors indicated that, their consumers prefer yellow fleshed sweet potatoes to other types. The main reason was availability and a general liking for the yellow. Some vendors also indicated that the YFSP is high in dry matter content which most consumers prefer. OFSP is the least common due to the challenges facing the type including unavailability, high prices and associations with the sick and the poor.
The top three drivers of demand are taste, nutrition content and price. The main driver of demand for sweet potatoes in both rural and urban areas is taste. An increase in supply will result to a decrease in price making sweet potatoes affordable.
5. RECOMMENDATIONS

5.1 Intervention Matrix

<table>
<thead>
<tr>
<th>Factors INTERNAL to the Value Chain</th>
<th>STRENGTHS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of the nutritional importance of sweet potatoes SP are more affordable than some substitutes e.g. cassava, banana and rice</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors EXTERNAL to the Value Chain</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>OPPORTUNITIES</th>
<th>Intervention Plan – Short Term (picking the low-hanging ripe fruits)</th>
<th>Intervention Plan – Short - Medium Term (picking the low-hanging but not yet ripe fruits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of varieties conforming to consumer preferences</td>
<td>Expand the utilization of technologies, products, practices to exploit markets, by-products (starting with demand/market development, and attracting investors)</td>
<td>Develop a promotional strategy for the fresh SP roots (especially OFSP) and new products to create awareness among different consumer segments</td>
</tr>
<tr>
<td>Availability of high yielding varieties for increasing the volumes supplied to the market at reduced prices</td>
<td>Nutritional benefits of SP (especially OFSP)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THREATS</th>
<th>Intervention Plan – Medium Term (picking fruits high up the tree)</th>
<th>Intervention Plan – LONG Term (grow new fruit tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price fluctuations</td>
<td>Create consumer awareness on the importance and benefits of SP (especially OFSP)</td>
<td></td>
</tr>
<tr>
<td>Poor quality roots (damaged, low dry matter, high fibre, pest &amp; disease infestations, small sized roots)</td>
<td>Develop and promote storage techniques for reduced losses</td>
<td></td>
</tr>
<tr>
<td>Short Shelf life of fresh roots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception as an inferior food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart burn, flatulence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relatively cheaper substitute value added products e.g. wheat flour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unethical business practices by the traders</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.2 Summary of Interventions

Three main interventions are recommended in order to activate market growth. These are geared towards creating more awareness and promoting usage among both existing and potential consumers:

a) Expand the use of existing and new technologies from research for primary processing into products and by-products so as to exploit and develop demand led markets and
to attract investors. There is a strong market for fresh roots and an untapped market for other sweet potato products.

b) Develop a promotional strategy for fresh sweet potatoes roots (especially OFSP) and new products to create awareness among different consumer groups.

c) Develop and promote storage techniques to reduce losses. Sweet potatoes have a short shelf-life and spoil easily and rapidly. Consumers prefer roots that are fresh and have a “straight from the farm look”.

240) Based on survey and investigations we recommend the following actions:

a) Promote sweet potato consumption among consumers, including institutional buyers and non-consumers, by organizing campaigns to create consumer awareness (across all market segments) on their importance and benefits. Emphasis should be placed on nutritional and health benefits, such as among diabetics, and food security, particularly the consumption of OFSP.

b) Create awareness and benefits of OFSP with high dry matter content that can compete favorably with WFSP and YFSP.

c) Promote sweet potatoes as an alternative raw material among the animal feed processors by providing technical skills and encouraging increased production among producers to ensure sufficient supply.

d) Influence national policy to adopt sweet potato feeding programs in schools and support the schools directly to implement sweet potato feeding programs by providing vines and supporting the initial process for production and creating awareness among school-going children who in turn may become future producers and consumers.

e) Develop and enforce standards on grading by size, packaging, and quality in order to meet consumer demands for better products.

f) Encourage processing and value addition during periods of glut to improve product shelf-life. Work with existing processors as an entry point to train value chain actors on the importance of sweet potatoes and to create demand.

g) Invest in incubation projects to try-out and promote processed products, for example working with Makerere University Food Science Incubation Unit.

h) Develop post-harvest handling technologies to improve crop quality and shelf-life of fresh roots.
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## APPENDICES

### Appendix 1: Major sweet potatoes consumption forms and their preparation methods

<table>
<thead>
<tr>
<th>Consumption form</th>
<th>Preparation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atapa</td>
<td>Atapa is made from sweetpotato flour (derived from Amuukeke or Inginyo) mixed with either millet or cassava flour, re-hydrated with boiling water and cooked over heat into a brown edible bread like paste. SP flour alone may also be used and mixed with tamarinds or sour milk to neutralize the sweetness (regarded as undesirable).</td>
</tr>
<tr>
<td>Boiled Sweetpotato</td>
<td>Sweetpotato roots are peeled (or left unpeeled) and washed. The roots are boiled in water.</td>
</tr>
<tr>
<td>Mixture of Sweetpotato and beans</td>
<td>Sweetpotato roots and beans are boiled separately and then mixed when ready</td>
</tr>
<tr>
<td>Mashed Sweetpotato and beans</td>
<td>Raw Sweetpotato roots are added to boiled beans cooked and mashed when ready.</td>
</tr>
<tr>
<td>Otere</td>
<td>Otere is made from dried chips of Sweetpotato, which are boiled, salt added, and either eaten in that form or mashed. Otere is a similar product to Amuukeke though it is given a different name by the Langi ethnic group from Lira and Apac.</td>
</tr>
<tr>
<td>Steamed Sweetpotato</td>
<td>Sweetpotato roots are peeled, washed and then steamed in banana leaves.</td>
</tr>
<tr>
<td>Raw Sweetpotato roots</td>
<td>Sweetpotato roots are peeled and eaten raw in the garden.</td>
</tr>
<tr>
<td>Inginyo</td>
<td>Inginyo is a dry chip like (more of a chunk) primary product. First roots are crushed into pulp and sun dried.</td>
</tr>
<tr>
<td>Amuukeke</td>
<td>Roots are dried in the sun for 1-2 days. They are then peeled, sliced into thin horizontal strips and sun dried on rocks, polythene bags or courtyards specially smeared with cow dung and then stored. To cook, the dry chips are boiled in salted water until soft. These can be eaten at this stage or mashed and put back on fire to remove excess moisture.</td>
</tr>
<tr>
<td>Roasted Sweetpotato</td>
<td>Roots are peeled and roasted on an open fire.</td>
</tr>
<tr>
<td>Porridge</td>
<td>Sweetpotato flour is mixed with cold water to form a paste which is then added to boiling water (with/without tamarinds) and boiled until ready.</td>
</tr>
<tr>
<td>Kwon</td>
<td>Boil water, add sweetpotato flour mixed with millet/sorghum flour and stir.</td>
</tr>
<tr>
<td>Ugali</td>
<td>Water is boiled, sweetpotato flour added and the whole mixture is mixed over heat into a soft bread form.</td>
</tr>
<tr>
<td>Fried Sweetpotato chips</td>
<td>Fresh sweetpotato is sliced and deep fried in cooking oil. Salt is added when ready.</td>
</tr>
<tr>
<td>Processed products</td>
<td>Boiled sweetpotato roots are mashed and: i) added as an ingredient instead of flour ii) To make juice; boiled sweetpotato roots are mashed, water is added and the whole mixture is strained using a sieve to obtain juice.</td>
</tr>
</tbody>
</table>

*Source: Harvest Plus, 2006*
Appendix 2: Selected foodstuff prices as per 28/06/2012 in Arapai local market in Soroti district, Uganda.

<table>
<thead>
<tr>
<th>Foodstuff</th>
<th>Price 2012 in Ug. Sh. Per basin</th>
<th>Previous cost 2011 in Ug. Sh. per basin</th>
<th>Cause of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet potatoes (inginyo)</td>
<td>7,000/= 2.98 US $</td>
<td>9,000/= 3.83 US $</td>
<td>High production and low quality product.</td>
</tr>
<tr>
<td>Sweet potatoes sliced (Amukeke)</td>
<td>9000/= 3.83 US $</td>
<td>11,000/= 4.68 US $</td>
<td>Increased amounts produced due to diverted attention as a result of disappointment from cassava production making supply high in the market and drop in market price.</td>
</tr>
<tr>
<td>Cassava chips</td>
<td>11,000/= 4.68 US $</td>
<td>9,000/= 3.83 US $</td>
<td>Reduction in amounts produced due to cassava brown streak virus and mosaic virus.</td>
</tr>
</tbody>
</table>

Source: Heyi, D. D, 2012

Appendix 3: Prices of sweet potatoes per bag (Tsh)

<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Village</th>
<th>Farm gate prices</th>
<th>Market prices (City)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low season</td>
<td>High season</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High season</td>
<td>Low season of production</td>
</tr>
<tr>
<td>Mwanza</td>
<td>Ukerewe</td>
<td>Busagami</td>
<td>12,000-15,000</td>
<td>6,000-8,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bukonyo</td>
<td>8,000</td>
<td>3,000-6,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sengerema</td>
<td>10,000</td>
<td>6,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luholonngoma</td>
<td>10,000-12,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Morogoro</td>
<td>Kilosa</td>
<td>Kyegeak</td>
<td>17,000</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mtumbaatubu</td>
<td>22,000</td>
<td>7,000</td>
</tr>
<tr>
<td>Dar es</td>
<td>Temeke</td>
<td>Gezaulole</td>
<td>13,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Saam</td>
<td></td>
<td>Mbuto</td>
<td>15,000</td>
<td>7,000</td>
</tr>
</tbody>
</table>

Source: Ndunguru, 2012
Appendix 4: OFSP varieties

Orange-fleshed sweetpotato varieties

Kabode

Vita

Ejumula

Kakamega

Source: Harvest Plus, 2011

Appendix 5a: Age levels of respondents

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of consumers</th>
<th>Location N, (%)</th>
<th>20 years &amp; below N, (%)</th>
<th>21 - 30 years N, (%)</th>
<th>31 - 40 years N, (%)</th>
<th>41 - 50 years N, (%)</th>
<th>51 years &amp; above N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>318</td>
<td>Rural 258 (81%)</td>
<td>12 (5%)</td>
<td>86 (33%)</td>
<td>71 (28%)</td>
<td>46 (18%)</td>
<td>43 (16%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 60 (19%)</td>
<td>2 (3%)</td>
<td>21 (35%)</td>
<td>22 (37%)</td>
<td>10 (17%)</td>
<td>5 (8%)</td>
</tr>
<tr>
<td>Rwanda</td>
<td>170</td>
<td>Rural 84 (49%)</td>
<td>6 (3%)</td>
<td>25 (30%)</td>
<td>22 (26%)</td>
<td>23 (27%)</td>
<td>10 (12%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 86 (51%)</td>
<td>2 (2%)</td>
<td>42 (49%)</td>
<td>27 (31%)</td>
<td>12 (14%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Kenya</td>
<td>192</td>
<td>Rural 63 (34%)</td>
<td>26 (40%)</td>
<td>13 (20%)</td>
<td>15 (23%)</td>
<td>11 (17%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 127 (66%)</td>
<td>6 (4%)</td>
<td>52 (41%)</td>
<td>47 (37%)</td>
<td>21 (17%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>462</td>
<td>Rural 187 (40%)</td>
<td>13 (6%)</td>
<td>58 (31%)</td>
<td>37 (31%)</td>
<td>42 (23%)</td>
<td>17 (9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 275 (60%)</td>
<td>18 (7%)</td>
<td>124 (45%)</td>
<td>89 (32%)</td>
<td>32 (12%)</td>
<td>12 (4%)</td>
</tr>
<tr>
<td>Uganda</td>
<td>276</td>
<td>Rural 137 (57%)</td>
<td>8 (5%)</td>
<td>56 (36%)</td>
<td>53 (34%)</td>
<td>21 (13%)</td>
<td>19 (12%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 119 (43%)</td>
<td>12 (10%)</td>
<td>39 (50%)</td>
<td>29 (24%)</td>
<td>14 (12%)</td>
<td>5 (4%)</td>
</tr>
<tr>
<td>EAC</td>
<td>1,418</td>
<td>Rural 751 (53%)</td>
<td>37 (5%)</td>
<td>251 (33%)</td>
<td>216 (29%)</td>
<td>147 (20%)</td>
<td>100 (13%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 667 (47%)</td>
<td>40 (6%)</td>
<td>298 (45%)</td>
<td>214 (32%)</td>
<td>89 (13%)</td>
<td>4%</td>
</tr>
</tbody>
</table>
### Appendix 5b: Education levels of respondents

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of consumer</th>
<th>Location N, (%)</th>
<th>Never gone to school N, (%)</th>
<th>Primary education N, (%)</th>
<th>Secondary education N, (%)</th>
<th>Diploma/ certificate N, (%)</th>
<th>University degree N, (%)</th>
<th>Post graduate degree N, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>318</td>
<td>Rural 258 (81%)</td>
<td>102 (40%)</td>
<td>110 (43%)</td>
<td>26 (10%)</td>
<td>12 (5%)</td>
<td>4 (1%)</td>
<td>4 (1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 60 (19%)</td>
<td>4 (7%)</td>
<td>29 (48%)</td>
<td>8 (13%)</td>
<td>6 (10%)</td>
<td>4 (7%)</td>
<td>9 (1.5%)</td>
</tr>
<tr>
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<td>167</td>
<td>Rural 82 (49%)</td>
<td>14 (17%)</td>
<td>44 (53%)</td>
<td>16 (20%)</td>
<td>4 (5%)</td>
<td>4 (5%)</td>
<td></td>
</tr>
<tr>
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<td>4 (5%)</td>
<td>30 (35%)</td>
<td>34 (40%)</td>
<td>6 (7%)</td>
<td>7 (8%)</td>
<td>4 (5%)</td>
</tr>
<tr>
<td>Kenya</td>
<td>192</td>
<td>Rural 65 (34%)</td>
<td>3 (5%)</td>
<td>15 (23%)</td>
<td>17 (26%)</td>
<td>22 (34%)</td>
<td>8 (12%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 127 (66%)</td>
<td>11 (9%)</td>
<td>35 (28%)</td>
<td>48 (37%)</td>
<td>27 (21%)</td>
<td>6 (5%)</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>464</td>
<td>Rural 189 (40%)</td>
<td>22 (12%)</td>
<td>123 (65%)</td>
<td>26 (14%)</td>
<td>10 (5%)</td>
<td>7 (3%)</td>
<td>1 (1%)</td>
</tr>
<tr>
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<td>Urban 275 (60%)</td>
<td>10 (4%)</td>
<td>124 (45%)</td>
<td>91 (33%)</td>
<td>24 (8%)</td>
<td>25 (9%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Uganda</td>
<td>277</td>
<td>Rural 136 (57%)</td>
<td>20 (13%)</td>
<td>60 (38%)</td>
<td>46 (29%)</td>
<td>25 (16%)</td>
<td>4 (3%)</td>
<td>1 (1%)</td>
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<tr>
<td></td>
<td></td>
<td>Urban 121 (43%)</td>
<td>4 (3%)</td>
<td>26 (22%)</td>
<td>49 (40%)</td>
<td>25 (21%)</td>
<td>16 (13%)</td>
<td>1 (1%)</td>
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<tr>
<td>EAC</td>
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<td>Rural 750 (53%)</td>
<td>161 (21%)</td>
<td>352 (40%)</td>
<td>131 (18%)</td>
<td>73 (10%)</td>
<td>27 (4%)</td>
<td>6 (1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 668 (47%)</td>
<td>22 (3%)</td>
<td>220 (33%)</td>
<td>217 (33%)</td>
<td>109 (16%)</td>
<td>79 (12%)</td>
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</table>

### Appendix 6: Reasons for consuming the different varieties by respondents in Tanzania

<table>
<thead>
<tr>
<th>Varieties consumed by respondents (N)</th>
<th>Percentage of responses per reason</th>
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<tbody>
<tr>
<td></td>
<td>Tastes good</td>
</tr>
<tr>
<td>Berita (5)</td>
<td>40</td>
</tr>
<tr>
<td>Dudugala (14)</td>
<td>50</td>
</tr>
<tr>
<td>Kigambilenyok (8)</td>
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<tr>
<td>Kisenia (6)</td>
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<td>Lupungumulu (6)</td>
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</tr>
<tr>
<td>Manika (5)</td>
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</tr>
<tr>
<td>Mayayo (7)</td>
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<tr>
<td>Mbatata (27)</td>
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<td>Mkerewa (5)</td>
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<td>Morogoro (21)</td>
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<td>Mwanamisalab (8)</td>
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</tr>
<tr>
<td>Mwanamituto (9)</td>
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<td>Nkerewa (5)</td>
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</tr>
<tr>
<td>Polista (32)</td>
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</tr>
<tr>
<td>Shangazi (17)</td>
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</tr>
<tr>
<td>Simama (7)</td>
<td>42</td>
</tr>
<tr>
<td>Sugute (6)</td>
<td>86</td>
</tr>
<tr>
<td>Ukimwe (6)</td>
<td>70</td>
</tr>
<tr>
<td>Upamba (10)</td>
<td>63</td>
</tr>
<tr>
<td>Utitiri (7)</td>
<td>80</td>
</tr>
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</table>
## Appendix 7: Reasons for consuming the different varieties by respondents in Uganda

<table>
<thead>
<tr>
<th>Variety (N) consumed by respondents</th>
<th>Percentage of responses per reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tastes good</td>
</tr>
<tr>
<td>Dimbuka (51)</td>
<td>33</td>
</tr>
<tr>
<td>Bamumyombokere (30)</td>
<td>25</td>
</tr>
<tr>
<td>Silk (30)</td>
<td>55</td>
</tr>
<tr>
<td>Mbale (29)</td>
<td>51</td>
</tr>
<tr>
<td>Osukut (22)</td>
<td>70</td>
</tr>
<tr>
<td>Araka (17)</td>
<td>65</td>
</tr>
<tr>
<td>Soroti (17)</td>
<td>57</td>
</tr>
<tr>
<td>Kyebandura (1.5)</td>
<td>49</td>
</tr>
<tr>
<td>Kawogo (14)</td>
<td>55</td>
</tr>
<tr>
<td>Nasapot (12)</td>
<td>60</td>
</tr>
<tr>
<td>Atekeke (11)</td>
<td>73</td>
</tr>
</tbody>
</table>

## Appendix 8: SWOT analysis for Consumers

### STRENGTHS
Awareness of the nutritional importance of sweet potatoes
SP are more affordable than some substitutes e.g. cassava, banana and rice

### WEAKNESSES
Inability to differentiate varieties

### OPPORTUNITIES
Availability of varieties conforming to consumer preferences
Availability of high yielding varieties for increasing the volumes supplied to the market at reduced prices
Nutritional benefits of SP (especially OFSP)

### THREATS
Price fluctuations
Poor quality roots (damaged, low dry matter, high fibre, pest & disease infestations, small sized roots)
Short Shelf life of fresh roots
Perception as an inferior food
Heart burn, flatulence
Relatively cheaper substitute value added products e.g. wheat flour
Unethical business practices by the traders