Analysis of Demand and Value Chains of Yams Sub-Sectors in Tanzania and Uganda

Volume 4: Analysis of Demand and Value chain of Yams in Tanzania, Uganda and the Rest of East African Community

T - DRAFT – June 25th, 2013

Kilimo Trust
Regional solutions to local problems
www.kilimotrust.org
EXECUTIVE SUMMARY

1. Yams serve as staple food in many countries and form about 10% of the total roots and tubers produced globally (FAO, 2002). In the developing world, yams rank among the top 10 food crops (Scott et al., 2000; Nweke, 2004). Sub-Saharan Africa accounts for 70% of world yam production grown on 2.83 million hectares of land with Nigeria leading in production with 3.4 million tonnes followed by Côte d’Ivoire (5 million tonnes), Ghana (3.9 million), and Bénin (2.1 million tonnes), (IITA 2009). While Africa is a leading yam producer, East African countries are not among the top seven producers and they lag behind West Africa in production.

2. There exists scanty information and data on yams in East Africa. In both Tanzania and Uganda yams are grown on small scale farms, often intercropped with other food crops. It is also mono-cropped in a few areas such as Eastern Uganda where it has local importance (Coyne et al, 2004). Yams are characterized by low productivity - at 6MT/ha in Tanzania compared with about 11MT/ha realized in West African countries such as Nigeria.

3. The major yams varieties grown in Uganda are Kyetutumula (D. cayenensis ), Kikuwa (D. burkilliana) , Makunyi (D. bulbisiana) , Masebe (D. alata), Nandigoya (D. alata), Ndaggu Nganda (D.alata), Ndaggu Nziba (D. alata ) and Balugu (Mudiope, et al., 2007). The main producing areas are Rakai, Masaka, Kapchorwa, Mbale, Iganga, Mukono, Luweero, Masindi, Adjumani, Nakasongola and Kayunga.

4. In Tanzania the varieties grown include Viguonzo, Mahombo, Maole, Buyu, Tona, and Vitunga with the major growing areas being Mtwara, Morogoro, Kibaha, Kondoa, Arusha, Mwanza and Zanzibar. The highest volumes of 9,800 tons were realized in 2011. Other varieties grown in southern Tanzania (Mtwara and Newala Districts) are Vinyamihwa, Mboko, Mkonga wa nembo, Hangadi, Hamandeke, Vitundi, Luvale, Matu, Mnyuvele and Vyekundu.

5. Yams take a longer period of time to mature compared to other food crops - 6 months to 12 months depending on variety.

6. Generally, yams have a relatively higher cost of production compared to other root crops due to the fact that they require staking in many areas, greater labor input for land preparation (clearing and mounding), stake-tying, weeding and careful harvesting. IITA (2009) notes that these labor requirements exceed those for other starchy staples such as cassava accounting for about 40% of yam production costs while 50% of the expenditure goes to planting materials.

7. The yam is mainly consumed fresh with the tubers generally eaten as a vegetable either boiled, baked or fried. The tubers may also be mashed or pounded into dough after boiling, processed into flour, or cooked into pottage with added protein sauce and oils. There is very little processing of yams in Tanzania and Uganda, with only one processor having been identified in this study.

8. Besides production, producers also undertake a number of other activities including marketing and storage. They also participate in various types of trainings. There are more producers in Tanzania than Uganda who access improved planting materials.
9. Yams are mainly sold as fresh by about 97% of the wholesalers in both Tanzania and Uganda. Other forms in which yams are traded are flour and dried chips.

10. Among retailers in Tanzania, Uganda, Kenya, Burundi and Rwanda, prices are majorly determined by prevailing market prices, negotiations, suppliers, buyers and the retailers themselves. Market forces of demand and supply are the key determinants of price for a majority (80%) of retailers in Tanzania.

11. Yellow and water yams are the most common types traded in Uganda (64%) due to their availability and consumer preference.

12. Most yams are consumed within the producing districts in Tanzania and Uganda. However, some yams from up-country are also transported to the cities of Kampala and Dar es Salaam and other big towns in the two countries.

13. The non-consumers of yams attribute non-consumption to the tasteless nature of yams, scarcity of yams in the market, lack of awareness on yams especially among the youth, high prices, stomach problems and the hard nature of the tuber.

14. In both countries, the smallholder production system is characterized by weak linkages. Most of the producers are small-holders carrying out their activities individually hence the weak linkage with producer organizations. Similarly, there exist weak linkages between smallholder producers and the input suppliers with the only established linkage being between producers and fellow producers.

15. The major constraints in yams production include: high production costs (planting material and labor), decreasing soil fertility, perishability of yam seed and their bulkiness during transport, inadequate yield potential of varieties, as well as increasing levels of field and storage pests and diseases associated with intensification of cultivation. Pests attack the growing tubers such as termites and tuber beetles. There are also some diseases that yams are prone to (IITA 2009).

16. Inadequate capital to invest in improved planting material and improved implements was another challenge, reported by over 50% of the producers. Limited markets and poor weather conditions also impacted yam production.

17. Retailers of yams face a myriad of challenges when dealing with their suppliers such as high prices, delivery of poor quality products, unreliable supply, scattered suppliers and breach of contractual agreements by suppliers.

18. The study notes that there’s little public sector attention being given to yams and concludes that the yams sub-sector is not well developed in the two countries and therefore does not present a compelling opportunity for promoting its growth.
# TABLE OF CONTENTS

1. INTRODUCTION .................................................................................................................. 1  
   1.1 Objectives ....................................................................................................................... 1  
   1.2 The Overarching Context .............................................................................................. 1

2. SITUATION ANALYSIS ....................................................................................................... 2  
   2.1 Yams Production ............................................................................................................ 2  
   2.2 Yams Processing, Utilization and Marketing ................................................................. 4
   2.3 Nutritional and Socio-cultural Importance of Yams ....................................................... 4

3. METHODOLOGY ................................................................................................................. 6  
   3.1 Data Needs, Sources and Limitations ............................................................................. 6  
      3.1.1 Secondary data ......................................................................................................... 6
      3.1.2 Primary data ............................................................................................................. 7
      3.1.3 Sampling Techniques and Sample Size .................................................................... 8
   3.2 Tools and Data Collection ............................................................................................... 11
   3.3 Data Analysis ................................................................................................................... 11
   3.4 Limitations of the Data ..................................................................................................... 12

4. SURVEY RESULTS .............................................................................................................. 13 
   4.1 Input supply ................................................................................................................... 13  
   4.2 Production and Productivity of yams ........................................................................... 13 
   4.3 Land Resources Allocation to Yams ............................................................................ 14
   4.4 Marketing ....................................................................................................................... 15
   4.5 Yams processing and distribution patterns .................................................................... 17
   4.6 Yams Marketing in Tanzania and Uganda .................................................................... 18
      4.6.1 Wholesalers ............................................................................................................. 18
      4.6.2 Retailers .................................................................................................................. 19
      4.6.3 Transporters/ transporter traders .......................................................................... 22
   4.7 Yams consumption ........................................................................................................ 24
      4.7.1 Individual Consumers ......................................................................................... 24
      4.7.2 Institutional consumers ....................................................................................... 31
      4.7.3 Food vendors ....................................................................................................... 31
   4.8 Non Consumers as Potential Markets for yams ............................................................. 34 
      4.8.1 Individual non-consumers of yams ..................................................................... 34
   4.9 Mapping of the yams value chain in Tanzania ............................................................. 35
      4.9.1 Core processes ...................................................................................................... 35
      4.9.2 Yams flow from production to market areas in Tanzania ....................................... 35
      4.9.3 Value Addition and Value Capture ...................................................................... 36
      4.9.4 Value Chain Institutions and Horizontal and Vertical Linkages ............................ 37
      4.9.5 Service providers in the value chain .................................................................... 38
      4.9.6 Previous interventions in yams subsector in Tanzania .......................................... 39
      4.9.7 Policy and Institutional Environment Underlying the Yams Value Chain ............ 41
   4.10 Mapping of the yams value chain in Uganda ............................................................... 42
      4.10.1 Core processes in the yams value chain .............................................................. 42
4.10.2  Yam Flow from Production to Marketing areas in Uganda ........................................... 43
4.10.3  Level of Employment in the Yam Value Chain............................................................. 44
4.10.4  Value Addition and Value Capture along the Yam Value Chain ................................. 45
4.10.5  Horizontal and Vertical Linkages in the Yam Value Chain ......................................... 45
4.10.6  Service Providers in the Yam Value Chain .................................................................. 46
4.10.7  Previous interventions in yams sub-sector in Uganda .................................................. 47
4.11  Policy and Institutional Environment Underlying the Yam Value Chain ....................... 47
5. APPENDICES ......................................................................................................................... 53
  5.1  Appendix 1: Demographics of the yams consumers .......................................................... 53
  5.2  Appendix 2: Yam varieties in Tanzania ............................................................................. 53
  5.3  Appendix 3: Yams types and varieties in Uganda ............................................................ 54
  5.4  Appendix 4: SWOT analysis of the Yams value chain in Tanzania and Uganda ......... 54
6. REFERENCES .......................................................................................................................... 56
# LIST OF ACRONYMS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDS</td>
<td>Business Development Services</td>
</tr>
<tr>
<td>BMGF</td>
<td>Bill and Melinda Gates Foundation</td>
</tr>
<tr>
<td>BRELA</td>
<td>Business Registration and Licensing Agency</td>
</tr>
<tr>
<td>BROSDI</td>
<td>Busoga Rural Open Source Development Initiative</td>
</tr>
<tr>
<td>CGIAR</td>
<td>Consultative Group of International Agricultural Research</td>
</tr>
<tr>
<td>CIP</td>
<td>International Potato Centre</td>
</tr>
<tr>
<td>COWO</td>
<td>Concerned Women</td>
</tr>
<tr>
<td>DFID</td>
<td>UK Department for International Development</td>
</tr>
<tr>
<td>D&amp;VCA</td>
<td>Demand and Value Chain Analysis</td>
</tr>
<tr>
<td>EAC</td>
<td>East African Community</td>
</tr>
<tr>
<td>EACM</td>
<td>East African Common Market</td>
</tr>
<tr>
<td>HAAP</td>
<td>Youth HIV/AIDS Awareness Project</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>Human Immunodeficiency Virus /Acquired Immunodeficiency Syndrome</td>
</tr>
<tr>
<td>IITA</td>
<td>International Institute of Tropical Agriculture</td>
</tr>
<tr>
<td>INED</td>
<td>Integrated Environment Defense</td>
</tr>
<tr>
<td>JAF</td>
<td>James Arwata Foundation</td>
</tr>
<tr>
<td>KT</td>
<td>Kilimo Trust</td>
</tr>
<tr>
<td>LZARDI</td>
<td>Lake Zone Agricultural Research and Development Institute</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
</tr>
<tr>
<td>MKUKUTA</td>
<td>Mpango wa Kuratibu na Kukuza Uchumi wa Taifa</td>
</tr>
<tr>
<td>NAADS</td>
<td>National Agricultural Advisory Services</td>
</tr>
<tr>
<td>NADDO</td>
<td>Nakasongola District Development Organization</td>
</tr>
<tr>
<td>NARO</td>
<td>National Agricultural Research Organization</td>
</tr>
<tr>
<td>NARS</td>
<td>National Agricultural Research System</td>
</tr>
<tr>
<td>NGO</td>
<td>Non Governmental Organizations</td>
</tr>
<tr>
<td>NOGUMU</td>
<td>National Organic Movement in Uganda</td>
</tr>
<tr>
<td>NPT</td>
<td>National Performance Trial</td>
</tr>
<tr>
<td>PADEP</td>
<td>Participatory Agricultural Development and Empowerment Project</td>
</tr>
<tr>
<td>SIDO</td>
<td>Small Industries Development Organization</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strength Weakness Opportunity Threats</td>
</tr>
<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>
</tbody>
</table>
LIST OF FIGURES

Figure 1: Production (MT), Area harvested (Ha) and productivity trend of yams in Tanzania ..3
Figure 2: Institutions offering training on yam production and marketing .......................... 14
Figure 3: Main buyers of yams and means of determining prices in Uganda and Tanzania .... 15
Figure 4: Post harvest handling activities before selling .................................................. 16
Figure 5: Gender distribution in the yams value chain .................................................... 16
Figure 6: Challenges facing yam producers and the suggested recommendations ............ 17
Figure 7: Reasons for some traders doing better than wholesalers in Uganda and Tanzania.... 19
Figure 8: Duration of retailers in the yams retailing business across the EAC ....................... 19
Figure 9: Major yam types traded by retailers in Uganda ................................................. 20
Figure 10: Yam retailers’ competitors in Uganda, Tanzania and the EAC in general ......... 20
Figure 11: Price determination at yams retail level across the EAC ................................. 21
Figure 12: Major yam retailers’ customers by country across the EAC ......................... 22
Figure 13: Challenges facing transporters in the EAC and suggested interventions ........... 23
Figure 14: Services demanded by transporters and challenges in accessing them ............ 24
Figure 15: Perception on Yams as a staple food by the rural and urban consumer segments - across the EAC ........................................................................................................... 25
Figure 16: Types of yams consumed by individual consumers in Uganda ......................... 26
Figure 17: Major yams products purchased by consumers - across the EAC ..................... 27
Figure 18: Sources of supply of yams and yam products for yams consumers across the EAC .............................................................................................................................. 27
Figure 19: Reasons by consumers for preferring different sources of yams and yam products in Tanzania .................................................................................................................. 28
Figure 20: Reasons by consumers for preferring different sources of yams and yam products in Uganda .................................................................................................................. 28
Figure 21: Household consumption trends of yams and yam products as perceived by consumers in Tanzania .............................................................................................................. 29
Figure 22: Household consumption trends of yams and yam products as perceived by consumers in Uganda .............................................................................................................. 29
Figure 23: Household consumption trends of yams and yam products as perceived by consumers across the EAC ........................................................................................................ 29
Figure 24: Commodities that are highly consumed by institutions in Uganda, Tanzania and EAC ............................................................................................................................... 30
Figure 25: Roasted yams being sold by food vendors in Kenya ............................................ 32
Figure 26: Sources of yam supply by segment of food vendors - across the EAC ............... 33
Figure 27: Major food staples consumed by the non - yam consumers across the EAC ...... 34
Figure 28: Reasons for not consuming yams across the EAC ............................................ 34
Figure 29: Yams value chain (core processes) map in Tanzania ........................................ 35
Figure 30: Flow of yams from production to trading areas in Tanzania .............................. 36
Figure 31: Value Capture along the Yams Value Chain ...................................................... 37
Figure 32: Horizontal and Vertical Linkages along the Yams Value Chain in Tanzania ...... 38
Figure 33: Business Development Services provision and relationships with actors .......... 38
Figure 34: Core processes in the Uganda yams value chain ............................................. 42
Figure 35: Uganda Yams geographical trade flows ............................................................. 44
Figure 36: Value Capture along the Yams Value Chain in Uganda ................................. 45
Figure 37: Horizontal and Vertical Linkages in the Yam Value Chain ............................. 46
LIST OF TABLES

Table 1: Relative nutritional benefits of spending US$ 1 on yams ........................................ 5
Table 2: Sample Distribution of places visited in the EAC region ........................................ 10
Table 3: Category of Respondents interviewed along the yams value chain......................... 11
Table 4: Category of respondents interviewed for the yams demand analysis ....................... 11
Table 5: Land allocation (hectares) by selected commodities in Uganda and Tanzania ........ 15
Table 6: Mode of Transport and corresponding transporters interviewed .......................... 22
Table 7: Number of individual consumers interviewed ......................................................... 24
Table 8: Income levels of individual consumers interviewed .............................................. 25
Table 9: Institutional yam consumers interviewed in Kenya, Tanzania and Uganda .......... 31
Table 10: Number of vendors interviewed in the EAC ......................................................... 32
Table 11: Previous interventions in yams subsector in Tanzania ........................................ 40
Table 13: On-going and previous interventions in yams sub-sector in Uganda ................. 47
1. INTRODUCTION

1.1 Objectives

1) The **main objective** of this study was to determine the extent to which developing the markets (including consumption by producers themselves) of yam commodity and its products in Tanzania and Uganda, would contribute to the achievement of food and nutrition security, especially for low income earners as well as creating wealth and enhancing their incomes.

2) This study presents an analysis of the Demand and Value Chain of yams in Uganda and Tanzania, and the Rest of East Africa member states. It provides a general picture with regard to the production, trading and consumption of yams in the region.

1.2 The Overarching Context

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

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

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

4) The East Africa Community (EAC) 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.

5) 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. In the EAC Region, more than 40% of such commodities are often lost at post harvest and processing levels - since only 28% of the agricultural produce is processed. The proportion of processing is even lower for perishable commodities. However, through processing the stable shelf-life of all the so called perishable commodities can be increased to several years enabling them to be traded widely in space and time.

6) Without adequate commercialization of the perishable staples produced in Africa, it will be difficult to achieve Millennium Development Goal (MDG) 1 (elimination of hunger, malnutrition and poverty).
2. SITUATION ANALYSIS

2.1 Yams Production

7) Yams (Dioscorea spp) are a high value crop and forms about 10% of the total roots and tubers produced in the world (FAO, 2002). They serve as staple food in many countries. In the developing world, yams rank among the top 10 food crops (Scott et al., 2000; Phillips et al., 2004 and Nweke, 2004). Sub-Saharan Africa accounts for 70% of world yams production grown on 2.83 million hectares of land (CGIAR, 2009 and IITA, 2009). Nigeria is the leading producer with 34 million tonnes followed by Côte d’Ivoire (5 million tonnes), Ghana (3.9 million), and Bénin (2.1 million tonnes), (IITA 2009).

8) In the major producing countries of West Africa, yields are about 11 MT/ha (IITA 2009). In Tanzania, where yams are mainly a low-input, food security crop grown on small scale, with relatively constant yields at about 6 MT/ha (Asiedu-Larbi, 2010). Information on yield from Uganda was not available. A comparison between these findings demonstrates a significant yield gap of 5 MT/ Ha between West Africa and Tanzania with the former producing at large scale and the latter at small scale.

9) In Uganda, yam is mainly intercropped within banana fields with crops such as coffee, cassava and cocoyam or as individual plants grown against trees for support. It is also monocropped in a few areas such as Eastern Uganda where it has local importance (Coyne et al, 2004). The setts (tuber pieces or white tubers used for planting) are planted towards the end of the dry season while dormant. Sometimes they are pre-germinated.

10) A survey of yams in eleven districts in Uganda revealed that yellow Guinea yam (D. cayenensis) and water yam (D. alata), were mostly found under cultivation in farmers’ fields. White Guinea yam (D. rotundata), the African species with the largest volume of production among yams in the world due to its dominance in West Africa and good tuber food quality was not found (Coyne et al, 2004). Today, the major yams varieties grown in Uganda are Kyetutumula (D. cayenensis), Kikwa (D. burkilliana), Makunyi (D. bulbisiana), Masebe (D. alata), Nandigoya (D. alata), Ndaggu Nganda (D.alata), Ndaggu Nziba (D.alata) and Balugu (Mudiope, et al., 2007).

11) For yams, the cost of production is relatively high compared to other root crops due to the fact that they require staking in many areas, greater labor input for land preparation (clearing and mounding), weeding and careful harvesting. Stalking is essential if good yields are to be obtained (Curran S., and Cook J., 2009; IITA 2009). Strings are tied from mounds to the trees for the yams to climb up. This permits a higher leaf area per vine. When mulching, it is important to use grass, straw and leaves on top of the mound or ridges (IITA 2009). Ficus natelensis (omutuba) tree is the best support for yams, but other tree species can be used for stalking. Yams respond well under omutuba trees because of continuous water and leaf litter droppings. When they shed their leaves, they give more light to the vines.

12) IITA (2009) reported that the aforementioned labor requirements exceed those for other starchy staples such as cassava accounting for about 40% of yam production costs while 50% of the expenditure goes to planting materials. If farmers do not purchase new seed yams, they must set aside about 30% of their harvest for planting the next year.
13) In Tanzania, production of yams is found in North-Western Tanzania around Kagera Region and Northern Tanzania especially in Kilimanjaro and Arusha regions, as well as in Morogoro and Zanzibar. In Uganda, yams are reported to be grown in Rakai, Masaka, Kapchorwa, Mbale, Iganga, Mukono, Luweero, Masindi, Adjumani, Nakasongola and Kayunga.

14) Between 2003 and 2011, there were increased production trends of yams in Tanzania. The highest produce of 9,800 MT were realized in 2011 while in the same year the area harvested drastically reduced to 1475 ha. Productivity trend was also highest in the same year at 6.6MT/Ha and lowest in 2009 at 4.9 MT/Ha (Figure 1).

15) However data on production, area harvested and productivity in Uganda was not available.

Figure 1: Production (MT), Area harvested (Ha) and productivity trend of yams in Tanzania
Source: FAOSTAT, 2013

16) In the southern zone of Tanzania, yam is considered a women crop. Some of the varieties which are available in the zone are vinamvila, mhoko, nkonga wa nembo, hangadi, hamandeke, vitundi, luvale, matu, Mnywele and vyekunde (Mtwara and Newala Districts). The harvesting is done by women. After harvest, heads cut from the tuber are planted during the same period of harvest July-October. The main distinguishing characters are the shape of tubers, colour of the flesh/cortex, colour of skin and taste (Mponda et al, 2001).

17) According to most farmers, yams cultivation has declined over the years. Some of the varieties are in the state of extinction and are mainly grown by the old, for example matu. Generally, most of the yams genetic resources have been lost and continue to be lost. This could be explained due to unavailability of planting material. Upcoming farmers such as the youth do not easily access planting material as is the case with other crops. For yams planting is done during the same period of harvesting (dry season) (Mponda et al, 2001).

18) In Mtwara for example, yams are harvested from the field anytime from May each year. They are usually stored above the ceiling in a cool room under dry conditions. But it is also possible to keep yams in containers that are airy placed in cool and dry places (Mponda et al, 2001).
19) The major constraints in yams production include: high production costs (planting material and labor), decreasing soil fertility, perishability of seed yams and their bulkiness during transport, inadequate yield potential of varieties, as well as increasing levels of field and storage pests and diseases associated with intensification of cultivation (IITA 2009).

2.2 Yams Processing, Utilization and Marketing

20) The yam is mainly consumed fresh with the tubers generally eaten as a vegetable, boiled, baked or fried (Curran S., and Cook J., 2009). In Tanzania, yams are normally boiled and eaten as *futari* during the Ramadan period and sometimes as *Mseto* when mixed with other vegetables. For example the *vitundi* yams have become very popular during the ramadhan period (Mponda et al, 2001). In Uganda the *endagui* is liked by many consumers. In the past, Baganda tribesmen used yams as vegetables by mixing it with legumes or oily seeds.

21) The tubers may also be mashed or pounded into dough after boiling, processed into flour, or cooked into pottage with added protein sauce and oils. There is very little processing of yams in Tanzania and Uganda.

22) Tuber peelings and over matured tubers have been used as feeds for animals such as pigs, goat and chicken. In Bugisu, in Eastern Uganda, the bitter yam (*Dioscorea dumetorum*) is crushed and fed to milking animals to increase milk production.

23) In Tanzania consumption of yams is found in North-Western Tanzania around Kagera Region and Northern Tanzania especially in Kilimanjaro and Arusha regions, as well as in Morogoro and Zanzibar. In Uganda, trading of yams is in major towns such as Kampala, Mukono and Masaka.

24) Although some farmers prefer exchanging yams for manual labour on their farms, many farmers sell yams particularly D. cayensis (*Kyetutula and Bulugu*) in both rural and urban markets. Normally tubers are displayed in the open/sun which leads to deterioration of the commodity.

25) Under tropical conditions, sound tubers will store for about four months depending on variety and species. Most producers store their yams underground while others store in the house by spreading on the ground (IITA, 2009).

2.3 Nutritional and Socio-cultural Importance of Yams

26) Yams are essentially carbohydrate foods with relatively high protein, fats and ascorbic acid (Vitamin C) content, dietary fibre which helps reduce constipation and they are also low in saturated fat and sodium. The tuber is a rich source of minerals like copper, calcium, potassium, iron, manganese, and phosphorus. 100 g provides about 816 mg of Potassium. Potassium is an important component of cell and body fluids, which helps control heart rate and blood pressure by countering hypertensive effects of sodium. Copper is required in the production of red blood cells. Manganese is used by the body as a co-factor for the antioxidant enzyme, *superoxide dismutase*. Iron is required for red blood cell formation. The high potassium and low sodium balance protects against osteoporosis and heart disease. Yam products have a lower glycemic index than potato products thus providing a more sustained form of energy and better protection against obesity and diabetes. (USDA, 2013)
27) The approximate composition of edible yam tubers is water 65 to 75%, protein 1 to 2.5%, fat 0.05 to 0.20%, carbohydrates mainly starch 15 to 25%, fibre 0.5 to 1.5% and ash 0.7 to 2.0%. They also contain 8 to 10 mg/100g of ascorbic acid, most of which is retained during cooking (Table 1).

28) Yams are a source of food and nutrition for some of the world’s poorest and undernourished households, and are valued for their stable yields under conditions in which other crops may fail (Alexandratos, 1995; Scott et al., 2000). Some ritualism is also developed around the production and utilization of yam (IITA, 2006). For example, in Uganda consumption of yams is also associated with the birth of twins.

Table 1: Relative nutritional benefits of spending US$ 1 on yams

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Energy (Kcal)</th>
<th>Carbohydrates (g)</th>
<th>Proteins (g)</th>
<th>Total fibre (g)</th>
<th>Iron (mg)</th>
<th>Potassium (mg)</th>
<th>Zinc (mg)</th>
<th>Vitamin A RAE (ug)</th>
<th>Vitamin C (mg)</th>
<th>Thiamine (mg)</th>
<th>Vitamin D (IU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bananas</td>
<td>2745</td>
<td>717</td>
<td>29</td>
<td>32</td>
<td>18</td>
<td>12248</td>
<td>8</td>
<td>1260</td>
<td>414</td>
<td>4</td>
<td>1120</td>
</tr>
<tr>
<td>Rice</td>
<td>3006</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>12668</td>
<td>11</td>
<td>26631</td>
<td>98</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Yams</td>
<td>2360</td>
<td>558</td>
<td>31</td>
<td>82</td>
<td>11</td>
<td>16320</td>
<td>5</td>
<td>140</td>
<td>342</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Cassava</td>
<td>384</td>
<td>694</td>
<td>44</td>
<td>60</td>
<td>9</td>
<td>8957</td>
<td>31</td>
<td>684</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Maize grain</td>
<td>7446</td>
<td>1315</td>
<td>192</td>
<td>35</td>
<td>35</td>
<td>3855</td>
<td>45</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Maize flour</td>
<td>5897</td>
<td>1147</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>3834</td>
<td>1064</td>
<td>811</td>
<td>62</td>
<td>141</td>
<td>54350</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>156</td>
<td>105</td>
<td>83390</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Sorghum flour</td>
<td>6660</td>
<td>1429</td>
<td>177</td>
<td>122</td>
<td>35</td>
<td>3738</td>
<td>27</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Chicken</td>
<td>370.7</td>
<td>0</td>
<td>32.1</td>
<td>0</td>
<td>1.6</td>
<td>322.9</td>
<td>23</td>
<td>70.7</td>
<td>2.8</td>
<td>0.1</td>
<td>17.2</td>
</tr>
<tr>
<td>Beef</td>
<td>433.3</td>
<td>0</td>
<td>61.7</td>
<td>0</td>
<td>2.6</td>
<td>1803.0</td>
<td>23.2</td>
<td>6.1</td>
<td>0</td>
<td>0.2</td>
<td>12.1</td>
</tr>
<tr>
<td>Dairy</td>
<td>381</td>
<td>43.9</td>
<td>40</td>
<td>0</td>
<td>9.3</td>
<td>1249.1</td>
<td>3.4</td>
<td>438.1</td>
<td>0</td>
<td>9.4</td>
<td>15.1</td>
</tr>
<tr>
<td>Goat</td>
<td>251.7</td>
<td>0</td>
<td>25.3</td>
<td>0</td>
<td>6.5</td>
<td>885.1</td>
<td>9.2</td>
<td>0</td>
<td>0</td>
<td>0.3</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>2224</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Millet flour</td>
<td>2454</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>2051</td>
<td>74</td>
<td>118</td>
<td>59</td>
<td>21</td>
<td>9234</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

3. METHODOLOGY

3.1 Data Needs, Sources and Limitations

3.1.1 Secondary data

29) This assignment started with a review of secondary data and information with an aim to: i) identify any efforts done in the yams value chain in Tanzania and Uganda, ii) identify important gaps which needed filling using primary data to ensure that the study contributes to existing knowledge and iii) widen the understanding of the yams sub-sector in the two countries.

30) The following data and information was collected from secondary sources for yams:

a) Demand for yams in the EAC region. The specific data collected included:
   i) The different segments of consumers (individual and institutional) of yams in the region,
   ii) The varieties, types and forms they prefer and the reasons for preference,
   iii) The amount (on weight basis) of yams they consume per period of time,
   iv) The sources of the yams demanded as well as the market prices and
   v) The challenges facing the consumers in accessing and consuming yams including unavailability of desired varieties, unfriendly prices and long distance to the source.

b) Trade in yams in Tanzania and Uganda. Data was collected on the following:
   i) The main actors trading in yams, their scale of operation as well as their geographical coverage,
   ii) Sources of their supply and the target end markets, how much they source and trade,
   iii) The costs they incur in their operations 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 of yams in Tanzania and Uganda. This formed the supply side of the two value chains. The specific aspects considered were:
   i) Varieties grown and why they were preferred,
   ii) Land size under yams cultivation and quantities produced,
   iii) The percentage of the produce sold to assess the level of commercialization of the commodity,
   iv) The target markets where they sell their produce and the form in which they sell them,
   v) Modes of operation (individual farmers vs. groups) of the producers and the implication of the modes in terms of production costs incurred as well as gross margins realized from the enterprise and
   vi) The challenges the suppliers face in their activities.

31) 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 yams 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

32) A plan to collect primary data was designed in consultation with experts in yams from across all the EAC partner states. 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, in their presentations,

c) Provided guidance on how to fill the gaps by:
   i) Providing some of the required data to beef up the secondary information already collected,
   ii) Providing possible organizations and contact persons to help in collecting the primary data required,

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

33) The actors interviewed along the value chain and the primary data collected from them was as discussed below.

a) **Input suppliers**: These included seed 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) Sources of their inputs and the terms of accessing the inputs including price among other terms, costs involved and margins realized.
   ii) Their target customers and terms of accessing the inputs including price among other terms by their customers.
   iii) Their 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 of having contracts as well as disadvantages of not having such.
   iv) The formality of their enterprises as evidenced by an operation license, benefits of running a legal business entity, as well as the disadvantage of not formalizing the enterprises.
   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 their impact on the sector (positive or negative).
b) **Producers:** Both individual farmers and farmer groups were interviewed for the following data.
   i) Varieties they prefer growing and the characteristics that make those particular varieties to be preferred.
   ii) Size of land under cultivation, inputs and agronomic practices applied, harvesting and post harvest technologies accessed.
   iii) Quantities produced, the percentage of the produce marketed and where it is sold.
   iv) Production costs incurred in 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) Challenges in the production of yams including post harvest handling challenges, their suggested solutions to the challenges and the probable stakeholders who could be tasked with the responsibility.

c) **Traders:** The traders interviewed were middlemen, transporters, processors, wholesalers and retailers. The following information was collected from them:
   i) Sources of their supply and existing supply gaps in terms of quantities expected against actual quantities purchased.
   ii) Varieties of yams they trade in and why, forms in which they are traded and why.
   iii) Main customers and their location, prices and pricing mechanism of their traded yams.
   iv) Their geographic scope of operation, legality of their enterprises and support services availability and accessibility.
   v) Challenges encountered 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 organizational consumers were interviewed for data on:
   i) Their income brackets and location.
   ii) Size of their households for individual consumers and the population in the case of organizations, amount consumed and substitutes for yams.
   iii) Their main suppliers, the varieties consumed and why, proportion of the total food budget going to purchasing yams,
   iv) Their demand response to changes in prices, challenges they face in accessing yams for consumption and any possible ways of addressing them.

e) **Business Support Service Providers** who included market information providers, finance providers and researchers were interviewed on:
   i) Their target clients, products and services they offer and the terms of offer.
   ii) Their geographic scope including where their customers are located, their mode of delivery of their services, challenges they face in the delivery of their products and services and any possible opportunities.
   iii) Information on the legality of their businesses was also sought.

3.1.3 **Sampling Techniques and Sample Size**

34) Appropriate sampling techniques (census, purposive and simple random sampling) were selected and used as described.
a) Census was conducted on research institutions, experts and input suppliers 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 especially on improved varieties of yams. 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 for financial service providers were used.

35) The following areas and respondents in Tanzania, Uganda and the rest of the EAC were sampled (Tables 2, 3 and 4).
Table 2: Sample Distribution of places visited in the EAC region

<table>
<thead>
<tr>
<th>UGANDA</th>
<th>URBAN (CONSUMPTION AND TRADE)</th>
<th>URBAN (PRODUCING)</th>
<th>RURAL (PRODUCING)</th>
<th>RURAL (NON PRODUCING)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mbale</td>
<td>Jinja</td>
<td>Butaleja</td>
<td>Kampala</td>
</tr>
<tr>
<td></td>
<td>Iganga</td>
<td>Masaka</td>
<td>Luweero</td>
<td>Nakasongola</td>
</tr>
<tr>
<td></td>
<td>Masindi</td>
<td>Mubende</td>
<td>Soroti</td>
<td>Kayunga</td>
</tr>
<tr>
<td></td>
<td>Mukono</td>
<td>Kumi</td>
<td>Lira</td>
<td>Adjumani</td>
</tr>
<tr>
<td></td>
<td>Kyegegwa</td>
<td>Mubende</td>
<td>Soroti</td>
<td>Kayunga</td>
</tr>
<tr>
<td></td>
<td>Mugoni</td>
<td>Karabole</td>
<td>Lira</td>
<td>Adjumani</td>
</tr>
<tr>
<td></td>
<td>Kyanjoo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TANZANIA</td>
<td>Ub (consumption and trade)</td>
<td>Ub (Producing)</td>
<td>Rural (producing)</td>
<td>Rural (non producing)</td>
</tr>
<tr>
<td></td>
<td>Shinyanga</td>
<td>Shinyanga urban</td>
<td>Shinyanga rural</td>
<td>Mbeya rural</td>
</tr>
<tr>
<td></td>
<td>Bukoba</td>
<td>Kahama urban</td>
<td>Kahama rural</td>
<td>Gairo rural</td>
</tr>
<tr>
<td></td>
<td>Mbeya town</td>
<td>Misenyi district</td>
<td>Kishapu district</td>
<td>Hai District</td>
</tr>
<tr>
<td></td>
<td>Makumbako town</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Njombe town</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Morogoro</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gairo urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mvomero urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mwanza Municipality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Magu town center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Misungwi town center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sengerema town center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arusha Municipal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moshi Municipal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BURUNDI</td>
<td>Urban</td>
<td>Rural (producing)</td>
<td>Rural (non-producing)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bujumbura capital</td>
<td>Buja/Rural province</td>
<td>Kirundo province</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bururi province</td>
<td>Murambya province</td>
<td></td>
</tr>
<tr>
<td>KENYA</td>
<td>Mombasa town</td>
<td>Taita Taveta</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meru town</td>
<td>Chaaria</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nakuru town</td>
<td></td>
<td>Mombasa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nairobi city</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Starehe constituency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Langata constituency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Roysambu constituency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Westlands constituency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RWANDA</td>
<td>Kigali city</td>
<td>Gakenke</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ruhango</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Category of Respondents interviewed along the yams value chain

<table>
<thead>
<tr>
<th>Country</th>
<th>Input Suppliers</th>
<th>Producers</th>
<th>Transporters</th>
<th>Retailers</th>
<th>Wholesalers</th>
<th>BDS providers</th>
<th>Financial Service Providers</th>
<th>Key Informants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>18</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Kenya</td>
<td>45</td>
<td>39</td>
<td>26</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rwanda</td>
<td>25</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>10</td>
<td>53</td>
<td>30</td>
<td>112</td>
<td>31</td>
<td>4</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Uganda</td>
<td>15</td>
<td>242</td>
<td>66</td>
<td>173</td>
<td>70</td>
<td>24</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>295</td>
<td>141</td>
<td>367</td>
<td>162</td>
<td>31</td>
<td>54</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 4: Category of respondents interviewed for the yams demand analysis

<table>
<thead>
<tr>
<th>Country</th>
<th>Consumers</th>
<th>Food vendors</th>
<th>Institutional buyers</th>
<th>Food processors</th>
<th>Yam Feed processors</th>
<th>Non consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>97</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>52</td>
</tr>
<tr>
<td>Kenya</td>
<td>165</td>
<td>76</td>
<td>15</td>
<td></td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>Rwanda</td>
<td>138</td>
<td>113</td>
<td></td>
<td></td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tanzania</td>
<td>179</td>
<td>75</td>
<td>4</td>
<td></td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>Uganda</td>
<td>325</td>
<td>112</td>
<td>12</td>
<td>1</td>
<td></td>
<td>121</td>
</tr>
<tr>
<td>Total</td>
<td>904</td>
<td>377</td>
<td>31</td>
<td>1</td>
<td></td>
<td>427</td>
</tr>
</tbody>
</table>

3.2 Tools and Data Collection

36) Different tools were used to collect and record data from different respondents as were deemed appropriate. Structured questionnaires were administered to producers, traders and consumers because their activities in the yams value chain were specific. On the other hand, interview guides were administered to BDS providers and experts since they cut across several activities along the value chain.

37) The methods to administer the tools were interviews, focus group discussions for farmer groups as well as observation by the field staff. Observations were recorded and reported to the analysis team in an insights reporting session.

3.3 Data Analysis

38) The data collected was captured using Census and Survey Processing (CSPro) system. The system captures both qualitative and quantitative data. This makes it a more powerful tool for data capture especially if the data is to be referred to in the future. After capture, the data was then exported to the SPSS on need basis for cleaning and analysis. The process of data analysis involved editing, recoding, verification and interpretation so as to ensure data accuracy. Both qualitative and quantitative data analyses approaches were utilized. Results from descriptive analysis were presented in form of tables, graphs and charts to give trends and patterns. 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.

39) Quantitative analysis on the other hand involved calculating trends e.g. costs, prices and gross margins along the value chains. Value chain mapping approach was also used with the resulting maps being interpreted and relevant implications attached to the interpretations.
Some of the maps produced were: value chain actors, processes and activities maps. 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 in the value chain 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.

3.4 Limitations of the Data

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

b) There was limited secondary data information on yams and some of what was available was very outdated which made it difficult to conduct a comprehensive situation analysis to guide the study.

c) The study was conducted during off peak in Tanzania and in Uganda and therefore the price dynamics would have been different had the study been undertaken during a peak season.

d) It was difficult to classify the varieties traded and consumed in Tanzania due to limited capacity among the experts.

e) Lack of harmonization of yam types and varieties within the regions in the countries.

f) 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 period of data collection exercise.

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

h) Transporters of yams were not commodity-specific since they transported other commodities such as bananas alongside the yams.

i) It was not possible to obtain equal number of respondents for each category of respondents. Some categories such as processors and institutional buyers had very few actors (in fact, there was only one processor of yams in the entire region, found in Uganda!).

j) There was poor response to some questions on costs and margins which made it difficult to calculate gross margins.
4. SURVEY RESULTS

40) The main operators in the yam value chain are: input suppliers, producers, processors, assemblers, retailers (urban and rural), wholesalers (urban and rural), transporters who also double as traders and processors.

4.1 Input supply

41) A total of 25 input suppliers were interviewed (Tanzania-10 and Uganda-15). The study noted that most input suppliers are located in urban areas and other up-country towns. They mostly supply farm implements such as hoes and occasionally seed yam. Planting materials are majorly sourced from fellow farmers, mostly for free, with very little supplies from NGO’s, agricultural research centres and government programs. The main customers of the input suppliers are farmers and non-governmental organizations.

42) In Uganda, some of the NGOs and projects involved in seed yam supply include: National Organic Movement in Uganda (NOGUMU), Busoga Rural Open Source Development Initiative (BROSIDI), Integrated Environment Defense (INED) and Yam Food Promotion Project (YFP). It was noted that there were a few farmers who took planting materials to the open markets for sale. There were no dedicated private planting materials suppliers which is one of the market failures that has resulted in low production and productivity of the commodity.

43) Other inputs that are important at the processing stage of the value chain are tarpaulins, milling machines and packing materials. The input suppliers also provide after sale services such as training in production and marketing of agricultural produce, extension services and provision of market information.

4.2 Production and Productivity of yams

44) Both individual producers as well as producer groups were targeted by the study. However, only data from individual farmers was analyzed because there were no farmer groups specializing in yams. A total of 295 producers were interviewed with 242 of them from Uganda and the remaining 53 from Tanzania.

45) The scale of cultivation of yams in Tanzania and Uganda is small; hence it was not possible to determine the acreage under yams in most places. To quantify the scale of production, the number of plants per producer was used. Some households reported a minimum of 3 plants and a maximum of 3 acres as observed in Zanzibar. Moreover, there were cases of households having one (1) yam plant.

46) Most producers in Uganda grow yellow and water yams. The major yams varieties grown in Uganda are Kyetutumula, Kikwa, Makunyi, Masebe, Nandigoya, Ndaggu Nganda, Ndaggu Nziba and Balugu.

47) Findings from the study showed that production and harvesting occur throughout the year with some months experiencing relatively more activity than others. Yams take longer period of time to mature (6 months to 12 months depending on variety) compared to other
food crops. Many households intercrop yams with other crops such as coffee, cassava, coco yams and maize. A few others grow yam plants individually against trees.

48) The two main inputs used for yam production are planting material and hand hoes and ox-drawn plough for cultivating. Seed yams are the most expensive inputs in the yam production. Consequently, farmers prefer using their own seed yams with most of the planting materials being sourced from fellow farmers. They treat the seed yam using wood ash. Some producers reported to be using herbicides not specifically for yams but for other commodities intercropped with yams. In Tanzania, 35% of the respondents reported that they use farmyard manure and more so those who planted their crop in hills.

49) Other activities that are undertaken by the farmers to ensure supply of yams include: accessing improved planting materials, marketing, storage which is mainly in ground and sometimes in the family houses and participation in various types of trainings. The study noted that the producers in Tanzania access improved planting material more than their counterparts in Uganda. This is because of the relatively high levels of commercialization and extension services in Tanzania than Uganda, and improved infrastructure especially feeder road networks.

50) Of all the interviewed producers, 19% had attended training on yams specifically on agronomic practices, post harvest handling and marketing in that order. Training in agronomy was common and accounted for 90% in Tanzania and 80% in Uganda. In Tanzania, there were no producers trained on marketing which is a gap that needs an urgent attention. Training is mainly from government or its agents for example in Tanzania PADEP and in Uganda NAADS. However in Uganda CBOs are more active in building the capacity of yam producers. In both countries, NGO’s like IITA are also involved in capacity building.

![Figure 2: Institutions offering training on yam production and marketing](N=295)

### 4.3 Land Resources Allocation to Yams

51) Due to scarcity of resources, yams compete with other crops for land and labour among others. Hence, an analysis for land allocation to different crops in both Tanzania and Uganda was undertaken. It was noted that other commodities are given more attention than yams (Table 5).
Table 5: Land allocation (hectares) by selected commodities in Uganda and Tanzania

<table>
<thead>
<tr>
<th>Year</th>
<th>National land allocation in Ha</th>
<th>Yams</th>
<th>Cassava</th>
<th>Sweet potato</th>
<th>Irish potato</th>
<th>Maize</th>
<th>Dry beans</th>
<th>Sorghum</th>
<th>Millet</th>
<th>Rice</th>
<th>Vegetables</th>
<th>Bananas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Tanzania</td>
<td>1800</td>
<td>879000</td>
<td>576220</td>
<td>172970</td>
<td>363070</td>
<td>1208690</td>
<td>613870</td>
<td>345855</td>
<td>1136290</td>
<td>300000</td>
<td>1208690</td>
</tr>
<tr>
<td></td>
<td>Uganda</td>
<td>415000</td>
<td>620000</td>
<td>102000</td>
<td>1032000</td>
<td>930000</td>
<td>470000</td>
<td>350000</td>
<td>1119320</td>
<td>286225</td>
<td>737661</td>
<td>143000</td>
</tr>
<tr>
<td>2011</td>
<td>Tanzania</td>
<td>1475</td>
<td>739794</td>
<td>699073</td>
<td>203089</td>
<td>3287850</td>
<td>737661</td>
<td>811164</td>
<td>350000</td>
<td>1119320</td>
<td>286225</td>
<td>737661</td>
</tr>
<tr>
<td></td>
<td>Uganda</td>
<td>426148</td>
<td>531790</td>
<td>96717</td>
<td>1063000</td>
<td>1142660</td>
<td>364000</td>
<td>483917</td>
<td>90000</td>
<td>128801</td>
<td>108585</td>
<td></td>
</tr>
</tbody>
</table>

Source: FAO, 2013

4.4 Marketing

52) Producers grow yams for income generation and own consumption. However, data from the study could not establish the levels of commercialization of yams in both countries due to the piece meal nature of harvesting and trading. In Tanzania there were specific times when the trade of yams is high including the month of Ramadan, school festivals and other festive periods. However, in Uganda 24% of what is produced is sold for income generation while about 76% is retained for consumption by the producing households. Most of the trade in yams involves farmers selling directly to consumers.

53) Yams are majorly sold fresh as reported by 95% and 97% of respondents selling their produce in this form in Tanzania and Uganda respectively. Farmers sell to their customers in heaps of 15-25 kg at US$ 3.731 - US$ 9.31.

54) Other forms in which yams are sold include boiled as reported by 3% and 2% of the respondents. The remaining percentage is sold as confectionaries. The buyers include individual consumers and traders who sell to either consumers or other traders as summarized in Figure 3. Yams are displayed under shade or a well-aerated place to enable them keep longer after harvesting.

55) Price is majorly determined through negotiations. In other circumstances, it is determined by the producers or the consumers. In Tanzania, competition is a determinant of prices as was reported by 41% of the producers which is not the case in Uganda where trade in yams is unstructured.

56) Yams are exposed to several post-harvest handling practices as a way of adding value. Such activities include treating damaged tubers with ash, washing off excess soil and storage. The

\[1\] 1 US$ = UGX 2,684 as at January, 2013 (Source, Bank of Uganda)
main activity is sorting according to size and level of damage. The bigger, clean and undamaged tubers attract premium prices (Figure 4).

![Figure 4: Post harvest handling activities before selling (N=295)](attachment)

57) Both men and women are involved in the production and marketing of yams with different activities being shared between men and women. In Tanzania, the value chain is more inclusive than in Uganda with over 60% of the activities being shared and 84% of the households having men and women marketing the commodity. On the other hand, in Ugandan households 43% of the marketing is by both men and women. This is because of the relatively high level of commercialization of the enterprise in Tanzania attracting men despite the commodity being traditionally for women (Figure 5).

![Figure 5: Gender distribution in the yams value chain (N=295)](attachment)

58) Several challenges were reported as hindering the production and marketing of yams. The key one was inadequate capital to invest in improved planting material and implements as reported by over 50% of the respondents. Pests and diseases, limited markets and poor weather conditions are all affecting yam production. The main pests attacking the growing tubers were termites and the tuber beetle. Fungal diseases were the most predominant on yam and can be controlled by: use of clean and healthy seed yams, treatment of seed yams with fungicide before planting, practicing crop rotation with legumes and cereals, and keeping farm clean of weeds.

59) To address these challenges, the producers suggested that there is need for training especially in agronomic practices and post harvest handling. The need for provision of timely and accurate market information was also important (Figure 6).
4.5 Yams processing and distribution patterns

60) There were very few yams processors in the region. As a result, only one (1) yam processor was interviewed during the data collection exercise and hence processing and distribution patterns of yams are presented as a case study (Box 1).

Box 1: Processing and distribution patterns for yams: The Case of Collecting and Exchange of Agricultural Contents (CELAC), Kayunga District Farmers’ Network

CELAC Kayunga District Farmers’ Network is a community based organization (CBO) situated in Kayunga district, Central region of Uganda. It has a membership of 18 members. CELAC processes yams but on a relatively small scale and mostly on demand basis. For instance in 2012, they managed to process about 7 MT of yams. The main varieties of yams that they use in processing are: “Nigerian” (improved balugu from Kawanda), Ekisebe, and mukulujjuni. The conversion rate is 100kg of raw yams = 30kg of yams flour. The CBO has 5 female and 1 male permanent employees.

The yams are sourced from the members who deliver about 1 bag weighing 100kg; each bag is purchased at a price of UGX50,000-60,000. When purchasing the key quality parameters that the CBO looks out for is appearance of the yams supplied which should be free from diseases and physical damage such as bruises.

The roots are sliced and then dried on tarpaulin. This process takes 2-3 days. The dried chips are then pounded in a mortar or taken to the mill where they are processed into flour, some of which is used in making confectionaries such as cakes, “bhagia”, and pancakes. The selling prices of these commodities vary and the final buying prices are negotiated between the buyer and the processor. The main marketing channels are the school canteens, retail shops, supermarkets, school canteens and food kiosks.

The distribution channel of the yams products

<table>
<thead>
<tr>
<th>Miller situated in Kayunga</th>
<th>Forms traded</th>
<th>Selling prices (in UGX)</th>
<th>Marketing channel (within Kayenga)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yam flour</td>
<td>8,000/kg</td>
<td>Food kiosks, retail shops, supermarkets</td>
</tr>
<tr>
<td></td>
<td>Cakes</td>
<td>450/kg</td>
<td>Schools, canteens</td>
</tr>
<tr>
<td></td>
<td>“Bhagia”</td>
<td>100/100g sachet</td>
<td>Schools, canteens</td>
</tr>
<tr>
<td></td>
<td>Pancakes</td>
<td>50/piece</td>
<td>Schools, canteens</td>
</tr>
</tbody>
</table>

The processor does not have direct competition from other yam processors but only from substitute products such as sweet potatoes and wheat. The firm is currently receiving support from BROSDI in provision of farm inputs to the producers in the group, preparing exhibitions, training of farmers and provision of starter planting materials.

The processor faces two key challenges namely: weather changes which interfere with the drying process thus leading to rotting of the raw materials and poor packaging.

The processor recommended that these problems can be addressed through provision of solar drying equipments to cater for the drying of the raw materials and provision of better packaging materials.
4.6 Yams Marketing in Tanzania and Uganda

4.6.1 Wholesalers

61) A total of 162 wholesalers were interviewed across the EAC out of which 21% and 47% were from Tanzania and Uganda respectively. In Uganda, 63% were rural while 37% were urban wholesalers. On the other hand, in Tanzania, 93% of the wholesalers were urban while only 7% were rural. In general, about 55% of them were men while 45% were women. About 90% of the wholesalers were involved directly in their business as the proprietors with 40% of them having been at it for over five years.

62) Yams were mainly sold as fresh by about 97% of the wholesalers in both Tanzania and Uganda. Other forms in which yams were traded are flour and dried chips. Majority of the wholesalers indicated that fresh yams are the most preferred because of their affordability by the consumers, as mentioned by over 45% of the wholesalers in both countries, compared to other forms. Furthermore, fresh yams are more readily available than any other form.

63) Yams are normally packed in sacks weighing between 200 – 300Kgs which takes between 4-5 men to load on a truck.

64) The wholesalers double up as transporters who travel to the producing areas to purchase from individual farmers. They later sell to local retailers, individual consumers, food vendors and institutions. In determining the prices, the wholesalers consider the quality of the product, the size, their relationship with the suppliers/buyers and the quantities involved.

65) Post-harvest losses resulting from rotting of the commodity were realized by 53% and 45% of Tanzanian and Ugandan wholesalers respectively. Other losses were as a result of physical damages such as breakages and bruises as reported by over 36% of the wholesalers in both countries and theft during storage.

66) The wholesalers’ major competitors are as fellow wholesalers, brokers and producers who sell directly to the consumers.

67) The wholesalers in both countries perceive their competitors as having a competitive advantage over them because they had enough working capital, established linkages and good relations with suppliers where some have formal supply contracts and pre-financing facility for their suppliers (Figure 7). The contracts are usually unwritten but depend on mutual trust which plays a key role in their execution. Pre-financing is sometimes executed in the form of packaging materials.
Market information and business management training are the major business support services accessed by wholesalers in Uganda and Tanzania. They are able to access business management because they also deal in other commodities in addition to yams. However, financial services such as business loans are only accessible to Ugandan wholesalers.

The major challenges encountered in the yams wholesaling include unreliable supply, high cost of the produce, low demand for the commodity, post-harvest losses resulting from breakages, and poor access roads during collection of the produce which increases the operating costs.

4.6.2 Retailers

A total of 367 retailers were interviewed across the EAC out of which 30% and 47% were interviewed in Tanzania and Uganda respectively. Over 30% of yams producers in both countries sell their produce directly to the consumers. Over 90% of the yams retail businesses are run by the proprietors themselves with over 35% of them having been in business for over 5 years (Figure 8). Rural retailers are either found on the road-side in the production areas or in the local open markets.
71) Fresh yams are the most common form of yams traded by 96% and 99% of retailers in Tanzania and Uganda respectively signifying very low levels of value addition and limited utilization of value added products. This could be attributed to low awareness on the part of the consumers and/or the retailers themselves on processed products. However, the retailers pointed out that the fresh products and their markets are readily available. The other traded forms are flour, dried chips and crisps.

72) Retailers trade in yellow, water, white, wild and bush yams. Yellow yams were the most common traded yams in Uganda (59%) followed by water yams. White, bush and wild yams were the least traded by a small number of retailers in Uganda respectively. (Figure 9). This is because both the yellow and water yams are primarily grown in Uganda and therefore the main ones available in the market. Some of the varieties traded by retailers in Tanzania included iona, buyu, majoka, maole, vitung, maombo and vigonzo. However, it was not possible to classify them and establish the most commonly traded types of yams in Tanzania.

73) The major determining factors for the type of yams to trade in are: availability from the suppliers (mostly farmers) and the demand levels by the consumers. This shows that both yellow and water yams are the most predominant types even among the producers and are also popular among the consumers. For example in Uganda, Kyetutumula which is a yellow type was preferred by most retailers since it fetches a relatively higher price than the others while baluga is found to be sweet and palatable to the consumers. Retailers also preferred trading in endaga - a water type since it is liked by consumers. This demonstrates that trading in yams is highly driven by consumer preferences and high commercial value for the retailers. White yams are native to West Africa and very scarce in East Africa.

74) Across the EAC, sometimes the retailers procure fewer supplies than required due to various reasons. Retailers indicated that limited working capital was the key reason for procuring fewer supplies of yams. Other important factors were low supply and demand of the commodity. This is exacerbated by the fact that the production is still very low coupled with low demand especially among the young generation.

75) The main competitors of yam retailers in the EAC region are other retailers, middlemen and producers and processors, especially in the case of Uganda, who sell directly to individual consumers. Other retailers are the main competitors for majority of the retailers in Tanzania (65%) and Uganda (62%) respectively. This scenario is the same across the
EAC with processors being the least important competitors (Figure 10). There is very limited processing.

![Chart: Yam retailers’ competitors in Uganda, Tanzania and the EAC in general (N=367)](chart10.png)

**Figure 10: Yam retailers’ competitors in Uganda, Tanzania and the EAC in general (N=367)**

76) The main sources of yams for majority of the retailers in Tanzania, Uganda and the rest of EAC are individual farmers, wholesalers and village assemblers in order of importance. Individual farmers are the most important suppliers for majority of retailers (44%) in Tanzania and Uganda (61%).

77) Among retailers in Tanzania, Uganda, Kenya, Burundi and Rwanda, prices are majorly determined by prevailing market prices, negotiations, suppliers, buyers and the retailer himself. Market forces of demand and supply (market price) are the key determinants of price for majority of retailers in Tanzania (80%). However, in Uganda, 32% of the retailers negotiate with the buyers while 31% of them determine prices themselves (Figure 11). Since yams are mainly traded in pieces, retailers also use size in determining the prices.

![Chart: Price determination at yams retail level across the EAC (N=367)](chart11.png)

**Figure 11: Price determination at yams retail level across the EAC (N=367)**

78) The common marketing channels for yams retailers are individual consumers, food vendors and institutional buyers. The main market segments for majority of retailers in Tanzania (87%) and Uganda (72%) are individual consumers. Institutional buyers are the
least important market segment for 2% of retailers in Uganda with no institutions buying from Tanzanian retailers which could point to lower popularity of the commodity among institutions (Figure 12).

Figure 12: Major yam retailers’ customers by country across the EAC (N=367)

79) The retailers interviewed are faced by a myriad of challenges when dealing with their suppliers such as high prices, delivery of poor quality products, unreliable supply and scattered suppliers. For instance, in Uganda, unreliable supply by individual farmers and high prices are the major challenges to 29% and 26% of the interviewed retailers respectively. However, in Tanzania, delivery of poor quality produce by individual producers and high prices by the suppliers are the most important challenges for 50% and 30% of the retailers respectively.

80) Unreliable supply points to low production and/or productivity while poor quality produce could be as a result of limited capacity of the suppliers especially farmers to effectively handle post-harvest handling practices. These are some of the major market failures in the yams value chain. Some of the post-harvest practices carried out by the retailers include: sorting, cleaning, storing and packing.

4.6.3 Transporters/ transporter traders

81) A total of 141 transporters were interviewed across the EAC. The means of transport in the region include small trucks (1 – 20 MT), motorcycles, bicycles, heavy trucks (>20 MT) and tractors.

Table 6: Mode of Transport and corresponding transporters interviewed

<table>
<thead>
<tr>
<th>Country</th>
<th>Bicycle N, (%)</th>
<th>Motorcycles N, (%)</th>
<th>Small trucks (1-20 tones) N, (%)</th>
<th>Heavy trucks (over 20 tones) N, (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>2 (4)</td>
<td>38 (83)</td>
<td>6 (13)</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Uganda</td>
<td>12 (18)</td>
<td>21 (31)</td>
<td>30 (45)</td>
<td>4 (6)</td>
<td>66</td>
</tr>
<tr>
<td>Tanzania</td>
<td>1 (3)</td>
<td>27 (90)</td>
<td>2 (7)</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>13 (9)</td>
<td>24 (17)</td>
<td>95 (66)</td>
<td>12 (8)</td>
<td>141</td>
</tr>
</tbody>
</table>
82) Small trucks are mostly used across the region because of the small to medium operation of actors making the big trucks (>20) uneconomical due to the relatively low volumes involved. Bicycles are mostly used in Uganda indicating that the volumes of yams being transported are smaller. Other means include motorcycles.

83) Most of the transporters are engaged in multiple commodity transportation with a few of them especially transporter-wholesalers engaging in yam transportation only. This could be attributed to the low quantities of yams to be transported which may not make economic sense to the transporters. They offer their services to traders (wholesalers and retailers) and farmers who take their produce directly to the market. The yams sold on the road-side in the production areas are transported by head or in wheel-barrows owing to their low quantities.

84) The scope of operation was classified into local, national and regional. Local was defined as any operation covering the district the transporter was based and the immediate bordering districts whereas national transporters were operating beyond the district of operation and the immediate neighbor districts. Regional transporters were those covering the EAC partner states and beyond. Majority of transporters in Uganda, Tanzania, Burundi and Rwanda operate at local level. This was associated with inadequate capital to acquire efficient means. In Kenya and Tanzania, 63% and 49% of the transporters respectively, were national presenting an opportunity to upscale. It is worth noting that regional transporters were few with Kenya recording 4%, the highest in the region.

85) The top four challenges hindering the provision of transport services include poor roads as reported by 33% of the transporters in the region, high costs of operation especially due to high cost of fuel, corruption and theft of produce during transportation. Breakages and bruises of the commodity during the packaging, loading and off-loading processes were reported to be the major cause of loss during transportation of yams. On the other hand, the interviewed transporters suggested that if roads were improved, levies on agricultural commodities reduced and ethics of police officers improved, then the sector would operate more efficiently (Figure 13).

![Figure 13: Challenges facing transporters in the EAC and suggested interventions (N=141)](image)

86) As players in a value chain, transporters require support to be able to operate efficiently. Market information especially information on demand and prices was reported as being very important by the majority (55% and 65%) of the respondents in Tanzania and Uganda respectively. Financial support and training on road use and personal rights were also
reported as important services. Unfortunately, not all these services are accessible due to weak linkages of transporters with the service providers, high cost of accessing the services and inadequate collateral to access financial products (Figure 14).

![Figure 14: Services demanded by transporters and challenges in accessing them (N=141)](image)

4.7 Yams consumption

87) The principal 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 yams for the “away from home” consumers. The different segments were outlined as follows:

4.7.1 Individual Consumers

Socio-economic and demographic characteristics of individual consumers

88) A total of 904 individual yams consumers were interviewed (Table 7) across the EAC. The yams consumer market was segmented into urban and rural between 20 years and below and 51 years and above (Appendix 1a). However, the study noted that since yam consumption is considered medicinal and has cultural attachment, it was mainly consumed by the elderly and the sick.

Table 7: Number of individual consumers interviewed

<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>Burundi</td>
<td>97</td>
<td>78 (80%)</td>
<td>19 (20%)</td>
<td>46 (69%)</td>
<td>32 (41%)</td>
<td>9 (17%)</td>
<td>10 (53%)</td>
</tr>
<tr>
<td>Rwanda</td>
<td>138</td>
<td>93 (67%)</td>
<td>45 (33%)</td>
<td>46 (49%)</td>
<td>47 (51%)</td>
<td>24 (38%)</td>
<td>21 (47%)</td>
</tr>
<tr>
<td>Kenya</td>
<td>165</td>
<td>46 (28%)</td>
<td>119 (72%)</td>
<td>20 (43%)</td>
<td>26 (57%)</td>
<td>50 (48%)</td>
<td>69 (52%)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>179</td>
<td>65 (36%)</td>
<td>114 (64%)</td>
<td>37 (57%)</td>
<td>28 (43%)</td>
<td>62 (54%)</td>
<td>52 (46%)</td>
</tr>
<tr>
<td>Uganda</td>
<td>325</td>
<td>202 (62%)</td>
<td>123 (38%)</td>
<td>122 (60%)</td>
<td>80 (40%)</td>
<td>60 (49%)</td>
<td>63 (51%)</td>
</tr>
<tr>
<td>Total</td>
<td>904</td>
<td>484 (54%)</td>
<td>420 (46%)</td>
<td>271 (56%)</td>
<td>218 (44%)</td>
<td>205 (49%)</td>
<td>215 (51%)</td>
</tr>
</tbody>
</table>
89) The consumers were further segmented into low income earners comprising of those who earn USD60 and below, medium income earners those who earn between USD61-160 and the high income earners (USD 161 and above) as shown in Table 8. The study noted that yams are consumed by consumer segments across the three different income segments albeit at varying degrees.

Table 8: Income levels of individual consumers interviewed

<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>Burundi</td>
<td>94</td>
<td>Rural 76 (81%)</td>
<td>31 (41%)</td>
<td>36 (47%)</td>
<td>9 (12%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 18 (19%)</td>
<td>15 (89%)</td>
<td>3 (17%)</td>
<td>3 (17%)</td>
</tr>
<tr>
<td>Rwanda</td>
<td>133</td>
<td>Rural 92 (69%)</td>
<td>33 (35%)</td>
<td>43 (47%)</td>
<td>16 (17%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 41 (31%)</td>
<td>8 (20%)</td>
<td>17 (41%)</td>
<td>16 (39%)</td>
</tr>
<tr>
<td>Kenya</td>
<td>158</td>
<td>Rural 41 (26%)</td>
<td>9 (22%)</td>
<td>12 (29%)</td>
<td>20 (49%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 117 (74%)</td>
<td>1 (1%)</td>
<td>12 (10%)</td>
<td>101 (89%)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>163</td>
<td>Rural 60 (37%)</td>
<td>23 (38%)</td>
<td>26 (43%)</td>
<td>11 (19%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 103 (63%)</td>
<td>19 (18%)</td>
<td>32 (31%)</td>
<td>52 (51%)</td>
</tr>
<tr>
<td>Uganda</td>
<td>316</td>
<td>Rural 198 (63%)</td>
<td>116 (58%)</td>
<td>63 (32%)</td>
<td>19 (10%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 118 (37%)</td>
<td>33 (28%)</td>
<td>46 (35%)</td>
<td>39 (35%)</td>
</tr>
<tr>
<td>EAC</td>
<td>864</td>
<td>Rural 467 (54%)</td>
<td>212 (45%)</td>
<td>180 (39%)</td>
<td>75 (10%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 397 (46%)</td>
<td>61 (15%)</td>
<td>122 (31%)</td>
<td>214 (54%)</td>
</tr>
</tbody>
</table>

Consumer preferences by type and by-products

90) The study noted that in the EAC, 44% of the low income earners interviewed in the rural market segment perceive yams as a staple food while only 1.5% of high income earners perceive it as a staple. In the urban markets 43% of the medium income earners perceive yams as a staple food while 25% of the high income earners perceive it as a staple (Figure 15). This could be attributed to the fact that some of the rural consumers get the yams from their own farms while those who purchase do so at relatively low prices in comparison to their urban counterparts.

Figure 15: Perception on Yams as a staple food by the rural and urban consumer segments - across the EAC (N=904)

91) In Tanzania, rural consumers’ preference of purchasing yams over other staples is attributed to consumers having own production, liking by family members and the fact that it is a staple food in the community. In Uganda rural consumer preference for yams over
other staples is largely driven by factors such affordability, own production, easy to prepare and its nutritional value. In the EAC rural consumer segments prefer yams to other staple foods due to its nutritional value.

92) Among the urban consumers in Tanzania, 21% prefer purchasing yams over other staples since it is liked by the family members whereas in Uganda affordability and liking by family members at 19% respectively are the key factors.

93) Consumers across all the income levels in urban and rural market segments in Uganda consume more of yellow and water yams as opposed to any other type. In Uganda yellow yams are mainly consumed by more consumers (an average of 64% across all income levels). However water yams are also consumed at high levels especially by the low income urban consumers. This is because both types of yams are more available in the country. There is also some little consumption of white, wild and bush yams by consumers (Figures 16).

![Figure 16: Types of yams consumed by individual consumers in Uganda (N=325)](image)

94) Some of the varieties that are consumed in Tanzania include; Vigonzo, Mahombo, Maole, Buyu, Tona, Vitungi and majoka while in Uganda some of those that were consumed include Kyetutumula, Balugu, Ngadu ndaga, Impanya mangunyi, Nigeria and Masebe among others (See Appendix 2 and 3 for details). Balugu is found to be very sweet compared to the others.

95) The key attributes that the consumers look out for when purchasing yams include size, price which has to be relatively low, quality (free of disease and spots), taste, cleanliness of the tuber and dry matter content among others.

96) Consumers in the EAC mainly purchase the following different forms of yams products: fresh, boiled, steamed, boiled and mashed (fufu), roasted, flour and confectionaries. However fresh yams are majorly preferred by 73% of consumers in EAC so that they can prepare them at home in their preferred form (Figure 17).

97) Consumers in EAC sometimes fail to get the yams and yams products in the market mainly due to low production leading to scarcity. There are also very few yam processors and hence processed products are negligible.
Sources of supply of yams and by-products

98) In Tanzania, Uganda and the rest of the EAC, 72%, 47% and 61% of consumers respectively mainly purchase their yams from open markets, while only a small number purchase from retail shops, wholesalers, processors and super markets. Preference for purchasing from the open markets is attributed to affordable prices compared to other sources, short distance from the seller, convenience and the fact the seller offers a variety of other products (Figures 18, 19 and 20).

99) Since yams are large in size, they are mainly purchased in pieces. Pricing is determined by the size of the yams, the location purchased from, the seller and the time of purchase - if purchasing from an open market in the evening, prices tend to be lower since the seller is about to close their business for the day.

NOTE: “Others” entail processors & super markets (N=904)
Figure 19: Reasons by consumers for preferring different sources of yams and yam products in Tanzania
(N=179)

Figure 20: Reasons by consumers for preferring different sources of yams and yam products in Uganda
(N=325)

Consumption Patterns/ trends of yams and by-products and drivers of change

In Tanzania, consumption trends of yams among the high and medium income consumers in the rural areas were perceived to have increased while it remained constant among the high and low income consumer segments in the urban; and low income consumer segments in the rural areas for the last 3 years. In Uganda consumption trends among the different income segments in the urban areas and high and medium level income earners in the rural areas during the same period, have remained constant but increased in the rural areas. In the EAC consumption trends in the last 3 years are perceived to have remained constant by the urban consumers across all income levels and the medium income level consumers in the rural areas. However both the high and low income level consumers in the rural areas in the EAC perceived it to have increased (Figures 21, 22 and 23). The key drivers of the constant consumption trends are scarcity of yams in the market and the fact that it is used as a substitute for other food staples such as...
cassava and sweet potatoes. The low income earners in the rural market segments also cited same household size as a key reason for consumption remaining constant.

Figure 21: Household consumption trends of yams and yam products as perceived by consumers in Tanzania
(N=179)

Figure 22: Household consumption trends of yams and yam products as perceived by consumers in Uganda
(N=325)

Figure 23: Household consumption trends of yams and yam products as perceived by consumers across the EAC
(N=904)
Substitute products for yams and price elasticity of demand

101) Maize, sweet potatoes and bananas are some of the commodities which are consumed by institutions in Tanzania and Uganda and the rest of the EAC (Figure 24). Other important ones include cassava, yams and Irish potatoes. However yams are substituted with sweet potatoes, Irish potatoes, rice and cassava.

![Figure 24: Commodities that are highly consumed by institutions in Uganda, Tanzania and EAC (N=904)](chart)

102) The price of the yams determines the volumes purchased by consumers cross the EAC. In both Tanzania and Uganda, over 40% of consumers purchase more quantities of yams when price falls. When price increases, in Tanzania they purchase more quantities while in Uganda the quantities remain constant. Drawing a comparison with EAC when price falls, consumers purchase more quantities, whereas price increase leads to purchase of less quantities. This could be because consumers are highly price sensitive coupled with limited incomes and less purchasing powers.

103) Over 75% of both urban and rural consumers in the EAC perceive the price trends to have increased during the last 3 years. In both Tanzania and Uganda, the perceived increase in prices is attributed to low production which leads to scarcity of yams in the market leading to high demand.

Challenges in yam consumption and proposed recommendations

104) There is an array of challenges faced by the individual consumers as they purchase the yams. The key ones in order of importance are: high cost of yams, poor quality yams which are damaged/bruised and diseased, yams are hard to cook and difficult to prepare, scarcity of the yams due to seasonality of the crop and limited yam products.

105) However the consumers proposed the following in order to address some of the aforementioned challenges: training of producers in order to increase production, provision of quality seeds to farmers, sensitization of consumers on nutritive value of yams, improvement of quality of yams through better sorting and cleaning before marketing and more research on yam varieties that are superior among others.
4.7.2 Institutional consumers

106) A total of 30 yams institutional consumers from Kenya, Tanzania and Uganda were interviewed (Table 9). Most of these institutions purchase yams weekly.

Table 9: Institutional yam consumers interviewed in Kenya, Tanzania and Uganda

<table>
<thead>
<tr>
<th>Nature of institution</th>
<th>Kenya</th>
<th>Uganda</th>
<th>Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotels</td>
<td>2</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Learning Institutions</td>
<td>10</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Prisons</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious Institutions</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>11</td>
<td>4</td>
</tr>
</tbody>
</table>

107) Sources of supply: In Tanzania, institutional buyers interviewed source their yams from open markets and farmers. Purchase from this source is mainly attributed to convenience. Other important factors include existence of more varieties and commodities, proximity to the seller and availability.

108) In Uganda most of those interviewed purchase from open markets mainly due to short distance from the seller, convenience and affordable prices.

109) Purchasing and consumption pattern/trend of yams and drivers of change: Institutions in the EAC purchase yams over other staples due to affordability, liking by customers, ease of preparing, availability and nutritional value. In Tanzania the three key factors considered in purchasing yams over other staples by the institutions interviewed are affordability, easy to prepare and preference by consumers.

110) Price elasticity of Demand: Institutional buyers were found to be price insensitive in both countries. Therefore, most of those interviewed reported that they would procure the same quantities of yams whether or not the prices fluctuated.

Challenges faced in consumption

111) Institutional consumers face challenges such as unavailability of yams, high prices, poor quality yams which are bitter and bruised and the fact that it takes long to cook them in comparison to other foods.

4.7.3 Food vendors

Description and characteristics of food vendors

112) The food vending category includes those people who sell cooked forms of yams in small restaurants, kiosks, roadsides and open markets. These food vendors mainly cater for “away from home” consumers. A total of 377 food vendors were interviewed across the EAC region. (Table 10)
Table 10: Number of vendors interviewed in the EAC

<table>
<thead>
<tr>
<th>Countries</th>
<th>Total Respondents</th>
<th>Rural N (%)</th>
<th>Urban N (%)</th>
<th>Male N (%)</th>
<th>Female N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>76</td>
<td>17 (22)</td>
<td>59 (78)</td>
<td>48 (63)</td>
<td>28 (37)</td>
</tr>
<tr>
<td>Uganda</td>
<td>113</td>
<td>51 (46)</td>
<td>62 (53)</td>
<td>12 (11)</td>
<td>101 (89)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>75</td>
<td>33 (44)</td>
<td>42 (56)</td>
<td>3 (4)</td>
<td>72 (96)</td>
</tr>
<tr>
<td>Rwanda</td>
<td>113</td>
<td>74 (66)</td>
<td>39 (35)</td>
<td>61 (54)</td>
<td>52 (46)</td>
</tr>
<tr>
<td>Total</td>
<td>377</td>
<td>176 (47)</td>
<td>20 (53)</td>
<td>124 (33)</td>
<td>253 (67)</td>
</tr>
</tbody>
</table>

Among the food vendors that were interviewed in the EAC region, 53% were from the urban market segment while 47% were from the rural one. Food vending is undertaken by both men and women but largely dominated by the women at 67%. Most of the food vendors across the urban and rural market segments have attained primary and secondary education levels. Tanzania has the highest number of food vendors in both the urban and rural areas that have attained primary education. This demonstrates that with this literacy level they are able to manage their food vending business in a relatively effective manner.

**Forms of yams traded**

Various forms of yams are traded by the food vendors across the EAC. These include boiled, fried, roasted, and steamed. Figure 25 shows a food vendor roasting yams.

![Roasted yams being sold by food vendors in Kenya](image)

**Sources of supply**

In EAC food vendors purchase yams from different sources such as farmers, open markets, wholesalers, retail shops and from their own gardens. However, with an exception of Rwanda, the main source of supply for urban and rural food vendors in the rest of the EAC is the open markets. The urban food vendors interviewed in Rwanda mainly source from the farmers.

The least important source of supply for both urban and rural vendors in Tanzania is wholesalers; while in Uganda wholesalers and own gardens are the least important for rural and urban food vendors respectively (Figure 26).
Drivers of Purchasing and selling patterns by food vendors

117) On average 40% of food vendors in both urban and rural markets consider yams as a staple food for their customers. The sale of yams by food vendors in both the urban and rural markets is determined by: likeability by clients, affordability, complementary food/eaten with other foods, palatability, availability, short cooking time, nutritious, staple food, and as a source of income for the vendor.

118) Both the rural and urban food vendors mainly purchase and sell yams because they are liked by the customers.

Consumer preference by types and drivers of consumption

119) Food vendors in Uganda sell different types of yams: water, yellow, white and bitter yams. However, yellow yams are the most predominant in Uganda among both urban and rural consumers, followed by water yams. The least preferred are the bitter yams. Preference for the yellow and water yams is largely driven by taste even though availability of the two in the market also plays a critical part.

Challenges faced by food vendors and suggestions to address them

120) The food vendors face a myriad of challenges in order of importance: unreliable supply, high prices, low demand from consumers, poor quality yams which are insect infested, broken and bruised hence easy spoilage and low capital to manage their business. Some of the recommendations that were made by the food vendors in order to address the above challenges include increased production through supplying producers with planting materials and training them on good agronomic practices, introduction of better varieties that are more palatable, infrastructural development and improvements to enhance effective transportation of yams and creation of awareness among consumers to consume yams among others.
4.8 Non Consumers as Potential Markets for yams

4.8.1 Individual non- consumers of yams

121) The study sought to interview a cross section of yams non- consumers across the urban and rural market segments within the EAC with an aim of evaluating the possibility of creating new markets for existing yams products. A total of 427 non- yam consumers were interviewed. The major commodities consumed by the yams non-consumers in EAC are: rice, maize, beans, sweet potatoes, Irish potatoes, cassava and bananas.

122) In Tanzania and Uganda maize and sweet potatoes are the key commodities consumed by both the urban and rural yam non-consumers respectively (Figure 27).

123) The non-consumers of yams attribute this to the tasteless nature of yams, scarcity of yams in the market, unawareness of yams especially among the young, high prices, stomach problems and the hard nature of the tuber (Figure 28). However these non-consumers indicated that they would consume yams if the following were done: introduction of tasty varieties, lowering of prices, increased production to ensure availability and introduction of better value added products.
4.9 Mapping of the yams value chain in Tanzania

124) Figure 29 shows the key processes in the yams value chain in Tanzania visualized in a flowchart as a sequence of activities from supply of production inputs to consumption. The main operators in the yam value chain are: input suppliers, producers, wholesalers, retailers (urban and rural) and consumers. The producers are majorly individual smallholders.

4.9.1 Core processes

![Diagram of yams value chain (core processes) map in Tanzania]

Figure 29: Yams value chain (core processes) map in Tanzania

4.9.2 Yams flow from production to market areas in Tanzania

125) Most of the yams in Tanzania are produced along the coastal region. The main Yam producing districts in Tanzania are Mtwara, Morogoro, Kibaha, Kondoia, Arusha, Mwanza and Zanzibar. The commodity is consumed as a snack during the month of Ramadhan in the Muslim calendar. Furthermore, the agricultural research stations in the region such as ARI-Naliendele in Mtwarra are actively involved in research and development of yams varieties.
Most of the yams are consumed within the producing districts. However, some yams from up-country are also transported to the coastal city of Dar es Salaam and Tanga as shown in Figure 30 with minimal informal cross-border trade if any.

![Map of Tanzania showing flow of yams from production to trading areas](image)

**Legend:**
- Major trading districts
- Major producing districts
- In-country trade flow

**Figure 30:** Flow of yams from production to trading areas in Tanzania

### 4.9.3 Value Addition and Value Capture

The average prices received (Tshs/Kg) depict the price at each node of the chain. For example, the pricing map (Figure 31) shows that the wholesalers buy yams at a price of Tsh945/Kg from the producers and sell at Tsh1155/Kg to the retailers. This means that the retailer earns Tsh210/Kg. To get the producer’s value share (income distribution along the value chain), the margin received by the producer is expressed as a ratio of the end (retail) price.
In this case, the producer’s share of value is 58% of the retail price (Figure 33). The value capture for wholesalers is 13% (one of the lowest) and they rely on the large volumes they deal in to make profits. The producer receives more than half of the value captured. However, this is based on the assumption that the farmers own the produce and therefore the computation is based on the gross price received from the wholesaler.

**Figure 31: Value Capture along the Yams Value Chain**

### 4.9.4 Value Chain Institutions and Horizontal and Vertical Linkages

The established linkages are those between the farmers supplying planting materials to fellow farmers, producers, retailers and consumers (Figure 32). The linkages between the retailers and the producers have been well established out of trust. Sometimes, the retailers collect the produce from the farmers’ fields. Most of the consumers that the producers deal with are those from their localities hence the established relationships are based on social connections.

The smallholder producers’ stream is characterized by weak linkages especially at the inputs supplying stage. There is minimal use of agro-inputs in yams production while planting materials system is informal with the only established linkage being between producers and fellow producers. This explains the low production and productivity of yams in Tanzania.
4.9.5 Service providers in the value chain

BDS provision in this study included financial services, market information, extension services, inputs supplying and research and development (Figure 33).
132) It was noted during the study that various yams BDS services were not available to farmers despite the fact that there was demand for them. This was especially evident where farmers reported that missing services included provision of advisory and extension services in yams and provision of financial services to yams farmers. This could partly be as a result of the subsistence production being practiced by the producers and the general lack of interest and investment in service provision and delivery in the yams sub-sector by the relevant authorities.

133) **Financial services:** A total of 14 financial service providers were interviewed. They included commercial banks, micro-finance institutions, SACCOs, and Village Savings Loan Associations (VSLAs). The criterion was that the institutions were supposed to be operating legally.

134) One of the limitations on the data from the financial institutions was that it was not specific to yams. This was because the banks have general financial products. The major products and services available to the agricultural value chain actors include loans, trainings on financial literacy, provision/financing of inputs and savings accounts.

135) In recent times, many farmers, not necessarily yam ones have received training on how to manage groups’ affairs strengthening their credit worthiness and reducing personal responsibility when borrowing. Most of the financial institutions have widened their geographic scope and are now available in the rural areas. The proximity aspects have made it possible for more farmers to access the existing financial products and services.

136) However, two of the financial service providers reported a decline in their lending which was largely because of inappropriate products, high cost of lending and minimal promotion by the institutions.

137) The financial providers have a challenge of limited skills in finance management by the borrowers especially farmers which increases the risk of lending to them. Low agricultural productivity also makes it difficult for the borrowers to repay their loans since most of the time they make losses leading to high default rates. Other challenges include, necessary but long loan approval criteria discouraging some potential borrowers and the institutions’ low capacity with regard to knowledgeable staff to assess agricultural enterprises.

138) **Research and development** is championed by the regional agricultural institutes such as the ARI Naliendele in Mwara, coastal region. The institute is engaged in the dissemination of quality yam planting materials.

139) It is worth noting that in Tanzania, one of the challenges mentioned by service providers is the few trained extension service providers, which may explain the low penetration of BDS in the country in general and the yams sub-sector in particular.

4.9.6 **Previous interventions in yams subsector in Tanzania**

140) Specific interventions on yams have previously been implemented in Tanzania as summarized in Table 11:
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Description of intervention</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kizimbani Research Institute</td>
<td>Researched on Performance of water yam (<em>dioscorea alata</em>) under various agronomic practices</td>
<td>1991</td>
</tr>
<tr>
<td>Naliendele Agricultural Research Institute</td>
<td>Carried out research in Mtwara on Farmer seed experts and their knowledge on seeds, forest food products and medicinal plants.</td>
<td>2001</td>
</tr>
<tr>
<td>Kizimbani Research Institute-</td>
<td>Researched on the Use of Wild and Cultivated Plants as famine Foods on Pemba Island, Zanzibar, Martin Walsh</td>
<td>2009</td>
</tr>
<tr>
<td>International Institute of Tropical Agriculture(IITA)</td>
<td>Carried out research on Improved technologies on yam for enhancing livelihood of farmers in Africa.</td>
<td>2011</td>
</tr>
<tr>
<td>Policy</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td><strong>The National Land Policy (1995)</strong></td>
<td>The National Land Policy underscores the importance of land use planning as a tool for land development and a framework for formulating extension packages. The policy provides an advocacy for community land use management as a key to addressing the problems of land degradation, equitable resource allocation and the resolution of conflicts between various land users.</td>
<td></td>
</tr>
<tr>
<td><strong>The National Microfinance policy (2000)</strong></td>
<td>The national microfinance policy provides a basis for the evolution of an efficient and effective savings mobilization and micro-financing system in the country. The policy recognizes the Savings and Credit Cooperative Societies (SACCOS) as the major providers of microfinance services which, when fully developed will evolve into community banks that later will be amalgamated to form Cooperative Banks.</td>
<td></td>
</tr>
<tr>
<td><strong>The Seed Act (2003)</strong></td>
<td>The Seed Act of 2003 complements the Plant Protection Act of 1997 in terms of regulation of the importation, exportation and sales of seeds in the country. According to the Act, all seed importation, exportation, production, processing, distribution, sale or advertisement for sale of seeds must seek permits.</td>
<td></td>
</tr>
<tr>
<td><strong>Agriculture Sector Development Strategy (2001)</strong></td>
<td>The primary objective of Agriculture Sector Development Strategy (ASDS) is to create an enabling and conducive environment for improving profitability of the sector as the basis for improved farm incomes and rural poverty reduction in the medium and long term.</td>
<td></td>
</tr>
<tr>
<td><strong>Agriculture Sector Development Programme (2003)</strong></td>
<td>Agricultural Sector Development Programme (ASDP) is National scope formulated in 2003 by Agricultural Sector Lead Ministries in collaboration with Development Partners, and other agricultural sector stakeholders. The objective of the Programme is to enable farmers to have better access to and use of agricultural knowledge, technologies, marketing systems and infrastructure, all of which contribute to high productivity, profitability and farm incomes and to promote private investment based on an improved regulatory and policy environment.</td>
<td></td>
</tr>
<tr>
<td><strong>Tanzania Agriculture and Food Security Investment Plan (TAFSIP) (2011)</strong></td>
<td>The Tanzania Agriculture and Food Security Investment Plan (TAFSIP) is a historic initiative that brings all stakeholders in the agricultural sector both in the mainland and in Zanzibar to a common agenda of comprehensively transforming the sector to create wealth, reduce poverty and achieve food and nutrition security.</td>
<td></td>
</tr>
<tr>
<td><strong>MKUKUTA</strong></td>
<td>MKUKUTA is a Kiswahili acronym for the National Strategy for Growth and Reduction of Poverty. This strategy is the development framework for the current five year phase (2005-2010). It forms part of Tanzania’s efforts to deliver on its national Vision 2025. The focus is outcome orientated and organized around three clusters: Cluster 1: Growth of income and reduction of poverty, Cluster 2: Improved quality of life and social well-being, and Cluster 3: Governance and accountability.</td>
<td></td>
</tr>
</tbody>
</table>
4.10 Mapping of the yams value chain in Uganda

4.10.1 Core processes in the yams value chain

Figure 34 shows the key processes and their relationships that enable fresh and processed yam products to reach the final consumer. This has been visualized in a flowchart as a sequence of activities.

Legend:
- Functions
  - Operators
  - Consumers
- Inputs flow: Fresh yams
- Boiled yams
- Yams flour
- Confectionaries - cakes

Figure 34: Core processes in the Uganda yams value chain
4.10.2 Yam Flow from Production to Marketing areas in Uganda

142) The main yam producing districts in Uganda are in Rakai, Masaka, Kapchorwa, Gulu, Mbale, Iganga, Mukono, Luweero, Masindi, Adjumani, Nakasongola and Kayunga. The main markets for Yam from these districts are Kampala, Mukono and Masaka with most of the production being consumed within the producing districts mostly by the producers themselves (Figure 35). The amount of Yam reaching the trade districts depends on the season since the commodity is highly seasonal. Larger farmers are also found on main roads in Kapchorwa and Mbale serving Kampala and other major cities.
4.10.3 Level of Employment in the Yam Value Chain

Due to the low commercialization of the yams and the low quantities involved, there are high levels of self employment with most yams related businesses including production being managed by the owners. A few casuals are also involved in loading and off-loading.
4.10.4 Value Addition and Value Capture along the Yam Value Chain

The average prices received (US$ /Kg) depict the price at each node of the chain. For example, the pricing map (Figure 36) shows that the wholesalers buy yams at a price of US$ 0.20/Kg from the producers and sell at US$ 0.23/Kg to the retailers. This means that the retailer earns US$ 0.14/Kg. To get the producer’s value share (income distribution along the value chain), the margin received by the producer is expressed as a ratio of the end (retail) price. In this case, the producer’s share of value is 55% of the retail price (Figure 41). The value capture for wholesalers/assemblers is 8% and relies on the large volumes they deal with to make profits.

![Diagram showing value capture along the yam value chain](image)

Figure 36: Value Capture along the Yams Value Chain in Uganda

4.10.5 Horizontal and Vertical Linkages in the Yam Value Chain

Yam value chain consists of both horizontal and vertical linkages. The linkages begin at the input supply level which involves two streams; the farmers themselves, agro-input dealers and government/ NGOs’ programs (Figure 37).
The established linkages are those between the farmers supplying planting materials to fellow farmers, producers, assemblers, traders and consumers. The linkages between the wholesalers and the producers have been well established because of the good relationship between them where yams are only harvested after the two have agreed on the prices and dates of collection.

The smallholder producers’ stream is characterized by weak linkages. Most of the producers are small-holders carrying out their activities individually hence the weak linkage with producer organizations. There are weak linkages between smallholder producers and the inputs suppliers with the only established linkage being between producers and fellow producers.

4.10.6 Service Providers in the Yam Value Chain

Service providers such as finance, extension, Research & Development, input suppliers and market information providers are not very active in the yams value chain. Therefore, services provision is generally weak and sometimes non-existent.

Very few organizations such as IITA are engaged in yams research and multiplication of planting materials. National Agricultural Research Organization (NARO) is another public organization engaged in the dissemination of production technologies such as improved planting materials and methods.

Other international organisations involved in the development of the yams value chain include DFID - in partnership with Belgium, Denmark, Ireland, Norway, Sweden, Switzerland which are directly funding IITA on research for improved yam production and the multiplication and distribution of planting materials and other technologies.
4.10.7 **Previous interventions in yams sub-sector in Uganda**

151) Table 13 is a summary of work that has been implemented on yams in Uganda by different actors.

**Table 12: On-going and previous interventions in yams sub-sector in Uganda**

<table>
<thead>
<tr>
<th>Implementing organization(s)</th>
<th>Description of intervention</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre for Integrated Development (CIDev) in partnership with International Institute for Tropical Agriculture (IITA), INED, Kayunga district local government and the farmers in four sub-counties of Kayunga District.</td>
<td>The clean yam production project: Supporting 400 farmers in four sub counties of Kayunga District, to produce clean yam planting material, for improved food security.</td>
<td>2004-2006</td>
</tr>
<tr>
<td>IITA Partners in Uganda and Tanzania:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• National Root Crops Research Institute (NaRCRI); and</td>
<td>The Root and Tuber Systems Program was funded by European Commission, FAO, France, Germany, IFAD, Japan, Kellogg Foundation, Netherlands, Nigeria, Rockefeller Foundation, Sweden, Switzerland, United States, World Bank and implemented in Sub Saharan Africa. It aimed at achieving genetic improvement of yam, primarily on white and yellow Guinea yams, and water yam. The principal objective of this project was to develop yams with high and stable yield of marketable tubers with plant morphology for reduced labor use in yam-based production systems.</td>
<td>2009-2011</td>
</tr>
<tr>
<td>• Kizimbani Agricultural Research Station, Zanzibar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGIAR and Bioversity International, the International Center for Tropical Agriculture (CIAT), the International Potato Center (CIP), and the International Institute of Tropical Agriculture (IITA).</td>
<td>The CGIAR Research Program on Roots, Tubers and Bananas (RTB) is a joint initiative of CGIAR and partners to address challenges such as the use of poor quality “seed” or limited genetic diversity, biotic and a-biotic constraints, and poor management practices more globally and efficiently.</td>
<td>Launched in 2012 – on-going</td>
</tr>
<tr>
<td><strong>Other partners and stakeholders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agro-Genetic Technologies Ltd (AGT)-Uganda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ssemwanga Centre for Agriculture and Food Ltd-Uganda</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.11 **Policy and Institutional Environment Underlying the Yam Value Chain**

152) The blueprint for agricultural development in Uganda the “Agriculture Sector Development Strategy and Investment Plan (DSIP) emphasize the need to transform the
agriculture sector from small-scale production/subsistence agriculture to commercial agriculture, listing 17 “priority” commodities. It highlights the importance of introducing measures to improve competitiveness and agriculture market integration as a way of ensuring sustained economic growth. Notably, the DSIP does not mention yams as one of the priority crops but includes cassava and Irish potatoes among the roots and tubers.

153) Pursuant to these growth objectives, measures aimed at encouraging the proactive commercialization of agriculture have been articulated in national and agriculture sector strategy documents. These include activities aimed at improving market access, encouraging value addition, and conformity to international standards and infrastructural development. Other documented needs include improved market information flows, logistics and storage facilities, interventions aimed at bulking production to attain economies of scale, and assistance with certification arrangements. Business Linkages strengthening is recognized as being a central part of this commercialization strategy. A number of private organizations have intervened at various levels of the yams value chain.

154) Other policies and strategies relevant to the yams sector are:

a) **National Land Policy** - This is for the sustainable management of land resources, since it is known that the majority of Ugandans are dependent on land for employment and survival. It is crucial for an integrated and effective system responding to a wide variety of intra-sectoral variables between the land sector and other productive sectors in the economy to be in place.

b) **Liberalization and privatization policy** - Under this policy, the market prices for food commodities are determined by supply and demand. The liberalization policy has opened up national borders for both formal and informal regional trade. Traders from neighboring countries can directly purchase food commodities at the farm gate as witnessed during the study. Many traders from Kenya and South Sudan buy food crops directly from the farmers in Eastern Uganda with local middle men playing a linking role. Opinions differ as to whether this is a threat to local food security as farmers no longer wish to add value through processing or whether it presents a golden opportunity to improve the market for this product. Access to markets is one of the key challenges in yams production. Bulky transportation to national market and frequent mismatch between supply and demand are among the impediments. Current market demand from the neighboring countries is generally perceived as promoting production. Generally the policy has a positive impact on local food security. However, the impact of the current growing regional market demands from Kenya and South Sudan is not clear. Further, detailed analysis is required on the impact on local food security of commercialization of yams for export markets.

c) **National Transport Policy** - Aims at developing and promoting transport services that will support increased agricultural and industrial production and promote trade by making produce available to the markets throughout the year. This has a great impact on yams marketing since it is available in different areas during different times hence addressing the issue of deficit in areas without.

155) The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is responsible for implementing the DSIP. Structurally, MAAIF consists of the headquarters; seven semi-autonomous organizations, and departments devolved to district level. The agencies...
operate at both national and sub-national levels and are responsible for the execution of approved plans and resources in their budgets. This leaves MAAIF HQ to concentrate on agricultural policy formulation, support and supervision (especially of Local Governments), sector planning, regulation, standard setting, quality assurance, and sector monitoring and guidance.

156) The semi-autonomous organizations relevant to the yams sector are:

   a) The National Agricultural Research Organization (NARO) for generation and dissemination of research technologies.

   b) National Agricultural Advisory Services (NAADS) for delivery of advisory services;

   c) The Northern Uganda Social Action Fund (NUSAF) for training and dissemination of planting materials

   d) Participatory Agricultural Development and Empowerment Project (PADEP) for extension services
5. CONCLUSIONS

157) One of the major market failures is the informal seed system which has impacted negatively on productivity and production resulting in unreliable and poor quality supplies of the yam.

158) Seed yam is very expensive and takes up most of the production costs which contribute to the low production volumes and area under production.

159) Yams are majorly produced by the older generation; with the young farmers not being interested in its production due to its long maturity period and the low yields. This could contribute to the extinction of the crop.

160) Yams are given minimal priority at the household levels and are mainly intercropped with other crops such as bananas hence limiting the scale of production and harvested quantities.

161) Yams are mostly staked on trees such as omutumba as this permits a higher leaf area per vine which contributes to good yields.

162) Yams are rich in energy, vitamin C and B6 and minerals such as potassium which are important nutrients to the body. Hence consumers are able to access all these nutritional benefits.

163) Yams are drought tolerant and can be stored in-ground for long and have a long shelf life after harvest in comparison to other root crops. They can therefore be relied on for food security and income generation.

164) **Consumer preference by type and varieties:** In Uganda yellow and water yams are the most predominant types preferred by most consumers. This is mainly because of taste and the fact that in most cases they are the only ones available in the market.

165) Some of the varieties that are consumed in Tanzania include; Vigonzo, Mahombo, Maole, Buyu, Tona, Vitungi and majoka while in Uganda some of those that were consumed include Kyetututumula, Balu, Ngadu ndaga, Impanya manguyi and Masebe among others.

166) The main attributes that the consumers look out for when purchasing yams are: size, price which has to be relatively low, quality (free of disease and spots), taste, cleanliness of the tuber and dry matter content among others.

167) Most of the yams are traded in raw form with little value addition while some of it is converted into flour and confectionery. Other forms include boiled, steamed and roasted which are mainly traded by the food vendors. The market for the various differentiated products is highly underutilized due to lack of awareness on yams and yams products.

168) The main substitutes for yams are sweet potatoes, Irish potatoes, rice and cassava which are readily available in the market and relatively cheaper than yams.
169) There is minimal value addition of yams largely due to low conversion rates, low supplies of yams and limited awareness on value added products among consumers, suggesting that the traders may not be able to maximize on economic benefits.

170) There are no clear standards in handling, packaging and units of measurement where yams are normally sold per ‘piece’ especially at retail level.

171) There is minimal support for the yams value chain from the public and development agencies due to its low prioritization by the relevant authorities. This has discouraged investment in the value chain by the private sector rendering the value chain subsistence. The producers themselves produce and market individually which makes access to business development services a bit more difficult.

172) Overall, these constraints make it difficult for the commodity to be promoted.
6. RECOMMENDATIONS

a) Enhance the capacities of the producers in good agricultural practices since yams fields should be kept free of weeds at all times because yams are sensitive to weed competition.

b) There is need to encourage more production and consumption of yams through effective promotion and consumer sensitization campaigns on the nutritional and economic benefits of yams especially among the youth targeting learning institutions.

c) Develop dedicated private seed yam multiplication and distribution enterprises for a sustainable seed system, through promotion of existing technologies on production of healthy seed yam that will eventually boost production.

d) Lobby for prioritization of yams in allocation of funds by the government and the development agencies for market research, products development and incubation.
5. APPENDICES

5.1 Appendix 1: Demographics of the yams consumers

a) Age 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>96</td>
<td>Rural 77 (60%)</td>
<td>3 (4%)</td>
<td>24 (31%)</td>
<td>28 (36%)</td>
<td>12 (16%)</td>
<td>10 (13%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 19 (20%)</td>
<td>1 (5%)</td>
<td>5 (26%)</td>
<td>3 (26%)</td>
<td>5 (26%)</td>
<td>3 (17%)</td>
</tr>
<tr>
<td>Rwanda</td>
<td>138</td>
<td>Rural 93 (67%)</td>
<td>28 (30%)</td>
<td>41 (44%)</td>
<td>16 (17%)</td>
<td>8 (9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 45 (33%)</td>
<td>1 (2%)</td>
<td>30 (68%)</td>
<td>10 (22%)</td>
<td>2 (4%)</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>165</td>
<td>Rural 46 (28%)</td>
<td>21 (49%)</td>
<td>11 (24%)</td>
<td>8 (17%)</td>
<td>6 (13%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 119 (72%)</td>
<td>3 (3%)</td>
<td>47 (39%)</td>
<td>41 (34%)</td>
<td>27 (23%)</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>179</td>
<td>Rural 65 (36%)</td>
<td>3 (3%)</td>
<td>16 (25%)</td>
<td>23 (35%)</td>
<td>14 (22%)</td>
<td>9 (13%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 114 (64%)</td>
<td>1 (1%)</td>
<td>39 (4%)</td>
<td>35 (31%)</td>
<td>25 (22%)</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>Uganda</td>
<td>324</td>
<td>Rural 203 (63%)</td>
<td>10 (5%)</td>
<td>65 (32%)</td>
<td>43 (22%)</td>
<td>27 (13%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 121 (37%)</td>
<td>6 (5%)</td>
<td>30 (41%)</td>
<td>21 (26%)</td>
<td>14 (12%)</td>
<td></td>
</tr>
<tr>
<td>EAC</td>
<td>902</td>
<td>Rural 484 (54%)</td>
<td>16 (3%)</td>
<td>154 (32%)</td>
<td>56 (28%)</td>
<td>45 (22%)</td>
<td>27 (13%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 418 (46%)</td>
<td>12 (3%)</td>
<td>171 (41%)</td>
<td>122 (29%)</td>
<td>80 (19%)</td>
<td>33 (8%)</td>
</tr>
</tbody>
</table>

b) Level of education

<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>94</td>
<td>Rural 76 (81%)</td>
<td>29 (38%)</td>
<td>39 (52%)</td>
<td>7 (9%)</td>
<td>1 (1%)</td>
<td>1 (1%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 18 (19%)</td>
<td>4 (22%)</td>
<td>11 (61%)</td>
<td>2 (11%)</td>
<td></td>
<td>1 (6%)</td>
<td></td>
</tr>
<tr>
<td>Rwanda</td>
<td>138</td>
<td>Rural 94 (68%)</td>
<td>19 (20%)</td>
<td>48 (52%)</td>
<td>18 (19%)</td>
<td>5 (5%)</td>
<td>4 (4%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 44 (32%)</td>
<td>3 (7%)</td>
<td>19 (44%)</td>
<td>8 (18%)</td>
<td>9 (20%)</td>
<td>5 (11%)</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>162</td>
<td>Rural 46 (28%)</td>
<td>1 (2%)</td>
<td>18 (39%)</td>
<td>9 (20%)</td>
<td>12 (26%)</td>
<td>5 (11%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 116 (72%)</td>
<td>4 (3%)</td>
<td>38 (33%)</td>
<td>49 (42%)</td>
<td>22 (19%)</td>
<td>3 (3%)</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>175</td>
<td>Rural 64 (37%)</td>
<td>17 (27%)</td>
<td>28 (44%)</td>
<td>13 (20%)</td>
<td>6 (9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 111 (63%)</td>
<td>5 (5%)</td>
<td>34 (32%)</td>
<td>36 (33%)</td>
<td>20 (18%)</td>
<td>13 (12%)</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>311</td>
<td>Rural 194 (62%)</td>
<td>25 (13%)</td>
<td>92 (47%)</td>
<td>38 (30%)</td>
<td>14 (7%)</td>
<td>5 (3%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 117 (38%)</td>
<td>12 (10%)</td>
<td>32 (27%)</td>
<td>36 (32%)</td>
<td>19 (16%)</td>
<td>18 (15%)</td>
<td></td>
</tr>
<tr>
<td>EAC</td>
<td>880</td>
<td>Rural 474 (54%)</td>
<td>91 (19%)</td>
<td>225 (47%)</td>
<td>103 (22%)</td>
<td>37 (8%)</td>
<td>15 (3%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban 406 (46%)</td>
<td>24 (6%)</td>
<td>100 (25%)</td>
<td>120 (30%)</td>
<td>97 (24%)</td>
<td>59 (14%)</td>
<td>6 (1%)</td>
</tr>
</tbody>
</table>

5.2 Appendix 2: Yam varieties in Tanzania

<table>
<thead>
<tr>
<th>Species</th>
<th>Variety</th>
<th>Flesh color</th>
<th>Skin color</th>
<th>Av. Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Alata</td>
<td>Tona</td>
<td>Cream</td>
<td>Cream</td>
<td>21.2</td>
</tr>
<tr>
<td></td>
<td>Zambarau</td>
<td>Pink</td>
<td>Pink</td>
<td>23.5</td>
</tr>
<tr>
<td></td>
<td>Ini la nyama</td>
<td>Pink</td>
<td>Pink</td>
<td>18.6</td>
</tr>
<tr>
<td></td>
<td>Byatu</td>
<td>Cream</td>
<td>Cream</td>
<td>20.5</td>
</tr>
<tr>
<td></td>
<td>Mkonza wa Kasa</td>
<td>Cream</td>
<td>Cream</td>
<td>25.5</td>
</tr>
<tr>
<td></td>
<td>Makede</td>
<td>Cream</td>
<td>Cream</td>
<td>20.3</td>
</tr>
<tr>
<td></td>
<td>Chatte</td>
<td>Cream</td>
<td>Cream</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Mwekundu ganda</td>
<td>Cream</td>
<td>Cream</td>
<td>35.6</td>
</tr>
<tr>
<td></td>
<td>Maga</td>
<td>Cream</td>
<td>Cream</td>
<td>18.6</td>
</tr>
<tr>
<td></td>
<td>Lisbon</td>
<td>Cream</td>
<td>Cream</td>
<td>15.3</td>
</tr>
<tr>
<td></td>
<td>Mpanga</td>
<td>Cream</td>
<td>Cream</td>
<td>20.2</td>
</tr>
<tr>
<td></td>
<td>Mwekundu ganda</td>
<td>Pink</td>
<td>Cream</td>
<td>22.9</td>
</tr>
<tr>
<td></td>
<td>Mayoka</td>
<td>Cream</td>
<td>Cream</td>
<td>28.6</td>
</tr>
<tr>
<td></td>
<td>Kaleyi</td>
<td>Cream</td>
<td>Cream</td>
<td>18.8</td>
</tr>
<tr>
<td></td>
<td>Mwendachi</td>
<td>Cream</td>
<td>Cream</td>
<td>31.4</td>
</tr>
<tr>
<td>D. Rotundata</td>
<td>TDr 89/</td>
<td>Cream</td>
<td>Cream</td>
<td>15.7</td>
</tr>
<tr>
<td></td>
<td>TDr 93/83</td>
<td>Cream</td>
<td>Cream</td>
<td>17.3</td>
</tr>
<tr>
<td></td>
<td>TDr 179</td>
<td>White</td>
<td>White</td>
<td>22.4</td>
</tr>
<tr>
<td></td>
<td>TDr 95/8988</td>
<td>Cream</td>
<td>Cream</td>
<td>16.8</td>
</tr>
</tbody>
</table>
5.3 Appendix 3: Yams types and varieties in Uganda

<table>
<thead>
<tr>
<th>Yam type</th>
<th>Local name</th>
<th>Scientific name</th>
<th>Gestation period (days)</th>
<th>Key attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water yam</td>
<td>Endaggu</td>
<td>Dioscorea alata</td>
<td>90-300</td>
<td>White in color</td>
</tr>
<tr>
<td>Water yam</td>
<td>Ebisebe-Masebe</td>
<td>Dioscorea alata</td>
<td>220-300</td>
<td>Turns purple after the water draining out, better yields are realized if planting holes are deeper(26)</td>
</tr>
<tr>
<td>Water yam</td>
<td>Nandigoya</td>
<td>Dioscorea alata</td>
<td>200-300</td>
<td>Purple skin, white flesh inside, resembles Kyetutumula</td>
</tr>
<tr>
<td>Water yam</td>
<td>Nara</td>
<td>Dioscorea alata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow yam</td>
<td>Kyetutumula</td>
<td>Dioscorea cayenensis</td>
<td>200-330</td>
<td>White inside, hairy skin</td>
</tr>
<tr>
<td>Yellow yam</td>
<td>Balagu</td>
<td>Dioscorea cayenensis</td>
<td>280-360</td>
<td>Yellow inside, smoother skin than Kyetutumula</td>
</tr>
<tr>
<td>White yam</td>
<td>‘Ngera’</td>
<td>Dioscorea rotundata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild yam</td>
<td>Kaama</td>
<td>Dioscorea abyssinica</td>
<td>200-300</td>
<td>White inside, clean hard skin looks like Kyetutumula</td>
</tr>
<tr>
<td>Wild yam</td>
<td>Ekikongo</td>
<td>Dioscorea burkilliana</td>
<td>330-360</td>
<td>White inside, cooks for more than 2 hrs and doesn’t go bad for a month after cooking</td>
</tr>
<tr>
<td>Bush yam</td>
<td>Wete</td>
<td>Dioscorea praehensilis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Key informants and B. Akello et al, 2011

5.4 Appendix 4: SWOT analysis of the Yams value chain in Tanzania and Uganda

**Strengths**
- Indigenous knowledge on yams production (High level of vertical integration)
- Existing skills in yams processing
- Very good knowledge of the markets and market trends
- Some consumers are aware of the nutritional benefits

**Opportunities**
- Development of dedicated private seed yam multiplication and distribution enterprises
- Distinct periods of high consumption for production timing
- Adoption of GAPs to close the productivity gap
- Yams are drought resistant and can be produced in a wide range of ecologies
- There are some development organisations e.g. ITA who are intervening at inputs supply and production level
- Long shelf-life of yams
- Nutritional benefits of yams (Potassium, Vitamins -C & B6, dietary fiber)
- Long shelf-life of yams - it is good for food security

**Inputs suppliers** → **Producers** → **Processors** → **Traders** → **Consumers**

**Weaknesses**
- Unreliable supply of planting materials
- Low production and productivity
- Limited use of improved inputs
- Unexploited market for value added products
- Limited business management skills
- Limited awareness of yams value added products

**Threats**
- Unexploited market for value added products
- Rudimentary processing technologies
- Inadequate transport facilities
- Inadequate working Capital
<table>
<thead>
<tr>
<th>Public institutions</th>
<th>Public sector</th>
<th>Seed yams</th>
<th>Varieties</th>
<th>Basic seed for multiplication</th>
<th>Yields</th>
<th>Mature time</th>
<th>Knowledge</th>
<th>Youth attractiveness</th>
<th>Prioritization by farmers</th>
<th>Pests and diseases</th>
<th>Nematodes</th>
<th>Production costs</th>
<th>Soil fertility</th>
<th>Conversion rate</th>
<th>High prices</th>
<th>Supply reliability</th>
<th>Substitute commodities</th>
<th>Market growth</th>
<th>Supply reliability</th>
<th>Competition</th>
<th>High prices</th>
<th>Demand</th>
<th>Post-harvest losses</th>
<th>Access roads and suppliers</th>
<th>Costs of operation</th>
</tr>
</thead>
</table>
6. REFERENCES

5. B. Akello, G. Biso and K. Odongkara, 2011: Towards increasing and sustaining production of yam for food security and improved livelihoods in Uganda.
21. Mudiope J., Coyne D. L., Adiapala E. and Talwana A. (2012), Damage to yam (Dioscorea spp) by root-knot nematode (Meloidogyne spp) under field and storage conditions in Uganda


27. Rees D., and Bancroft., (2003), Development of integrated protocols to safeguard the quality of fresh yams.


30. Thouvenel J.C and Dumont R, (1990), Petre de rendement de l’igname infectee par le virus de la mosaique en Cote d’Ivore
