ECONOMIC ANALYSIS OF SWEET POTATO *(Ipomoea batatas (L) lam)* VALUE CHAIN IN KANO STATE, NIGERIA

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DECLARATION

I hereby declare that this work, "Economic analysis of Sweet Potato ***(Ipomoea batatas (L) lam)*** Value Chain in Kano State Nigeria" is the product of my own research efforts undertaken under the supervision of Professor A. Aminu and Dr M.M Ahmad and has not been presented and will not be presented elsewhere for the award of degree or certificate. All sources have been duly acknowledged.

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CERTIFICATION

This is to certify that the research work for this thesis and the subsequent preparation of this thesis by Abbas Gambo Magam, SPS/12/MEX/00008 were carried out under our supervision.

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DEDICATION

This work is dedicated to my parents Alh Gambo Magam and Hajia Jummai Gambo Magam.

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ADP	Agricultural Development Project
BCR	Benefit Cost Ratio
CGIAR	Consultative Group for International Agriculture
CIP	International Potato Centre
FAO	Food and Agricultural Organisation
GVCI	Global Value Chain Concept Initiative
ICRISAT	International Crop Research institute for the Semi Arid Tropics
IIITA	International Institute for Tropical Agriculture
ITC	International Trade Centre
KNARDA	Kano State Agricultural and Rural Development Authority
KNSG	Kano State Government
LGA	Local Government Area
NBS	National Bureau for Statistics
NPC	National Population Commission
NRCI	National Root Crop Research Institute
OFSP	Orange Flesh Sweet potato
UN/FAO	United Nations Food and Agricultural Organisation

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ABSTRACT

The study examined the "Economic analysis of Sweet Potato ***(Ipomoea batatas (L) lam)*** Value Chain in Kano State Nigeria". The principal value chain actors were identified to be producers, marketers (wholesalers and retailers), processors and consumers. Multistage sampling technique was employed for the study. One hundred and twenty producers (120) were selected at the upstream level of the value chain. While in the downstream level, 180 actors which comprises of 100 traders (40 wholesalers, 60 retailers), 60 processors and 30 consumers were selected. Data were collected with the aid of questionnaire by trained enumerators. Data collected were analyzed using descriptive statistics, gross margin, and net marketing margin. The results of the study showed that sweet potato farmers produced an average of 15424.49Kg/ha. Mean ages of 44, 46, 41, 34 and 39 years were obtained for farmers, wholesaler, retailers, processors and consumers respectively. Household sizes ranging between 8 to 11, 8 to 10 persons were obtained for the farmers and marketers while processors had between 5 to 8 persons and consumers had 4 to 7 persons in their household. Mean years of experience in sweet potato business of 16 years was obtained for farmers, both wholesalers and retailers have average of 15 years in sweet potato business. All the actors were male with exception of processors where females (50%) and males (50%) were found to undertake artisanal processing. Profitability analysis of sweet potato production, processing and marketing shows that they were profitable with gross margins of N129370.07 per hectare for producers and net marketing margin of N371.88/135kg bag for wholesalers in peak period and N1009.86/135kg (bag) for off peak period. On the other hand, retailers had a net marketing margin of N597.7/135kg (bag) for peak period while in off peak period the retailers had a net marketing margin of N901.81/135kg (bag). The processors had a gross margin of N352.43. Despite the profitability of the value chain activities in the study area, a number of constraints were identified at each stage of the value chain. These constraints include, high cost of inputs, inadequate capital,scarcity of sweet potato during off peak and high cost of transportation. It is therefore recommended that the value chain actors should be linked with financial institutions such as commercial banks, community banks, and micro credit institutions to facilitate easier access to credit. Investment should be made by the government and other stakeholders on sweet potato storage technologies to overcome problem of perishability..

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Sweet potato *(Ipomoea batatas (L) lam)* is an important root crop. It belongs to the morning glory family known as convoluceae and originated from Latin America (Low *et al,* 2009). It is ranked second after cassava among the tropical root crops. The crop can be used in promoting nutritional security particularly in agriculturally backward areas. Beside carbohydrate it is a rich source of protein, lipid, calcium, and carotene (Anyaegbunam and Nto, 2011)

Sweet potato is a major food crop in the world and is cultivated in all tropical and subtropical regions particularly in Asia and the Pacific. Because of the versatility of sweet potato it is ranked as the world's seventh most important food crop after wheat, rice, maize, barley and cassava as it constitute a substantial source of carbohydrate and carotene (FAO, 2002). According to the United Nations Food and Agriculture Organization (UN/FAO, 2014) statistics, worlds production in 2013 was 127.3 million metric tones of sweet potato majority of which comes from China, with a production of over 70.5 million metric tons, or 68.4 percent of the estimated world production. China's production in year 2013 was down significantly from 2000, when 117.9 million metric tons of sweet potatoes were cultivated, or approximately 84.8 percent of total world production. Nearly half of the sweet potato produced in Asia is used as animal feed with the remainder primarily use for human consumption, either as fresh or processed products.

Sweet potato is widely cultivated in a number of developing countries, where it serves as a principal source of food and income for many of the world's poorest and most nutritionally insecure people. Data from the United Nations, Food and Agriculture Organization (FAO) indicates that over 95 percent of the sweet potato crop is produced in developing countries (UN/FAO, 2014). Sub-Saharan Africa produces more than seven million tones of sweet potatoes annually which constitute 5% of global production (Ewell, 2002). Africa top producers of sweet potato are Nigeria (3.5million tones) and Uganda (2.5million tones) and (1.3million tones} (UN/FAO, 2014).The utilization of sweet potato in Asia and Africa surely contributed in the improvement of local economies, aside been subsistence crop, sweet potato makes large contribution to livestock production in many areas.

Nigeria today is the largest producer of sweet potato in Africa with 3.5 million tones or 3.3 percent of total world production, while globally Nigeria is the second largest producer in terms of quantity after China, (UN/FAO, 2014). The production, marketing, utilization of sweet potato has expanded in the last decade to almost all ecological zones of Nigeria (FAO, 2008). Yields have increased in farmers' fields during the pre research era of 2 to 3 tons per hectre to 30 to 40 tons per hectare due to the availability of improved varieties. Despite the demographic pressure on land there has been increase in the production of sweet potato in Nigeria. Sweet potato production rose from 2.816 million metric tons in 2006 to 3.4 million metric tons in 2007. (Akoroda, 2009, Srinivas, 2009).These increase are attributed to improved technological inputs as a result of activities of international and national research organizations. Sweet potatoes are grown in all parts of Nigeria in diverse agro ecological zones, from tropical rainforest to semiarid and arid zones. The

concentration of sweet potato production has shifted from the sub humid zones of Kwara, Plateau, Niger and Benue states to northern semiarid agro ecological zones where Kaduna, Kano, Katsina and Bauchi are leading producing states (Bergh *et al*, 2013). Despite Nigeria being the second largest sweet potato producer in Africa, it only exports limited quantity of sweet potato. The overall export value of sweet potato is marginal. This trend reflects Nigeria's overall agricultural export market which has not been fully utilized since the discovery of oil. According to International Trade Centre (ITC), Nigeria ranked 33rd in World sweet potato export, in 2011. Nigeria's sweet potato export totaled 2401MT and represents 0.19% of world's sweet potato exports. In terms of sweet potato trading a long standing relationship between Nigeria and its northern neighbors like Niger and Chad have been established where Nigeria serve as supplier, Chad and Niger serve as buyers. (Bergh *et al,* 2013).

1.2 Problem Statement

Like other crop farmers, sweet potato farmers in Nigeria largely depend on rain fed agriculture for production. They produce mainly during the rainy season leading to a surplus of sweet potatoes soon after harvest and shortage in the dry season (Anon, 2003). In other words, there is lack of supply coordination among farmers in order to meet all year round market demand. Bulkiness and perishability affect post-harvest handling of sweet potato. Sweet potato is seasonal and does not store for a long time. Poor storability of sweet potato is mainly due to sprouting, dehydration and attack by pathogenic organisms (Ukpabi, 2004). These storage problems and others have led to losses by marketers in the course of performing their marketing functions. In most cases, poor storability and seasonality lead to market variations in quantity and quality of roots and its

associated price swings *(*Low *et al,* 2009). The rising consumer price for sweet potato may be an indication of market inefficiency. Sweet potatoes are mainly boiled or roasted and little attempt has been made to make flour or crisps (Ndunguru *et al*, 2003).Value addition is necessary if Nigeria is to enjoy higher benefits from the crop. Many actors in the value chain are not aware of the value addition possibilities of sweet potatoes. However, what is not well known is the value chain of sweet potato. The sweet potato value chain is rudimentary and little literature exists about it. Despite its potentials the value chain of sweet potato cannot be developed without knowing the existing relationship and linkages between the major actors involved along the value chain. This research aims at answering the following research questions:

i. Who are the major actors operating along the sweet potato value chain in the study area?
ii. What are the socio economic characteristics of sweet potato value chain actors in the study area?
iii. What are the functions, roles and relationship that exist among the actors involved in the chain?
iv. What are the margins acruing to each actor along the chain?
v. What are the major constraints and challenges influencing the performance of the various actors along the value chain?

1.3 Objectives of the Study

The broad objective of the study is to conduct an economic analysis of sweet potato value chain in Kano State, while the specific objectives are to;

i. identify and describe the major actors (enterprises) operating along the sweet potato value chain in the study area.

ii. describe the socio economic characteristics of sweet potato value chain actors in the study area.

iii. describe the functions, roles, and relationships existing among the major actors along the value chain.

iv. determine the cost and returns of the various enterprises (actors) along the sweet potato value chain.

v. identify and describe the major constraints and challenges influencing the performance of the various actors along the value chain.

1.4 Justification of the Study

Sweet potato has a role to play in the developing economies; its production provides job opportunities for farmers thus raising their income. Nigeria is the third largest producer of sweet potato in the world in terms of quantity after China. In 2013, Nigeria's sweet potato harvest is estimated at 3.5 million metric tons or 3.3 percent of total world production (UN/FAO.2014). However sweet potatoes are still considered a minor crop in the country. In 2010, sweet potatoes had the tenth highest production level of any single food crop in Nigeria, it comes next to cassava, yam, maize, sorghum ,millet and paddy rice. (Bergh, *et al,* 2013). It is an important food security crop for rural households and has a high yield potential that may be realized within a relatively short growing season. It is also adaptable to a wide range of ecological zones of 0 to 2000 meters above sea level. It is produced on small scale in a household based subsistence economy in Africa (Kisiangani and Pasteur,

2008). Not much has been documented on sweet potato value chain, hence the need to study the entire value chain of sweet potato. Improving sweet potato value chain will have a positive impact on the livelihood of all the actors involved along the chain. It can also lead to increase in the productivity of the various actors along the chain which could result in more savings and more investments.

The results of this research will help to provide information to other stakeholders including researchers, policymakers and in developing effective strategies for improving the sweet potato value chain.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual Framework on Value Chain

2.1.1 Definition of Value Chain

Global value chain concept as pointed out by Global Value Chain Initiative (GVCI), (2007) is an arrangement that describes the linkages of participants and their value creating activities that enhance the movement of goods and services from production, processing to the end user (consumer). The number and the conduct of participants along the chain determine its efficiency, pricing and returns accruing to each participant at every stage (GVCI, 2007).

Kaplinsky (1999) defined value chain to consist of full range of activities that are required to bring a product or service from conception, through the different phases of production, to delivery to final consumer and disposal after use. Towards the same vein, Kaplinsky and Morris, (2011) put forward value chain as a situation when all stakeholders in the chain operate in a way to maximize the generation of value along the chain. The concept can be viewed in two fold; the narrow and broad view. Narrow view is when value chain is considered within a firm producing certain output which includes the conception and design stage, input acquisition, main production and the marketing or distributive arrangements as such all these activities add value to the final product.

The broader approach of value chain connotes a complex range of activities undertaken by numerous actors: farmers, traders, processors, and exporters etc to bring raw material to the retail of the final product. The broad concept takes cognizance of activities

implemented by multiple actors or enterprises such that all backward and forward linkages are considered until the different produce are link to the final consumer.

In addition, Hartwich, Mongo, Ampuero and Soto (2010) define value chains as mechanism that allows producers, processors, buyers and sellers separated by space and time to add value to products and services as they pass from one segment of the chain to the next until the products gets to the final consumers. Therefore value chain analysis helps to show what different players (actors) in the chain put in and get out Daniel (2007).

In order to generate improvements in the supply or quality of any product, one needs to consider all aspects of the range of steps in the chain of events from production to consumption, including both opportunities and constraints, and the demand and supply of necessary products and services (Kaplinsky, 1999). Taking a value chain approach to economic development involves addressing the major constraints and opportunities faced by farmers (producers), processors, traders and other businesses at multiple levels and points along a given value chain. This will inevitably include a wide range of activities such as ensuring access to the full range of necessary inputs, facilitating access to cheaper or better inputs, strengthening the delivery of business and financial services, enabling the flow of information, facilitating improved market access, or increasing access to higher-value markets or value-added products.

Value chain analysis is a very useful conceptual tool when trying to understand the factors that impact the long-term profitability of a business and when developing a successful strategic plan for that business. The analysis facilitates an improved understanding of competitive challenges, helps in the identification of relationships and

coordination mechanisms, and assists in understanding how chain actors deal with powers and who governs or influences the chain. Developing value chains is often about improving access to markets and ensuring a more efficient product flow while ensuring that all actors in the chain benefit. Changing agricultural contexts, rural to urban migration, and resulting changes for rural employment, the need for pro-poor development, as well as a changing international scene (not least the increase in oil prices) all indicate the importance of value-chain (GVCI, 2007).

Kaplinsky and Morris (2011) perceived an increase in the gap in income distribution within and between countries of the world. However, they argue that value chain analysis can help to explain the processes particularly in a dynamic perspective, through mapping the range of activities along a value chain, its analysis pose to decompose the total value chain earnings in to the rewards that accrue to each different actor in the chain. To explain the distribution of the earnings, value chain analysis is the only way to get such information as oppose to other ways of assessing the global distribution pattern which only give partial insight. More so, value chain analysis sheds light on how firms, regions and countries are linked to the global economy. The mode of insertion determines to a large extent the distributional outcomes of global production system and the capacity with which individuals upgraded their operations and thus lunch themselves on to the path of sustainable income growth. In the value chain analysis, the international trade relations are considered as part of the network of producers, exporters, importers and suppliers. Thus within this context, the success of developing countries and market actors in the regions lies in the ability of accessing these networks.

2.1.2 Components of Value Chain

Daniel, (2007) reported that, value chain integrates three important levels which allows for the discovering of potentials and bottlenecks within the levels and in the dynamic interaction between them. Examining the value chain will reveal the following;

i Value chain actors

ii Value chain supporters

iii Value chain influencers

Value chain actors or participants are the major stakeholders in the value chain (Mustapha, 2012, and Tiamiyu *et al,* 2013). These are directly involved with primary activities of production, processing and marketing of the product. The actors exercise ownership of the product in time and space as it moves along the chain. Value chain supporters include individual or organizations that render services to the value chain actors; they include financiers of the agro-businesses, information disseminators, and other marketing extension agents. Value chain influencers are the organization and institution that are responsible for setting up the regulatory frame work for the value chain. Favorable business environment provides economic and political stability and allows for efficient business operations which lead to greater innovation and creativity.

2. 1.3 Value Chain Actors

Different types of value chain participants could be identified between producers and consumers; these include producers, farm commission agents, rural wholesalers, rural retailers, urban commission agents, urban wholesalers and urban retailers, performing

varied marketing functions. Adamu, (2010) also enumerated market participants to include producers, local assemblers, local transporters, commission agents, wholesalers, rural assemblers, lorry transporters, urban wholesalers and urban retailers for different agricultural commodities.

2.2 Conceptual Frame work on Sweet Potato

2.2.1 Origin and Distribution of Sweet Potato

Sweet potato (*Ipomea batatas* (L.) Lam) was first described in 1753 by Linnaeus as *Conolvulus batatas*. However in 1791 Lamarck classified this species within the genus *Ipomoea* based on the shape of the stigma and the surface of the pollen grains. The crop is a dicotyledonous plant, which belongs to the family *Convolvulaceae*. In this family there are about 50 genera and more than 100 species. But only *Ipomea batatas* is of major economic importance. Sweet potato is believed to have originated from Central America and was domesticated 5000 years ago (CGIAR, 2005). From its origin the crop then spread to other parts of the world; Columbus brought it to Europe and further introduced it to Africa. It is an important food crop in tropical and sub-tropical countries and grown in large scale in Mexico, Central America, South America, Mediterranean regions of Europe, Africa, India, China, Japan, South East Asia, East Indies and the Pacific Islands. China is the world's largest producer with an annual harvest of 100 million tonnes. Uganda, Nigeria, Indonesia and Vietnam which follow china in production each harvest about 2.5 million tons of Sweet potato annually (FAO, 2002).

Sweet potato is now cultivated throughout the tropics and warm temperate regions. According to Scott (1992) it is cultivated in more than 100 countries worldwide and is

ranked seventh among the most important crops. By far, China produces more sweet potatoes than any other nation. In 2013, the most recent year for which UN/FAO production data were available, China produced over 70.5 million metric tons, or 68.4 percent of the estimated world production. China's production in 2013 was down significantly from 2000, when 117.9 million metric tons of sweet potatoes were cultivated, or approximately 84.8 percent of total world production. Other nations, primarily in Asia and Africa, are significant producers of sweet potatoes. The top six sweet potato-producing nations include Nigeria, with a 2013 harvest estimated at 3.5 million metric tons or 3.3 percent of total world production; Uganda with 2.5 million metric tons or 2.5 percent of total world production; and Indonesia and Vietnam, with production totaling 2.3 and 1.3 percent of world production, respectively. With 2013 production of 1.1 million metric tons, or roughly 1 percent of total world production, the United States is the sixth largest sweet potato-producing nation in the world.

2.2.2 Sweet potato Production in Nigeria

Nigeria is the second largest sweet potato producer in the World after China, with the 2013 harvest estimated at 3.5 million metric tons or 3.3 percent of total world production (UN/FAO, 2014). There is growing interest in promoting sweet potato on the part of the Federal Government and other stakeholders including the International Potato Center (CIP) for several reasons. Sweet potato, with its broad genetic diversity that provides sweet and non-sweet varieties of varying colors (white, yellow and orange fleshed), has huge potential to improve food insecurity, micronutrient malnutrition and livelihoods in Nigeria which has yet to be fully exploited. Orange-fleshed sweet potato (OFSP), currently not widely grown in Nigeria, can be part of a food-based approach to

complement supplementation and fortification to address the high prevalence of vitamin A deficiency (29.5%) among young children. Tewe et al,(2001)

Higher population density and declining soil fertility is already pushing Nigerian farmers to increase sweet potato cultivation as the crop has a shorter maturity period than cassava and yam and does not have the high soil fertility requirements of yam. Its ability to grow under marginal conditions and flexible planting and harvest times are also driving its expansion. These factors, as well as investment in irrigation facilities, have given rise to a shift in concentration of sweetpotato production from the sub-humid zone (Kwara, Niger, Plateau and Benue States) to the more northern semi-arid zone namely Kaduna, Kano and Bauchi States (Owumah, Dipeolu and Fetuga, 2012)

Sweet potatoes are grown in all parts of the country in diverse agro ecological zones, from tropical rainforest to semi-arid and arid zones. While sweet potatoes are considered a cash crop in certain parts of Nigeria (for example, Kwara state), in most areas, sweet potatoes are grown as a secondary crop.

Sweet potatoes are adaptable to marginal environments; flexible in mixed farming systems; and have a short maturation period (3-8 months depending on the variety), which allows for two or more crop cycles in a year. Sweet potatoes generally require less labor inputs, and have lower rainfall and soil fertility requirements than other crops like yams.

Table 1: Major Sweet Potato Producing States in Nigeria

Ecological zone	States
South South	East Cross River, Delta, Akwa Ibom, Rivers, Bayelsa
South East	Imo, Enugu, Anambra, Ebonyi
South West	Osun, Oyo, Ekiti, Lagos
North Central	Kaduna, Benue, Kwara, Niger, Plateau
North East	Taraba, Adamawa, Bauchi, Yobe, Borno
North West	Sokoto, Kebbi, Katsina, Zamfara

Source: Tewe *et al* 2001

Different authors cite different reasons for sweet potatoes' rapid growth and acceptance in recent decades. Goldman (1996) explains that cropping challenges over the past 50 years, particularly diseases threatening the production of other major crops like cassava, groundnuts, cocoyams, bananas and plantains, caused Nigerian smallholders to diversify production to include sweet potatoes. Crissman *et al* (2011) cites other possible reasons to explain the crop's rapid expansion. Failures of other crops have caused farmers to switch to sweet potatoes. Cassava and sweet potatoes are often grown on the same farm or same region, and farmers frequently turn to sweet potatoes when cassava fails due to pest and disease attacks. Moreover, a decline in government support for maize production caused farmers to seek other low-cost alternatives. Finally, the impact of HIV/AIDS and large migration of rural males to urban areas reduced family labor options for agricultural production; remaining family members chose to plant crops that were required less risk, cost, and labor, such as sweet potatoes

2.2.3 Sweet Potato Production Cycle in Nigeria

Despite the appearance and name of "sweet potatoes", they are root crops, unlike potatoes which are tuber crops. Sweet potatoes are trailing or climbing plants with vines.

Sweet potato production is determined by rainfall. The best yields occur in areas with 750 to 1,000 millimeters of annual precipitation, with at least 500 mm falling during the growth season. However sweet potatoes do not grow well in water logged soil as it may cause tuber rots and reduce storage roots if aeration is poor. Rain fed sweet potatoes can be cultivated twice a year (i.e. April to August and August to December). In general, planting takes place from February through July in the central and south, where rainfall is heavier. But planting along rivers in the central part of the country or swampy areas in the north can extend the planting season from September to December. Most farmers grow sweet potatoes on plots of land less than one hectare in size. Sweet potatoes are often intercropped as the secondary or minor crop. In the south and central parts of the country, sweet potatoes are intercropped with other root and tuber crops (yams, cassava, cocoyams) and in the north they are intercropped with cereals like maize and millet. Sweet potatoes provide soil cover and leave vegetative residue that can be incorporated into the soil after harvest, which also contributes to the primary crop's production.

The sweet potato production cycle in Nigeria involves the following major activities, which are derived from sweet potato production inputs in Tewe, Ojeniyi, and Abu (2003):

1) *Land clearing, packing, and burning:* Land preparation can be manual or mechanized.

2) *Tilling/plowing and mounding or ridging:* Tilling/plowing helps create loose soil for optimal sweet potato production performance. Ridge planting is the most common method of growing sweet potatoes in Nigeria.

3) *Processing of planting materials:* Vines serve as planting materials.

4) *Planting:* Planting begins at the onset of the rainy season and continues until two months before rains stop. Sweet potatoes may be planted on mounds, ridges, beds, or on flat ground. The crop performs best on mounds and poorest on flat ground.

5) *First weeding:* Most sweet potato farmers practice hoe weeding. Sweet potatoes confront weed problems only during the first two months of growth. After this period, intense vine growth causes rapid and effective coverage of the ground, smothering the weeds present. Most small-scale farmers do not bother to weed sweet potato plots at all, due to this recognized pattern.

6) *Fertilizer application:* Sweet potato farmers typically do not apply fertilizer. However, studies show application significantly improves tuber yields. The recommemdecd dose is Nitrogen 1bag/acre, Phosphorus 1bag/acre, potassium 1bag/acre.

7) *Second weeding:* Hoe weeding is recommended a second time to ensure weeds to not prevent tuber growth.

8) *Harvesting:* Harvesting occurs 3-8 months after planting, depending on the variety. Harvesting entails cutting off shoots, carefully digging out tubers while avoiding bruises, using a fork shovel, long wooden sticks, metal rod with flattened ends, and hoes. Harvest time is flexible and often staggered. However, harvesting at the earliest maturation period is recommended to avoid attacks from weevils (beetles) as moisture in the soil decreases. In times of adverse conditions, only mature tubers are harvested for consumption or market sale. Small tubers are left to continue growing. Knowing when to harvest enables farmers to obtain tubers with a desirable dryness composition. Farmers often leave storage roots in the field during the dry season in the soil and harvest when food supplies are short.

Sweet potato production generally follows the activities listed above but the timing varies by region and agro ecological zone

Table 2: Sweet Potato Production Pattern by Different Ecological Zones in Nigeria

Ecological zone	States	Activity/time
North East	Taraba, Adamawa, Bauchi, Yobe, Borno	Planting July to August Possible second crop irrigated from November to December
North West	Kano, Jigawa, Katsina, Sokoto, Zamfara, Kebbi	Planting May to July
North Central	Benue, Kogi, Kwara, Niger, Kaduna, Nasarawa, Plateau	Ridges made from May to July, vines planted july through august
South west	Oyo, Osun, Lagos, Ekiti, Ondo, Ogun	Planting from March to August

Source; Tewe et al 2001

2.2.4 Sweet Potato Varieties Grown and their Uses

Depending on the variety, sweet potatoes *(Ipomea batatas)* range in level of sweetness (very sugary to bland), level of dryness (watery to floury) and in color, from white or red to yellow or deep purple. The most commonly cultivated sweet potato varieties in Nigeria are white and yellow/orange-fleshed. Initiatives have spawned to encourage the production and consumption of orange-fleshed sweet potato varieties that are rich in beta-carotene (a carotenoid or plant pigment responsible for the yellow and orange coloration of some tuber varieties) and help fight vitamin A deficiencies In Nigeria, most of the sweet potato landraces (local varieties developed by natural processes and adaption to the local environment) have white-fleshed roots with negligible amounts of beta-caroten, Ijeh and Ukpabi (2004) showed that a popular local yellow-fleshed landrace (known as Ex-

Igbariam) has an appreciable quantity of beta-carotene, though still relatively limited when compared to the orange-fleshed varieties. Nigeria's National Root Crop Research Institute (NRCRI) has officially released three improved, high-yielding white-fleshed varieties: TIS 87/0087, TIS 8164, TIS 2532-OP-1-13.13 The International Potato Center (CIP), International Institute for Tropical Agriculture (IITA) and the NRCRI are currently testing clones of local and orange-fleshed varieties.

2.2.5 Utilization of Sweet Potato.

Currently, sweet potato is being utilized in various forms in other parts of the world. These uses can be adapted in the country to boost production and consumption of the crop. A summary of sweet potato utilization potentials for the Nigerian food industry adapted from Egeonu (2004), is given below.

Sparri: Sweetpotato has been successfully made into sparri (coined from 'sweet potato garri'). This is grated sweet potato that is subsequently fermented for1-2 days and then roasted in the same way as garri isproduced from cassava. The product is as tasty ascassava garri and keeps well

Confectionaries: Sweetpotato can be made into various confectionaries including buns, cakes, rolls and puff-puff by utilizing dough made from the parboiledand grated tubers. Extensive work on this has beendone in Ghana.

Flour: Sweet potato flour could be used for bakingon its own or as a supplement to cereal flour, aswell as a stabilizer in the ice-cream industry (FAO,1990).

Crisps: Sweet potato could be processed intocrisps in much the same way as potato.

Canned Sweet potato: This is common in the USA where the yellow-fleshed varieties are preferred, and the tubers are cut into large chunks, filled into cans, heated at 85oC and immediately sealed.

Animal feed: Both roots and tops apart frombeing used fresh, could be made into a dried meal and fermented silage and fed to livestock, includingpigs, cattle and poultry. This use is quite significant in China, the USA, Taiwan and India (Scott, 1992; Woolfe, 1992)

.Starch: Starch can be produced from sweetpotato in the same way as from the other starchy roots excep that the solution is kept alkaline (pH 8) by using lime, which helps to flocculate impurities and dissolve the pigments. Sweet potato starch is used in the manufacture of starch syrup, glucose and isomerized glucose syrup, lactic acid beverages, bread and other confectionaries, as well as distilled spirits called shochu in Japan. Noodles and isomerized saccharides as as weetener for soft drinks are also made from sweet potato starch in China, Japan and Vietnam (Prain et al., 1997).

Sweet potato Beer: The Koedo Brewery Kawagoe, of Kawagoe in Japan has been producing sweet potato beer from roast local sweet potatoes since1996. It contains 7% alcohol and tastes like something between beer and wine, with a faint sweetness (JRT, 2000).

Sweet potato Beverage: Marketing of sweet-potato beverages and yoghurt started in 1997 in Japan and these products are now quite popular (JRT, 2000).Technology transfer and adaptation from this country into Nigeria for sweet potato beverage production in commercial quantities is an important initiative to be taken.Sweet potatoes are most commonly used for human consumption, animal feed, and diverse industrial uses. Sweet potatoes are usually consumed fresh but prepared in many different ways. Most commonly, the fresh root is peeled and boiled, roasted, or fried into chips (fries). The

leaves are often boiled and incorporated into soups and stews or stir fried with chili and minced dried shrimps. Sweet potatoes are also commonly fed to infants and young children. Sweet potatoes are cooked together with cowpea, lima beans, sesame, millet and/or other root and tuber crops to make a traditional porridge. Sweet potato dough is incorporated with other root and tuber crops to create two staple dishes in the country: *fufu,* a stiff, gelatinous dough prepared by pounding boiled tuber pieces in a mortar; and *amala,* a thick porridge that is often served with soup.

In the north and central regions of Nigeria, sweet potatoes can be peeled, sun-dried, and milled into flour that is used for sweetening local dishes or for preparing a fermented drink called *kunu.* Sweet potatoes are already a staple crop in northern Nigeria, where most of the crop is produced. However, the high level of sweetness remains the greatest barrier to sweet potato uptake in the south, where most of the country's population is concentrated. The National Root Crop Research Institute (NRCRI) is developing high dry matter, non-sweet, easy to pound varieties that would appeal to this large population segment.

A bulk of sweet potato production in india goes for human consumption, it is processed into different forms and consumed at the village or house hold levels. Only the vines are fed to cattle. Sweet potato roots are mostly eaten boiled, steamed, and roasted or baked. Another method is by roasting them unpeeled in low fire. In northern India, roots are ground into flour and used for chepatis and confectionary. Boiled sweet potato pulp is dried into shrads and used during festivals in maharasthra. No attempt has been made in india to produce secondary processed roots from sweet potato. In Srilanka, cultivated area under sweet potato is about 7000ha. The crop is grown in small-holden sector, mainly as rain fed cultivation in the highlands as well as the low lands during dry season. National

sweet potato production is about 70,000t/yr. All of this production is used for human consumption. Sweet potato is consumed as boiled roots, cooked vegetable or as fried chip. Clean fresh roots are peeled in coir sacs and transported to the market either by farmers or middlemen.

Sweet potatoes have a number of additional agricultural and industrial uses as well. Sweet potato vines, leaves and roots are used for animal feed for sheep, goats, and rabbits. Recent studies found that animals that are fed sweet potato vines actually produce less methane gas than animals given other types of feed, suggesting that sweet potato animal feed can help contribute to reducing global emissions. Sweet potatoes are also processed industrially into fried snacks like sweet potato fries (chips), candy, starch, noodles, and flour. There is high demand in urban areas for fried sweet potato crisps .Sweet potatoes can also be exploited for ethanol and bio fuel production. Sweet potatoes can be processed to yield about 137 liters of ethanol per MT of sweet potato tubers.(Odebode, 2008)

Table 3: Sweet potato Utilization by Different States in Nigeria

Ecological Zone	Sweet potato Growing States	Form of Utilization
South-west	Oyo, Osun, Lagos, Ekiti, Ondo, Ogun	Boiled and Eaten Fried into Chips and Eaten Pounded or Mixed with Yam and Eaten with Vegetable Soup
South-East	Anambra, Enugu, Imo, Abia, Ebonyi	Boiled and Eaten Fried and Eaten as chips Roasted Pounded
South-South	Edo, Delta, Bayelsa, Rivers, Akwaibom, Cross river.	Fufu Made into Porridge Snacks Starch Small tubers are used for animal feed Roasted or fried in cooking oil before being eaten.
North-West	Kano, Jigawa, Katsina, Sokoto, Zamfara, Kebbi	Boiled, Roasted and eaten Fried and Eaten as Chips Used in preparing "Kunnu" drink Fufu with Vegetable Soup "Usinsin Dankali" Snacks Sweetpotato flour mixed with Cassava flour to make Amala
North-East	Yobe, Borno, Adamawa, Taraba, Bauchi	Boiled and Eaten, Used as Sweetener Dried and Fed to Livestock "Kunnu" Drink
Norh-central	Benue, Kogi, Kwara, Niger, Kaduna, Nasarawa, Plateau	Eaten Boiled with Rice, Processed into Kunuzaki Sweetening Agent Oiled and Eaten with Groundnut Cake

Source, Odebode (2004)

2.2.6 Importance of Sweet Potatoes

Sweet Potatoes are Important for Income Generation and Food Security

Sweet potatoes present diverse industrial uses, some of which are potentially highly profitable, such as sweet potato snacks. Sweet potatoes are extremely adaptable to adverse environmental conditions; they can help increase food security in times of

drought and famine, particularly in post-conflict areas for displaced persons. Sweet potatoes produce carbohydrates much faster and require less labor than other crops. Sweet potatoes are used to restore access to food for resetting populations and alleviate future agro-climatic or political shocks. The challenge with using sweet potatoes in emergency response situations is the crop's low multiplication rate. Vine material needs to be ready to go and mechanisms in place to distribute vine materials to needy farmers. Sweet potato is largely grown for its tuberous storage roots, which are generally steamed or boiled (Walker *et al* 2011). The roots provide energy, proteins, vitamins A (particularly in orange fleshed sweet potato varieties), B1 and B2, ascorbic acid and folic acid in diets. Other important nutrients in sweet potato roots are calcium, phosphorous, sodium, iron and potassium (CIP 2012). Young sweet potato leaves are also consumed as vegetables in some countries and are rich in vitamins A, B1, B2, proteins and iron (CIP, 2012). Generally, the storage roots of sweet potato and foliage are also important supplementary fodder in livestock production. Hence, Sweet potato plays an important role in ensuring food security, especially during droughts in large parts of Africa and is seen as an important ingredient in animal feed industries (CIP, 2012)

2.2.7 Consumption of Sweet Potato

Domestic consumption has increased significantly since 1990; according to FAO (2010) estimates, consumption grew from 143,000 MT in 1990 to 2,746,000 MT in 2010. The proportion of sweet potato used for food consumption has risen steadily and accounts for 47.6% of total consumption, as compared to 35% in 1990 in Nigeria.

2.3 Review of Empirical Studies on Value Chain

The concept of value chain traces its source to business management which was described by Michael Poter (1985) in 'Competitive Advantage: Creating and sustain superior performance' Value chain analysis has been employed in the development sector as a means of identifying poverty reduction strategies by upgrading along the chain. ICRISAT (2013) has investigated strengthening the value chain for sweet sorghum as biofuel in India. It was aimed at providing a sustainable means of making ethanol that would increase the incomes of rural poor without sacrificing food and fodder security while protecting the environment. Ugonna *et al*, (2013) uses value chain approach to study potato production, processing and conversion to different products in Nigeria while identifying the existing technologies and technology gaps. Phillips *et al.,* (2013) used value chain to analyze productivity, improve livelihood, income and food security among yam farmers in Nigeria. Commodity chain analysis was used by Maiadua (2013) to study hide and skin value chain in Daura local government area of Katsina State. Towards the same vein Adeoye *et al*, (2013) studied plantain value chain mapping in south western Nigeria. Maize value chain in Kano State was studied by Abdullahi, (2012). Ouma and Jagwe (2010) investigated banana value chain in Central Africa towards identifying constraints and opportunities of small holder producer position in the value chain while designing strategies that would minimize the effects of agricultural commodity price fluctuations. Mustapha (2012) also uses the approach to study economic analysis of rice value chain in Kano State, Nigeria. The assessed the organization of rice value chain, different processing technologies, profitability of value chain activities as well as factors determining rice output and consumer preference for both local and imported rice. Legese

et al, (2008) assessed live animals and export meat value chain to determine constraints and opportunities for enhancing the efficiency of meat export Ethiopia. The study was conducted using Rapid Market Appraisal (RMA) to ascertain the characteristics of the marketing system, mapping the supply chain, understanding constraints and opportunities and as a basis for designing follow-up in value chain researches. Webber (2006) uses benchmarking to study coffee value chain in Tanzania. Benchmarking compare the performance of a company's value chain to its self at different time or to another value chain within a country or between countries toward providing a baseline such that information could be compared to guide decision and actions.

Humprey, (2000) reported that value chain framework have been utilized by development practitioners and researchers to capture the interactions of dynamic and complex markets in developing countries and to examine the interrelationships between the diverse actors involved in the stages of the marketing. In a similar development, Humprey (2005) asserts that, value chain dwells on the power relationships based on the governance of the chain and have highlighted potential point of entry for small holders. Value chain analysis allow for the assessment of the linkages between and among the productive activities along the chain when the framework is considered beyond the firm or activity specific. Additionally, the approach provides a framework for analyzing the nature and determinant of competitiveness.

2.4 Review of Empirical Studies on Sweet Potato

A lot of studies have been conducted on sweet potato some of which include, Yusuf . A *et al* (2015) studied economic analysis of small scale sweet potato production in Zaria Local

Government Area of Kaduna state .Analytical tools such as descriptive statistics, Gross margin analysis technique, correlation analysis and production function analysis were used for analysis of data. The analysis revealed that educational status, farm size and farming experience had strong positive correlation with sweet potato output while the result of the empirical Cobb Douglas production function reveals that the production inputs were able to explain variation in the level of output significantly by sixty eight percent [68%]. The findings of the study showed that the cost of production was N49, 069.00 per hectare with labour accounting for the highest cost item. The gross margin obtained was N44, 573.90 per hectare. The study equally shows that the factor inputs considered in sweet potato production were inefficiently utilized as demonstrated by their various efficiency ratios and with regards to return to scale, sweet potato farmers exhibited increasing return to scale.

Ahmad (2012), in his studies on 'Economics of Sweet Potato *(Ipomea batatas L)* Production in Some Selected Local Governments', Areas of Kano State, revealed that majority (43.3%) of the respondents were within the age of 30-42 years with mean age of 34 years, 70.83% were males, 69.16% were married and majority (26.6%) attended quranic education, 45% had farm size of between 0.2-1.0 hecters and majority inherited their farm land. Majority of the respondents 85.8% have an experience of between 1-15 years. The study also revealed that cost of labour (44.1%) accounted for the total cost of production and the gross income per hectre was found to be N75,553 with a gross margin of N45527 and for each naira invested there was a return of N2.51. The coefficient of multiple determination was found to be 91%. Fertilizer, seed , labour, and manure were statistically significant. Resource use efficiency revealed that farmers under utilise

resources like fertilizer, manure, seed and pesticide except labour. High cost of inputs, poor access to credit, poor price, pest and diseases as well as poor access to market were the major constraints faced by sweet potato farmers in the study area

Mahe et al (2015) in their studies on 'Analysis of Value chain of sweet potato in two districts of Bangladesh' found that the major value chain actors are input suppliers, producers, traders, processors and consumers. The study found that sweet potato producers sold almost 84% of their produce to traders, 10% for home consumption and 6% are used as livestock feed. The farmers stated that sweet potato requires few inputs and returns are comparatively high. The study revealed that there are no any specialised sweet potato traders in the study area, the available traders found were basically that of seasonal vegetables and horticultural crops. The study shows that at the beginning of the season traders secured 21% profit margin where as in the peak and late season they got 27% and 18% profit margin. The study revealed that sweet potato retailers purchased sweet potato from large traders and sometimes from the field and almost sell all the quantity to consumers on daily basis. The study revealed that sweet potato retailers got 14% profit margin at the beginning of the season, where as they secure 23% and 20% profit margin during peak and late season respectively. The study also found that sweet potato processing industries are not available in Bangladesh. It was found that consumers prefer boiled form of sweet potato followed by burned form.

Tewe, Ojeniyi, and Abu (2003) compared production costs and revenue for sweet potatoes, cassava, yam, and maize in southeastern Nigeria and found that sweet potatoes had a higher profit margin than cassava, yam, and maize. Furthermore, Anyaegbunam and Nto (2011) studied net returns, marketing margins and efficiencies between sweet potato

retailers and 120 wholesalers across 24 markets in different states in southeastern Nigeria. They concluded that overall sweet potato marketing system is inefficient, but lucrative. To address such inefficiencies, the authors recommend efforts to diversify sweet potato usage in order to reduce spoilage and improve access to processing and storage facilities for marketers.

2.5 Analytical Framework

2.5.1 Socio-Economic Characteristics of the Principal Value Chain Actors

Several analytical techniques and models were used in the determination of socio-economic characteristics of value chain actors, these models includes, descriptive statistics (use of percentages, mean, maximum, minimum and frequency etc). Thus, in the context of this research, the use of descriptive statistics was employed because of its simplicity and precision. Mujeeba (2015) in her work titled ' Chili pepper value chain in kano state, Nigeria' use descriptive statistics to describe the socio economics characterisc of chili pepper value chain actors. Katanga (2016) use descriptive statistics in research titled 'Sesame value chain in jigawa state,Nigeria' to describe the socio economic characteristics of sesame value chain actors. Ele *et al* (2015) on their work titled 'Gross margin analysis of sweet potato production in the inland valleys of Obubura Local Government Area of Cross River State, Nigeria' use descriptive statistics to describe the socio economics characteristics of sweet potato farmers in the study area.

2.5.2 Profitability of Sweet Potato Marketing

Gross and marketing margin, marketing efficiency, operation ratio, are some of the analytical models used in the assessment of cost and returns accrued to actors in the value chain. Bennet, used BCR to assess the profitability of sesame Marketing system. For the purpose of this research, gross and marketing margin models were selected for its simplicity in calculation and its wider acceptance among researchers. Gross and marketing margin are budgetary tool used in evaluating economic profitability of enterprises as employed by (Eluagu and Nwali, 1999; Tiamiyu 2002, Somda *et. al*., 2003, Olukosi and Erharbor, 2005, Achike and Anzaku 2010, Abu, *et al*,. 2011 and Tiamiyu *et al,* 2013).

Kushwaha and Adamu (2003) defined marketing margin as the difference in price paid for a commodity at different stages of a marketing system. Olukosi and Erharbor, (2005) further stated that time, place, form and possession are important factors that affect marketing margin. Hence marketing margin represents differences in price of a given commodity at different stages of time, place, form and possession as the commodity is passed from the farmer to the final consumer. It is made up of different costs of performing marketing functions such as storage, transport and processing. Alternatively, it is made up of returns to different factors of marketing, say transportation, storage, processing, other value additions, capital and management used in marketing. It should be noted here that the components of marketing margin differ from one product to another, since the functions required to be performed on commodities differ.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

Kano state is situated in the Sudan savannah agro ecological zone of Nigeria. The state lies approximately between latitude 10^0 33'^{0}N to 12^0 23 'N and longitudes 7^0 45 'E to 9^0 29'E , with altitude of 472 meter above sea level and a population of 9,401,288 during the 2006 census with proportion of 4,947,952 male and 4,453,336 female (NPC, 2006) The annual growth rate was 3.34% and the projected population in 2016 will be 12,541,318 with proportion of 6,600,568 male and 5940,750.2 female (Ahmed, 2014) It has an estimated land size of 21,276.872 km^2 with 1,752,200 hectares agricultural and 75,000 hectares of forest vegetation and grazing land (Abaje, Ndabula and Garba, 2014) Kano State borders Katsina and Jigawa state to the Northwest and North East respectively while on the other South west, it shares borders with Bauchi and Kaduna State respectively (KNSG, 2006)

Kano State has two seasonal periods categorized on the basis of moisture as dry and raining seasons. The temperature of Kano usually ranges between a maximum of 35^OC and minimum of 15.85^OC although sometimes during harmattan it falls down as low as 1^{0C}. Annual rainfall ranges between 787 and 960mm (KNARDA, 2001). Farming is among the major occupation of the people who are predominantly Hausa-Fulani. The principal crops grown in the state include millet, sorghum, soybean, groundnut, pepper, onion, etc. as well as animal husbandry, fishery, processing and marketing of agricultural products.

Kano State is one of the major sweet potato producing states in North-Western part of Nigeria with a production figure of 286.485 ton in 2013, the current year in which production data was available (KNARDA 2013). A total of 36.16 hectares is devoted to sweet potato production and average of 7.92t/ha is obtained (KNARDA, 2013). The major sweet potato producing Local governments in kano state include Rimin Gado, Albasu, Garko, Kibiya and madobi, (KNARDA, 2013) The state has 44 Local Government Areas and is administratively classified into three agricultural zones by Kano State Agricultural and Rural Development Authority (KNARDA, 1995).

1. Zone I, with its headquarters in Rano which consist of 14 LGA,s namely Bebeji, Bunkure, Doguwa, GarinMallam, Gwarzo, Karaye, Kibiya, kiru, Kumbutso, Kura, Madobi, Rogo, and Tudunwada.
2. Zone II, With its headquarters at Danbatta consist of the following LGA.s Bagwai, Bichi, Dawakin tofa, Kabo Kunchi, Makoda, Minjibir, Rimin gado, Shanono, Tofa, Tsanyawa and Ungoggo.
3. Zone III, With its headquarters at Gaya consist of the following LGA.s Ajingi, Albasu, Dala, Dawakin Kudu, Fagge, Gabasawa, Garko, Gezawa, Gwale, Municipal, Nasarawa, Sumaila,Takai, Tarauni, warawa and Wudil.

3.2 Sampling Procedure.

Stratified random sampling was used for the study. The respondents were categorised into producers, marketers. Processors and consumers.

3.2.1 Selection of Producers

A multistage sampling technique was use for the selection of producers. The first stage involves selection of 2 of the 3 ADP zones in the State. The zones were selected base on high concentration of sweet potato production. Zone II (Danbatta) and Zone III (Gaya) were selected. The second stage involves random selection of one local government area from each of the 2 zones among the sweet potato producing local Governments. Rimin Gado was selected from zone II while Albasu was selected from zone III. The third stage involve purposive selection of two main producing communities from each of the selected local Government Area. Gulu and Yelwa were selected from Rimin Gado while Hungu and Gwagwarandan were selected from Albasu Local Government Area. In each community a simple census was conducted to estimated number of Sweet potato producers to form a sample frame from which 16% of the estimated sweet potato farmers were randomly selected using balloting box method.

Table 4: Summary of location and Sample size for producers

Selected Zone	Selected LGA	Selected Villages	Estimated No of sweet potato producers	No of selected farmer
Gaya	Albasu	Hungu	200(16%)	32
		Gwagwarandan	200(16%)	32
Rano	Rimin Gado	Gulu	200(16%)	32
		Yalwa dan zai	150(16%)	24
				120

Source: field survey, 2015

3.2.2 Selection of Sweet potato Marketers (wholesalers and retailers)

Studies on sweet potato marketing covered both rural and urban markets. Both markets were selected based on their relative importance in terms of sweet potato marketing. The study employed ramdom selection of 50% of both the wholesalers and the retailers, as

such Darki market (Rural), Rimin Gado market (Rural) and Dakata market (Urban), Rimi Market (Urban) were selected. In rural markets it was observed that there are 3 locations for wholesalers and in each location there are 10 wholesalers. 5 wholesalers were randomly selected from each location making a total of 15 wholesalers in each of the rural market. For the retailers it was observe that they are located in two locations within the rural markets and in each location there are 20 retailers, hence 10 retailers were randomly selected from each location making a total of 20 retailers in each rural market. For the urban markets it was observed that the wholesalers have one location and 5 wholesalers were randomly selected out of 10 wholesalers in that location from each market. For the retailers it was observed they are stationed in two locations within the market and in each location there are 20 retailers, hence 10 retailers were randomly selected from each market making a total 20 retailers.

Table 5: Summary of sample size and location of marketers

Market	No of wholesalers	No of Retailers	Selected no of Wholesalers	Selected no of Retailers	Total
Darki (Rural)	30	40	15	20	35
Rimin Gado (Rural)	30	40	15	20	35
Dakata (Urban)	10	20	5	10	15
Rimi (Urban)	10	40	5	10	15

Source: field survey, 2015

3.2.3 Selection of sweet potato Processors.

Processing of sweet potato is at small scale for such reason artisanal processors of sweet potato were selected. The selection covers both rural and urban areas. Darki and Hungu

market were selected from Albasu LGA while Rimin gado and Gulu markets were selected from Rimin gado LGA. The markets were selected based on concentration of sweet potato processors on market days. In each market estimated numbers of sweet potato processors were estimated and 50% of the estimated number was selected. In urban areas multistage sampling technique was use for the selection of artisanal sweet potato processors. The first stage involved purposive selection of kano metropolis which comprises of eight Local Government Areas namely Kano Municipal, Nasarawa, Tarauni, Dala, Kumbotso, Ungogo, Gwale and Fagge based on high concentration of artisanal sweet potato processors. Second stage involves purposive selection of three LGA's. The LGA's been selected include Kano Municipal, Nasarawa, and Ungogo. The LGA's were selected based on high concentration of artisanal sweet potato processors.

The third stage involved purposive selection of one community in each of the LGA's being selected also based on high concentration of artisanal sweet potato processors. The communities being selected include Brigade in Nasarawa LGA, Yakasai in kano municipal and Kurna in Ungogo LGA. In each community a simple census was carried out to estimate the number of artisanal sweet potato processors to form a sampling frame from which sample was drawn.

Table 6: Sampling frame in respect of sweet potato processors

Place	Area selected	Estimated no	No selected (50%)
Albasu	Darki market	10	5
	Hungu	10	5
Rimin Gado	Rimin gado market	10	5
	Gulu	10	5
Kano municipal	Yakasai	20	10
Nasarawa	Brigade	30	15
Ungogo	Kurna	30	15

Source: field survey, 2015

3.2.4 Selection of Consumers.

A consumer survey was conducted to capture distribution pattern at the retail end different consumers. A total of 30 consumers were selected. The consumers were randomly selected by truncation in such a way that the first male or female buyer was selected while the second, third, fourth and fifth were ignored while the sixth buyer was considered until 30 consumers were selected.

Table 7: Summary of sample size for value chain actors

Actors	Sample size
Producers	120
Marketers	100
Processors	60
Consumers	30
Total	310

Source: Field survey, 2015

3.3 Data collection

Data for the study were collected using structured questionnaires administered by the researcher with the assistance of trained enumerators in the month of September 2015. Data collected includes information on the socio economic characteristics such as age, gender, marital status, household size, educational status and years of experience. Cost and Return as well as the constraints faced by the value chain actors (producers. Marketers, processors and consumers) were also examined.

3.4 Method of Data Analysis

Data for the study was analyzed using descriptive statistics, Gross margin, marketing margin, net marketing and marketing efficiency models. Descriptive statistics was use to achieve objective i, ii and v. Flow chart was use to achieve part of objective iii. Gross margin, marketing margin, net marketing margin and marketing efficiency were use to achieve objective iv.

3.4.1 Descriptive statistics

This involves the use of percentages, mean, standard deviation, and frequency distribution to describe the socio economic characteristics of the sweet potato value chain actors and to identify the constraints to sweet potato value chain actors in the study area.

3.4.2 Gross Margin Analysis

The gross margin analysis was used to evaluate the profitability of sweet potato production in the study area. It is very useful and in situation where fixed capital forms a negligible proportion of production cost, it is the difference between gross income (GI) and the total variable cost (TVC). According to Olukosi *et al,* (2005),gross margin is expressed as

GM = GI –TVC

Where

GM = Gross margin (₦/ha)

GI = Gross income (₦/ha)

TVC = Total variable cost. (₦/ha)

Gross income for producers of sweet potato = $Q_x * p_x$

Where Q_x = Total quantity of sweet potato produced (kg) + byproduct

p_x= price of sweet potato ((N/kg)

For production of sweet potato, TVC can be expressed as

The Total Variable Cost (TVC) of sweet potato producers = $Q_1X_1 + Q_2X_2 + Q_3X_3 + Q_4X_4$

Q_1 = Quantity of sweet potato vine (kg)

X_1 = Price of sweet potato vine (₦/kg)

Q_2 = Quantity of fertilizer (kg)

X_2 = price of Fertilizer (₦/kg)

Q_3 = Quantity of pesticide (ltr)

X_3 = price of pesticide (₦/ltr)

Q_4 = Amount of labour (man-day)

X_4 = price of labour employed (₦/man-day)

The financial ratios used are

Gross ratio: The gross ratio measures the financial success of a farm. A less than 1 ratio is desirable for any farm business. The lower the ratio the higher the return per naira invested. (Olukosi and Erhabor, 2008). Gross ratio (GR) is expressed as

GR = TC/TR

Where TC= Total cost (₦)

TR= Total Revenue (₦)

Operating Ratio (OR): which measures the solvency of the farm was also used in this study to further indicate the profitability of the farm business. A ratio of one implies

break-even and a ratio greater than one implies a loss and the lower the ratio, the higher, the profit. Operating Ratio was given by Olukosi and Erhabor (2005) as:

OR = TVC/TR

Where:

OR= Operating Ratio.

TVC = Total Variable Cost (₦).

TR = Total Revenue (₦).

Return to Naira invested defined as the total farm income divided by total cost of production was used in the study as expressed also by Olukosi *et al.,* (2005) as:

RNI = $\frac{TR}{TC}$

Where:

RNI = Return to Naira (capital) invested

TR = Total Revenue (₦)

TC = Total cost (₦)

Gross margin was also use to determine the profitability of sweet potato processing, Gross margin refers to the total income derived from an enterprise less the total variable cost

Gross margin = Total sales- Total variable cost

Total sale refers to the revenue derived from the sale of processed sweet potato either boiled or fried.

Total variable cost refers to cost of inputs used in processing sweet potato

TVC = C1 + C2 + C3 + C4+ C5 + C6 where

C1 = cost of raw sweet potato (₦/kg)

C2 = Cost of groundnut oil (₦/litre)

C3 = Cost of fire wood/kerosene (₦)

C4 = Cost of Maggi/salt (₦)

C5= Cost of transport (₦/kg)

C6= Cost of labour (₦)

3.4.3 Marketing Margin

Marketing margin was used to determine the profitability of sweet potato marketing. Marketing margin refers to the difference in prices paid for a commodity at different stages of the marketing system. It therefore represent difference in price of a given commodity at different stages of time, form, place and possession as its move from the primary producer to the ultimate consumer Olukosi *et al.,* (2005). At each intermediary level, it is the difference between price received on resale and the purchase price. It is as expressed as;

Marketing margin = selling price-supply price * 100

Net marketing margin = TR- TMC

NMM = Net marketing margin (₦/kg).

TR = Total revenue (₦/bag)) for selling sweet potato.

TMC = Total marketing cost (₦/kg)

$TMC = C_1 + C_2 + C_3 + C_4 + C_5 + C_6 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Cn$

Where

C1= cost of sweet potato ((₦/kg).

C2= cost of transportation ((₦/kg).

C3= Cost of loading (₦/kg).

C4= Cost of off loading (₦/kg).

C5= Govt revenue (₦/kg).

C6= Union fees (₦).

C7= Middle men charge (₦).

C8= Temporary market storage (₦).

C9= Cost of bag (₦)

C10= Cost of thread (₦)

Marketing Efficiency/ Marketing efficiency was used to measure market performance. Marketing efficiency is defined as the ratio of output to input. Improved marketing efficiency is a common objectives of farmers, food marketing firms, consumers and the society at large (Olukosi, *et al*, 2005)

M.E= Value added by marketing/cost of marketing*100

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the major findings of the study. The results are discussed under the following headings

4.1 Description of Sweet Potato Value Chain Actors.

Different actors were identified along the sweet potato value chain; the Principal value chain actors identified include the farmers, traders (wholesalers and retailers), processors and consumers.

4.1.1 Sweet potato Producers

Farmers were among the principal value chain actors performing a function in the upstream sector of the value chain. Sweet potato farmers in the study area were small scale farmers cultivating less than two hectares of farm land.. They harnessed and combined factors of production to grow sweet potato in their respective farms, sell the product mostly at farm gate to rural collectors, wholesalers, and sometimes rural retailers.The producers perform functions such as sourcing of information on input supply, production techniques, cultivation, hervesting, transporting and marketing,

4.1.2 Sweet Potato Marketers

There were many actors who play active role at different times along the sweet potato value chain. Marketing activities are divided into retailing and wholesaling. Understanding the role of each actor in the market is necessary because it determines how producers, processors and consumers have access to the market for buying and selling

sweet potato and how sweet potato gets to the urban consumers. The marketers identified include rural wholesalers, rural retailers, urban wholesalers and urban retailers.

Rural wholesalers: Rural wholesalers usually buy sweet patoto from producers at farm gate and sell to rural retailers. They sell in bags and need a lot of capital. The average size of one bag of sweet potato was found to be 135kg.

Rural Retailers: Rural retailers buy sweet potato from rural wholesalers and sometimes from the producers and sell it in small quantities to processors and consumers. The capital requirement is not much.

Urban wholesalers: Urban wholesalers purchase sweet potato from rural wholesalers in large quantity and sell it to urban retailers, they usually have stalls in the market for temporary storage and also need a lot of capital than the rural wholesalers. Urban wholesalers required capital ranging from one hundred thousand Naira and above while the rural wholesalers required an average of thirty to fifty thousand Naira.

Urban Retailers: Urban retailers purchase sweet potato from urban wholesalers and sell it to urban processors and consumers in small quantities. The capital requirements are not much.

4.1.3 Sweet Potato Processors

Processing is the conversion of a commodity from its raw form to a form more acceptable to the buyers. Ofoh (2009) stated that processing of agricultural commodities stabilizes the produce and facilitate its handling, availability and utility. Sweet potato processing involves peeling, slicing, washing and frying or boiling. Sweet potato is mostly processed

into fried form as chips or boiled form as boiled sweet potato. Processors of sweet potato own their business and perform the function of sourcing sweet potato, transporting, processing and marketing. The processors usually operate in the morning and evening. The processors prefer to purchase large sized sweet potato in order to maximize profit. Large-sized sweet potato gives higher quantity of consumable product when peeled. Majority of the processors processed sweet potato into fried form. An average of 64kg of sweet is processed.

4.1.5 Sweet Potato Consumers

Consumers are the ultimate end users along the value chain**.** Consumers purchase sweet potato in its raw or processed form. The consumers usually buy raw sweet potato on cash basis from retailers. Some consumers prefer to purchase processed sweet potato from processors or retail outlets. Consumption is wide spread among both rural and urban residents.

4.2 Socio Economic Characteristic of Sweet Potato Actors

Some relevant socio economic characteristics such as age, household size, farming experience, marital status, level of education, were analysed using descriptive statistics. Fabusoro (2000) reported that improvement of agricultural productivity is grossly influenced by some of the socio-economic parameters.

4.2.1 Quantitative Socio Economic Characteristic of Sweet Producers

Table 8a presents the results of quantitative socio-economic characteristics of sweet potato producers in the study area.

Age of Sweet Potato Producers

Age is a factor that may enhance the adoption of innovation and as reported by Nwaiwu *et al*, (2012) Age is a determinant of human reasoning, decision making and responsibility. Younger and middle aged individuals are known to be active and innovative (Adeoye *et al.*, 2011). Table 8a shows the distribution of the ages of sweet potato producers. It was found that majority of the producers (43.33%) are between the age range of 35-43 years .The result further shows that the producers had a mean age of 43 years with a minimum of 25 and maximum of 70 years. This implies that the producers fall within their youthful age that would enhance prompt and effective decision making. They are also expected to effectively utilize available resources (Nwaiwu *et al.*, 2012). The result also indicate that the sweet potato farmers are still agile and strong to undertake and provide effective labour force required for sweet potato production. This result agrees with the findings of Tsoho and Salau (2012) who obtained a mean age of vegetable producers they studied as 43 years; and concluded that age affects the adoption of innovation in traditional farming. There is equally a good opportunity for sustainable sweet potato production.

Table 8a Quantitative Socio-economic Characteristics of Sweet Potato Producers

Variable	Frequency	%	Mean	Min	Max	S.D	S.E
Age(years)							
25-34	15	12.5	44	25	70	7.95	0.72
35-44	52	43.3					
45-54	41	34.2					
55-64	11	9.2					
65-74	1	0.8					
Household size							
3-7	19	15.8	12	3	22	4.62	0.42
8-11	36	30.0					
12-15	43	35.8					
16-20	11	13.3					
21-25	6	5.0					
Years of experience							
4-11	16	16.7	16	4	30	5.96	0.54
12-19	25	26.0					
20-27	39	40.6					
28-35	14	14.6					
36-43	2	2.1					
TOTAL	**120**	**100**					

Source: Field survey, 2015

Household Size

According to National Population Commission (NPC, 2006) household is a group of persons staying under the same roof or in the same house. They share the same source of food and see themselves as a unit. The distribution of sweet potato producers house hold size is shown in Table 8a. It was found that majority 35.8% of the producers had a household size of 12-15 members, the producers had a mean of 11 members in there house hold with a minimum of 3 and a maximum of 22 members. Large family size have been established among sweet potato producers, this implies labour availability for farming activities and that the larger the household size the more the family labour and the lesser the cost of hired labour in the sweet potato production. This is in conformity with the findings of Musa (2003) who reported that, the higher the household size the more the family labour and the less the cost of hired labour in production and marketing

activities. Bada (2016) obtained an average household size of 9 members for producers of fresh tomato in Kano State, Katanga, (2016) obtained an average of 12 members,while Mujeeba, (2015) obtained an average household size of 12 members.

Farming Experience

Farming experience consists of knowledge or skill of farming which is gained through involvement or exposure to farming activities expressed in years. Longer experience improves performance, utilization of scarce resources, economic decision making and timely assessment of alternatives (Adesina and Kehinde, 2008). Table 8a shows that majority of the producers 40.6% had farming experience of 20-27 years. The producers had a mean of 15 years of experience with a maximum of 30 and minimum of 4 years in sweet potato production. This implies that majority of the producers in the study area had adequate farming experience in sweet potato production and continuity of sweet potato production is expected from them. This is in line with the work of Ahmad, (2012) who investigated sweet potato production in some selected LGAs of Kano state. It was found that majority of the producers had mean farming experience of more than 8 years.

4.2.2 Qualitative Socio Economic Characteristics of Sweet Potato Producers

Table 8b presents the results on qualitative socio-economic characteristics of sweet potato producers in the study area.

Table 8b: Qualitative Socio Economic Characteristics of Sweet Potato Producers

Variable	Frequency	Percentage
Gender		
Male	120	100
Female		
Marital Status		
Married	119	98.2
Single	1	0.8
Literacy Level		
Non formal	68	56.7
Primary	30	25.0
Secondary	16	13.3
Tertiary	6	5.0
Primary Occupation		
Farming	101	84.2
Marketing of sweet potato	4	2.1
Marketing and Trading	7	5.2
Trading	2	2.1
Butchery	2	2.1
Secondary occupation		
Farming	101	84.2
Marketing of sweet potato	4	2.1
Marketing and trading	7	5.2
Trading	2	2.1
Butchery	2	2.1

Source: Field survey, 2015

Gender of sweet potato producers

This refers to segregation into male or female. It is better used than sex, as sex is a biological segregation. The result in table 8b shows gender distribution of sweet potato producers. It was found that all the producers were male (100%) in the study area. This is due to the culture and norms of the society where female stay at home and take care of the children. This is in line with the work of Aminu, (2012) where he reported that majority of water melon producers were male.

Marital status of sweet potato producers

Marital status of a population may be defined as the population of single, married, widowed, and divorced people within it (Okafor and Andrew, 1994) The result in table 8b shows that majority (98.2%) of the producers were married while only 0.8 were single. This implies that majority of the producers have family responsibilities bestowed on them in terms of financial and social commitments. Additionally, there is possibility of early marriage among the producers and thus, they have large household size that could probably be available for farm work,while it shows higher level of domestic consumption expenditure

Literacy Level of sweet potato producers

Level of education is an indicator of the ability of an individual to read or write both in formal and informal way. An individual level of education should usually enhance his social and economic decision making ability for optimum performance and efficiency (Bashir, 2011). Education has been known to be a powerful instrument that helps to shape life and makes the essence of living meaningful. The educational attainment of the producers as revealed in table 8b, shows non formal education (Qur'anic) accounted for 56.8%, primary education accounted for 25.0%, 13.3% secondary education while 5.0% had tertiary education qualification. This implies that majority of sweet potato producers have no formal education which may affect them in adopting new production technologies.

4.2.3 Quantitative Socio Economic Characteristics of Sweet Potato Marketers (Wholesalers)

The socio economic characteristics of the marketers usually assist in getting clear understanding of the behavior of the respondents as well as providing a hint towards explaining their disposition that could improve their productivity (Ayinde et al 2007).

Age of Sweet Potato Marketers (wholesalers)

Age plays an important role in decision making. This is true in traditional societies like Nigeria, where responsibilities are assigned according to age (Muhammad, 2012) Result of descriptive statistics revealed that majority 40% of the marketers (wholesalers) are within the age of 32-45 years respectively. The Marketers (wholesalers) have a mean age of 46 years with a minimum 28 years and maximum 71 years. The result implies the marketers were within their active age and this signifies high prospects for continuity in the business.

Table 9a: Quantitative Socio Economic Characteristics of Marketers (wholesalers).

Variable	Frequency	%	Mean	Min	Max	S.D	S.E
Age(years)							
28-45	1	12.5	46	28	71	8.94	1.41
32-45	16	40.0					
46-54	12	30.0					
55-63	6	15.0					
64-71	1	2.5					
2-4	2	5	9	2	16	3.31	0.52
5-7	6	15.0					
8-10	17	42.5					
11-13	7	17.5					
14-16	8	20.0					
Years of experience							
4-9	3	7.5	15	4	30		0.97
10-15	26	65.0					
16-21	4	10.0					
22-27	4	10.0					
28-33	3	2.5					

Source: Field survey

Household size of Sweet Potato Marketers (wholesalers)

Household size refers to the group of persons staying in the same compound and eating from the same pot. The result revealed that 42.5% of the marketers had a household size of 8-10 members while 20.0% had a household size of 14-16 members. The remaining 17.5%, 15.0%, 5.0% had a house hold size of 11-13 members, 5-7members and 2-4 members. The marketers (wholesalers) had an average of 9 members in their household with a maximum of 16 and minimum of 2 members in their household. This could be attributed to the culture and norms of the people in the study area; an individual can marry as many as four wives in the society. This implies that the wholesalers have some degree of responsibility to cater for; it will make them to devote more time, energy and resources to meet up to the demand of their dependents also it increases demand on income thereby reducing savings.

Years of experience of Sweet potato marketers (wholesalers)

The business experience of the marketers affects their decision as well as performance. Besides its influence their understanding of production, processing and marketing. The result shows that majority of the wholesalers 65% had experience of 10-15 years in sweet potato marketing. The marketers (wholesalers) had an average of 15 years experience in sweet potato marketing with a maximum of 30 years and a minimum of 4 years. This indicates that most of the wholesalers were into the business for a long period, the number of years in the business has positive relationship with technical know-how and have very high propensity to adjust to changing economic conditions and adopt new ideas to increase profitability. This is in line with the finding of Musa (2003) that experienced traders are those with an average of 10-15 years of experience and above.

4.2.4 Qualitative Socio Economic Characteristics of Sweet Potato Marketers (wholesalers)

Table 9b presents the result on qualitative socio-economic characteristics of sweet potato marketers in the study area.

Gender of sweet potato marketers (wholesalers)

Gender refers to natural segregation of human race into male and female. The result shows that all the marketers (wholesalers) 100% were male, this is due to culture, norms and religion of the people in the study area, men are allowed to go out and perform all activities while female stay and take care of the home. This is in line with the finding of Mustapha, (2012) who reported that, male participated fully in farming and trading activities whereas females engaged mostly in processing of farm produce in the North-Western Nigeria. This may also be connected to the fact that trading requires frequent travels and visits to several markets which is not usually allowed or accepted for married women in Hausa agrarian communities.

Table 9b: Qualitative Socio Economic Characteristics of Sweet Potato Marketers (wholesalers)

Variable	Frequency	Percentage
Gender		
Male	40	100
Female	0	0
Marital Status		
Married	39	97.5
Single	1	2.5
Educational status		
Non formal	15	37.5
Primary	19	47.5
Secondary	6	15
Primary occupation		
Farming	34	85.0
Marketing of sweet potato	5	12.5
Trading	1	2.5
Secondary Occupation		
Farming	14	35.0
Marketing of sweet potato	26	65.0

Source: Field survey, 2015

Marital status of sweet potato marketers (wholesalers)

Marital status of a population may be defined as the categorization of the population based on single, married, widowed, and divorced people within it (Okafor and Andrew, 1994). It could be tied up to the household size and may likely affect the level of responsibility and labor availability to the traders The result shows that majority 97.5% of the marketers (wholesalers) were married while only 2.5% were single. This result is in consonance with Mustapha (2012) who reported that 83% of the respondents for paddy rice traders were married and polygamous. This implies that the wholesalers have responsibility to cater for

Educational status of sweet potato marketers (wholesalers)

Level of education is an indicator of the ability of an individual to read or write both in formal and informal way. An individual level of education should usually enhance his social and economic decision for optimum performance and efficiency. (Bashir, 2011). Education has been known to be a powerful instrument that helps to shape life and makes the essence of living meaningful. The educational attainment of the marketers (wholesalers) as revealed in Table 9b non formal education (Qur'anic) accounted for 37.5%, 47.5% had primary education while 15% had secondary education. The marketers (wholesalers) had attained some level of formal education with primary education being the highest formal education attained. This implies that the marketers have the ability to accept and comprehend new skills and carry out wise economic decisions.

4.2.5 Socio Economic Characteristics of Sweet Potato Marketers (Retailers)

The socio-economic characteristics of the marketers usually assist in getting clear understanding of the behavior of the respondents as well as providing a hint towards

explaining their disposition that could improve their productivity (Ayinde et al 2007). Table 10a presents the distribution of sweet potato marketers (retailers) based on their quantitative socio-economic characteristics.

Age of sweet potato retailers

Age plays an important role in decision making. This true in traditional societies like Nigeria, where responsibilities are assigned according to age, Muhammad, (2012), result of descriptive statistics revealed that majority 41.7% of the marketers (Retailers) were within the age of 36-40 years. The Marketers (Retailers) have a mean age of 41 years with maximum of 52 years and a minimum of 30 years. This showed that majority of the marketers were within their active age and this signifies high prospects for continuity in the business.

Table 10a: Quantitative Socio Economic Characteristics of Sweet Potato Marketers (Retailers)

Variable	Frequency	%	Mean	Min	Max	S.D	S.E
Age(years)							
30-35	10	16.7	41	30	52	5.92	0.76
36-40	25	41.7					
41-45	9	15.0					
46-50	14	23.3					
51-55	2	2.2					
Household size							
4-7	20	33.3	9	4	21	3.57	0.46
8-10	20	33.3					
11-13	10	16.7					
14-17	7	11.7					
18-21	3	5.0					
Years of experience							
1-7	8	13.3	14	1	35	7.21	0.93
8-14	22	36.7					
15-21	20	33.3					
22-28	7	11.7					
29-35	3	5.0					

Source, Field survey 2015

Household size of sweet potato retailers

The result in table7a revealed that majority 33.3% of the marketers had a household size of 8-10 members The marketers (wholesalers) had an average of 9 members in their household with a maximum of 21 and minimum of 4 members in their household. This indicated that, sweet potato retailers have relatively large number of household size. This result was higher than the national average of 5 according to NBS (2011); and as Ango *et al.,* (2011) posited, the reason behind large household size could be due to polygamous nature of Hausa people and their dependence on family as a source of labor.

Years of experience of sweet potato retailers

The business experience of the marketers affects their decision as well as performance. The result in table 10a shows that majority of the retailers 36.7% had experience of 8-14 years in sweet potato marketing. The marketers (retailers) had an average of 14 years experience in sweet potato marketing with a maximum of 35 years and a minimum of 1 year. The result is in line with the finding of Musa (2003) that experience traders are those with an average of 5 years of experience. According to this reasoning, the respondents have very high propensity to adjust to changing economic conditions and adopt new ideas to increase profitability.

4.2.6 Qualitative Socio Economic Characteristics of Sweet Potato Marketers (Retailers)

The result of qualitative socio-economic characteristics of sweet potato retailers is presented in Table 10b.

Table 10b: Qualitative Socio Economic Characteristics of Sweet Potato Marketers (Retailers)

Variable	Frequency	Percentage
Gender		
Male	60	100
Female		
Marital Status		
Married	59	98.3
Single	1	1.7
Educational status		
Non formal	39	65.0
Primary	17	28.3
Secondary	4	6.7

Source, Field survey 2015

Gender of sweet potato retailers

Gender refers to natural segregation of human race into male and female. The result in table7b shows that all the marketers (Retailers) 100% were male, this is due to the religion and norms of our society, women usually stay at home and take care of the children.

Marital status of sweet potato retailers

Marital status of a population may be defined as the population of single, married, widowed, and divorced people within it (Okafor and Andrew, 1994) the result in table 10b shows that majority 98.3% of the marketers (Retailers) were married while only 1.7% were single. This result corroborates with their mean age of over forty years and in a typical Northern Nigerian state, persons at such age must have been married. This result

is in consonance with Mustapha (2012) who reported that 83% of the respondents for paddy rice trading were married and polygamous.

Educational status of sweet potato retailers

Level of education is an indicator of the ability of an individual to read or write both in formal and informal way. An individual level of education should usually enhance his social and economic decision for optimum performance and efficiency. Bashir, (2011). Education has been known to b e a powerful instrument that helps to shape life and makes the essence of living meaningful. The educational attainment of the marketers (Retailers) as revealed by table 10b non formal education (Qur'anic) accounted for 65%, 28.3% had primary education while 6.7% had secondary education. The result implies that the level of non formal education attainment by the traders was relatively high though they attain some level of formal education. This result agrees with Adejobi and Babatunde (2011) who opined that operations in the markets were not necessarily tied to the level of education but how aggressive the marketers were in attending to customer interests.

4.2.7 Quantitative Socio Economic Characteristics of Sweet Potato Processors

Empirical evidences note emerging as documented by Fabusoro (2000), Haruna (2002) and Ja,afar-Furo (2006) shows that the improvement in agricultural productivity is grossly influenced by some socio economic parameters; the enhanced aspect of these socio economic variables in synergy with good human resources in a conducive/agricultural setting can improve production tremendously. The socio economic characteristics usually assist in getting clear understanding of the behavior of the respondents as well as providing a hint towards explaining their disposition that could improve their productivity (Ayinde et al 2007). The results are presented in Table 11a.

Table 11a: Quantitative Socio Economic Characteristics of Sweet Potato Processors

Variabe	Frequency	%	Mean	Min	Max	SD	SE
Age((yrs)							
14-22	9	15.0	34	14	55	10.41	
23-31	13	21.7					
32-40	25	41.7					
41-49	7	11.7					
50-59	6	10.0					
Household Size (No)							
5-8	19	46.3	5	5	14	3.47	
9-12	13	31.7					
13-16	5	12.2					
17-20	3	7.3					
21-24	1	2.4					
Experience (yrs)							
2-6	17	28.3	10	2	25	6.39	
7-11	15	25.0					
12-15	8	13.3					
16-20	3	13.3					
21-25	12	20.0					

Source: Field Survey 2015

Age of sweet potato processors

Age plays an important role in decision making. This is true in traditional societies like Nigeria, where responsibilities are assigned according to age. Result of descriptive statistics as revealed in table 11a shows that majority 41.7% of the processors had age range of 32-40 years, the processors had a mean age of 34 years with a maximum of 55 and minimum of 14 years. This shows that most of the processors are within their active youthful age and had the strength to take up the challenge of increase demand of processed sweet potato. This is in line with the findings of Abdullahi, (2011) where he reported that majority of maize processors were within the age range of 31-40 years.

Household size of sweet potato processors

The result in table 11a revealed that 46.3% of the processors had a household size of 5-8 members while 31.7% had a household size of 9-12 members. The remaining 12.2%,

7.3% , 2.4% had a house hold size of 13-16 members, 17-20 members and 21-24 members. The processors had an average of 5 members in their household with a maximum of 14 and minimum of 1 member in their household. This indicated that, processors have relatively large number of household size when compared with national average of 5 (NBS, 2011). Ango *et al.,* (2011) posited, the reason behind large household size could be due to polygamous nature of Hausa people and their dependence on family as a source of labour.

Years of experience of sweet potato processors

The business experience in sweet potato processing affects their decision as well as performance. The result shows that majority of the processors 28.3% had experience of 2-6 years in sweet potato processing. While 25%, 20% and 13.3% had an experience of 7-11, 21-25 and 12-15 years respectively. 13% of the processors had 16-20 years experience. The sweet potato processors had an average of 10 years experience in sweet potato marketing with a maximum of 25 years and a minimum of 2 years. This implies that the processors are well experienced in sweet potato processing which encourages sustainability.

4.2.8 Qualitative Socio Economic Characteristics of Sweet potato Processors

Results of qualitative socio-economic characteristics of sweet potato processors are presented in Table 11b.

Table 11b: Qualitative Socio Economic Characteristics of Sweet Potato Processors

Variable	Frequency	Percentage
Gender		
Male	30	50.0
Female	30	50.0
Marital Status		
Married	42	70.0
Single	11	18.3
Divorced	4	6.7
Widow	3	5.0
Educational status		
Non Formal	32	53.3
Primary	12	20.0
Secondary	13	21.7
Tertiary	3	5.0

Source, Field survey 2015

Gender of sweet potato processors

Gender refers to natural segregation of human race into male and female. The result shows 50% of the processors were male while 50% were female. Most of the male processors are in rural markets where they operate their business as sweet potato processors. Female processors are mostly found everywhere especially in urban areas.

Marital status of sweet potato processors

Marital status of a population may be defined as the population of single, married, widowed, and divorced people within it (Okafor and Andrew, 1994) The result shows that majority 70% of processors were married, 18.3% were single, 6.7% were divorced while only 5% were widow. It could be deduced that majority of the processors were married. This result corroborates with their mean age of about forty years and in a typical northern Nigerian state, persons at such age must have been married. This result is in

consonance with Mustapha (2012) who reported that 83% of the respondents for paddy rice processors were married

Educational status of sweet potato processors

Level of education is an indicator of the ability of an individual to read or write both in formal and informal way. An individual level of education should usually enhance his social and economic decision for optimum performance and efficiency (Bashir, 2011).Education has been known to be a powerful instrument that helps to shape life and makes the essence of living meaningful. The educational attainment of sweet potato processors as revealed in table 11b non formal education (Qur'anic) accounted for 53.3%, 20% had primary education, 21.7% had secondary education while 5% had tertiary education. This implies that majority of the processors had no formal education which may affect them in acquiring modern techniques of processing sweet potato.

4.2.9. Quantitative Socio- economic Characteristics of Sweet Potato Consumers

Quantitative socio-economic attributes of sweet potato consumers include age, household size and years in consuming sweet potato are presented in Table 12a.

Table 12a: Quantitative socio Economic Characteristics of Sweet Potato Consumers

Variabe	Frequency	%	Mean	Min	Max	SD	SE
Age							
30-36	14	46.7	39	30	57	1.32	7.62
37-43	6	20.0					
44-50	9	30.0					
51-57	1	3.3					
Household Size							
4-7	17	56.7	9	4	20	0.78	4.27
8-11	4	13.3					
12-15	6	20.0					
16-20	3	10.0					
Years in consuming sweet potato							
5-12	6	20.0	18	5	36	1.24	6.83
13-20	16	53.3					
21-28	6	20.0					
29-36	2	6.7					

Source Field survey, 2015

Age of sweet potato consumers

The age of the consumers varied from 30-57. With a mean age of 38, this implies that the consumers cut across many age groups. Majority of the consumers 46.7% fall within the age range of 30-36 years with a minimum 30 and maximum of 57 years.

Household size of sweet potato consumers

Household size has a direct relationship with sweet potato consumed. From the result in Table 12a, it shows that majority 56.7% of sweet potato consumers had a household size of 5-7 members, 20% had a household size of 12-15 members while 10% had a household size of 16-20 members .The consumers had a mean household size of 8 members with minimum of 4 members and a maximum of 20 members.

Year of consuming sweet potato

The result shows that majority 53.3% of the consumers had been consuming sweet potato for 13-20 years, 20% had been consuming sweet potato for 21-28 years while 6% had been consuming sweet potato for 29-36 years

4.2.10. Qualitative Socio Economic Characteristics of Sweet Potato Consumers

Table 12b: Qualitative socio economic characteristics of sweet potato consumers

Variable	Frequency	Percentage
Gender		
Male	22	73.3
Female	8	26.7
Marital Status		
Married	29	96.7
Single	1	3.3

Source, Field survey, 2015

Gender of Sweet Potato consumers

The result shows that 73.3% of sweet potato consumers were male while only 26.7% were female. The reason is because males are household heads they have the responsibility of purchasing food items to their family.

Marital status of sweet potato consumers

The result shows that 96.7% of sweet potato consumers are married while only 3.3% of the consumers are single.

4.3 Functions, Relationships and Linkages between the Major Actors along the Sweet Potato Value Chain.

Value chain development in agribusiness treats production as a chain of activities each of which adds value and cost to the final product, as the product makes its way through the

value chain the value of the product increases. Sweet potato value chain consists of several actors with each actor performing a specific function at a stage. The value chain focused on identifying all the actors participating in the value chain activities through the functions performed by the actors as well as the relationship and linkages existing between the actors and the value chain supporters. The major actors identified along the value chain were Input suppliers, producers, processors marketers, and consumers.

4.3.1 Input Suppliers

Input suppliers provide essential services of supplying farm inputs such as seeds, fertilizers, chemicals, agro sacks and farm implements to producers/farmers and to other value chain actors. For example farmers obtain fertilizer and chemicals, marketers obtain agro sacks from the input suppliers on market days. The transactions were on cash basis. This explains the major linkage between the input suppliers with producers and marketers

4.3.2 Producers

Farmers were among the principal value chain actors, performing a function in the upstream sector of the value chain. The farmers in the study area were small scale, they harnessed and combined factors of production to grow sweet potato in their respective farms and perform different functions such as acquiring farm land, sourcing of capital, sourcing of farm inputs like fertilizer, chemicals, seeds, production activities such as land preparation, planting, fertilizer application, weeding, harvesting and packing. The producers employ the services of both family and hired labour in sweet potato production and purchase farm inputs from open market on cash. Producers also perform the function

of marketing sweet potato. The producers produce an average of 15,329kg per hectare of in the study area.

Table 13: Information on Land Acquisition, Source of Capital and Source of Sweet Potato Vine

Variable	Frequency	Percentage
Land acquisition		
Inheritance	117	97.5
Borrowed	3	2.5
Source of capital		
Personal savings	118	98.3
Freinds and family	2	1.7
Source of sweet potato vine		
Self propagation	41	34.1
Fellow farmers	10	8.3
Vine propagators	69	57.5

Source: Field survey, 2015

Table 13 presents information on land acquisition, source of capital and source of sweet potato vine. The results shows that majority (97.5%) of the producers in the study area acquire their farm land through inheritance and (98.3%) and source capital from personal savings. Majority of the producers (57.5%) source their sweet potato vine from vine propagators.

Table 14: Information on System of Cropping and Reason for Sole Cropping

Variable	Frequecy	Percentage
System of cropping		
Sole	119	
Mixed	1	99.2
Reason for sole cropping		0.8
High yield	95	77.5
Easy production	25	20.8
Easy to control against disease	2	1.7

Source: Field survey, 2015

Table 14 presents the results on system of cropping and reason for sole cropping by sweet potato producers. The results shows that majority 99.7% of the producers produce sweet potato as a sole crop and majority of the producers (77.5%) practice sole cropping because it gives high yield, 20.8% practice sole cropping because of easy production while 1.7% practice sole cropping because it is easy to control against pest and diseases.

Table 15: Information on Variety of Sweet Potato Vine and Reason for Sweet Potato Production

Variable	Frequency	Percentage
Variety of sweet potato		
Dan china	119	99.1
Dan izala	1	0.83
Reason for sweet potato production		
Income generation	114	94.2
Income generation and household consumption	6	6

Source: Field survey, 2015

Table 15 presents the result on variety of sweet potato vine and reason for sweet potato production. The result shows that majority 99.1% of the producers grow sweet potato variety *(Dan china)* while only 1% grow *sweet potato variety(Dan izala)*. 94.2% of the producers engaged in sweet potato production for income generation while 5% of the producers engaged in sweet potato production for both income generation and household consumption.

4.3.3 Marketers

The marketers identified in the study were wholesalers (rural and urban) and retailers (rural and urban). The marketers play various roles in ensuring the smooth movement of sweet potato from producers to consumers. They perform various functions along the sweet potato value chain such as physical and facilitative functions. The physical functions performed by the marketers include sourcing of sweet potato, and transportation.

Table 16: Type of wholesaler and Reason for Sweet Potato Marketing

Variable	Frequency	Percentage
Type of Wholesaler	Frequency	Percentage
Insito	10	25.0
Transit	30	75.0
Reason for marketing		
Source of income	40	100

Source: Field Survey, 2015.

Type of wholesalers and reason for sweet potato marketing

Wholesalers purchase sweet potato in large quantity directly from the producers. Two types of wholesalers were identified namely insito and transit wholesalers. Insito wholesalers obtain sweet potato and sell it within the same market while transit wholesalers transport sweet potato to other neighboring states and countries. Result of the study reveals that majority (75%) of the wholesalers are transit wholesalers, 75% source their sweet potato from farm gate and engaged in sweet potato marketing for income generation.

Table 17 presents the result on source of sweet potato and mode of transportation of sweet potato by wholesalers.

Table 17: Information on Source of Sweet Potato and Mode of Transportation

Variable	Frequency	Percentage
Source of sweet potato		
Farm gate	30	75.0
Rural wholesaler	2	5.0
Rural reatailer	8	20.0
Mode of transportation		
Bus	2	5
Lorry	14	35
Pickup van	24	60

Source: Field survey, 2015

The result shows that majority 75% of the marketers (wholesalers) source their sweet potato at the farm gate, these are mostly the wholesalers in rural markets. They have easy access to the producers and tend to bargain for lower prices. While 20% source there

sweet potato from urban wholesalers, these are mostly wholesalers in urban markets and 2% from rural wholesalers.

Transportation is one of the physical functions performed by the marketers (Wholesalers) Transportation facilitates the movement of sweet potato from the farm to the market and even home to areas of deficit. Transportation therefore adds utility of place to a product because it gives both marketer and consumer satisfaction. Sweet potato marketers use different means of transporting sweet potato to the market depending on the type of wholesaler, price of transportation and quantity of sweet potato to be transported. The result in table 18 shows that that majority of the wholesalers 60% transport there sweet potato using pick-up van followed by 35% who use lorry as means of transporting sweet potato. Only 15% of the marketers use bus as means of transporting sweet potato.

Table 18: Major Buyers of Sweet Potato From wholesalers

Variable	Frequency	Percentage
Major buyers of sweet potato		
Retailers	35	87.5
Wholesalers	5	12.5

Source: Field survey, 2015

Table 18 presents the result on major buyers of sweet potato from wholesalers.

Wholesaling usually involves selling of products in large quantity. From the result it reveals that majority 87.5% of buyers of sweet potato from wholesalers are retailers who purchase sweet potato in large quantity and make it available to consumers in smaller quantities while only 12.5% of the buyers are wholesalers who purchase there sweet potato from their fellow wholesalers.

Table 19: Quantity of Sweet Potato Traded and Average Price of 135kg (bag) of Sweet Potato With Respect to Season.(wholesalers)

Period	Mean quantity traded (kg)	
	Peak period	Off peak period
Daily	10732.89	3382.5
Weekly	23339.82	11975
Monthly	672458	150150
Average prices(N)	2,191	3,617

Source: Field survey, 2015

Table 19 presents the result on quantity of sweet potato traded and average price of 135kg (bag) of sweet potato with respect to season by wholesalers. The result shows that the quantity traded in peak season is higher than quantity traded in off peak season, this is due to the availability of sweet potato at harvest season and the average price of 135kg (bag) was N2,191.. On the other hand during off-peak season sweet potato is scarce and the price of 135kg (bag) was N3,617. which is relatively higher than in peak season.

Retailers

Retailers purchase sweet potato in small quantity mostly from wholesalers and resell it in smaller quantity to processors and consumers. Table 20 presents the result on source of sweet potato and reason for sweet potato marketing by retailers.

Table 20: Information on source of sweet potato and reason for sweet potato marketing by Retailers

Variable	Frequency	Percentage
Source of sweet potato		
Farm gate	20	33.3
Rural collector	3	5.0
Rural wholesaler	35	58.3
Urban wholesaler	10	16.7
Reason for sweet potato marketing		
Income generation	53	85.3
Self employment	1	1.7
Both income generation and self employment	6	10.0

Source: Field survey, 2015

The result revealed that majority (58.3%) of the retailers sourced sweet potato from rural wholesalers and the transaction was found to be of deposit of a proportion of 30% of the initial payment with balance of 70% after sales of consignment The study also reveals that majority 85.3% of the retailers engaged in sweet potato marketing as source of income. Thirty three (33.3%) of the retailers transport their sweet potato in wheel barrow and the major buyers are consumers and processors. The study further revealed that average quantity of sweet potato traded daily by retailers was2300kg in peak period while in off peak period was 850.71kg and the average retail price of one bag of sweet potato was found to be N2873.33 in peak period while in off peak period was N4681.66.

Table 21: Information on Mode of transporting Sweet Potato by retailers and Major Buyers of Sweet Potato from retailers

Variable	Frequency	Percentage
Mode of transportation		
Bus	14	23.3
Lorry	5	8.4
Pickup van	14	23.3
Tricycle	7	11.7
Wheel barrow	20	33.3
Major buyers		
Consumers	57	95.0
Retailers	3	5.0

Source: Field survey, 2015

Table 21 presents information on mode of transporting sweet potato by retailers and major buyers of sweet potato from retailers. Transportation facilitates the movement of sweet potato from the farm to the market and even home to areas of deficit. Transportation therefore adds utility of place to a product because it gives both marketer and consumer satisfaction. Marketers use different means of transporting sweet potato to the market depending on the price of transportation and quantity of sweet potato to be transported**.** The result shows that 33.3% of the retailers uses wheel barrow to transport their sweet potato to the point of sell, this is because majority of the retailers purchase

their sweet potato from wholesalers in the same market and they usually buy in smaller quantities, 23.3% of the retailers use bus in transporting their sweet potato, 23.3% uses pick-up van, 11.7% uses tricycle while 8.4% use lorry. Retailing usually involves selling of products in smaller quantities. From the result in table 21 it reveals that majority 95% of buyers of sweet potato from retailers are consumers who purchase sweet potato in smaller quantities while 5% of buyers of sweet potato from retailers are there fellow retailers.

Table 22: Quantity of Sweet Potato Traded and Average price of 135 kg Bag of Sweet Potato (retailers) With Respect to Season

Period	Mean quantity traded (kg)	
	Peak period	Off peak period
Daily	2300	850.71
Weekly	2750	3003.33
Monthly	19521.24	4842.45
Variable	(N/bag)	
Average prices	Peak period	Off peak period
	N2873.33	N4681.66

Source: Field survey, 2015

Table 22 presents the result on quantity of sweet potato traded by and average price of 135kg (bag) of Sweet Potato (retailers) with respect to season. The result revealed the average quantity traded in peak season is higher than quantity traded in off peak season. this is due to the availability of sweet potato at harvest season and the average price of 135kg (bag) was N2873.33. On the other hand during off-peak season sweet potato is scarce and the price of 135kg (bag) was N4681.66 which is relatively higher than in peak season.

4.3.4 Processors

Processors perform the physical function of providing form utility by transforming sweet potato into more acceptable form required by consumers. The processors also perform the

function of sourcing inputs used in processing, processing itself and marketing of the processed sweet potato.

Table 23 presents the result on source of sweet potato, source of capital and source of knowledge on sweet potato processing.

Table 23: Information on Source of Key Inputs in Sweet Potato Processing Enterprise

Variable	Frequency	Percentage
Source of sweet potato		
Retailers	49	81.7
Wholesalers	11	18.4
Source of capital		
Personal saving	59	98.3
Friends and family	1	1.7
Type of enterprise		
Single ownership	59	98.3
Partnership	1	1.7
Source of knowledge on processing		
Parent and relative	55	91.4
Family and friends	5	8.6

Source: Field survey, 2015

The result reveals that majority 81.7% of the processors source there sweet potato from retailers, 18.4% source there sweet potato from wholesalers. Majority (98.3%) of sweet potato processors in the study area source there capital from personal savings, nature of business was single ownership and sourced there inputs from the market with nature of transaction on cash basis. The processors are sub divide into rural and urban processors**.** The study also reveals that a linkage exist between rural processor with producer, rural processor with rural retailer and urban processor with urban retailer. The processors are also link with consumers.

Table 24 presents the result on form of processing sweet potato by sweet potato processors

Table 24: Form of processing sweet potato

Variable	Frequency	Percentage
Frying	70	73.5
Cooking	25	23.3
Both cooking and frying	5	3.2

Source, Field survey 2015.

The result in table 24 reveals majority (73.5%) of the processors use frying as form of processing sweet potato, they processed it into fried form as chips, 23.5% use cooking as form of processing while 3.2% use both frying and cooking as form of processing. This agrees with the findings of Hafsa (2015) who reported that sweet potato is mostly utilize in fried form as chips in Kano state.

4.3.5 Consumers

Consumers are the ultimate end users along the value chain, Consumers purchase sweet potato in either raw or processed form. The study reveals that majority of the consumers consume sweet potato as food and frequency of consumption was on weekly basis. The study shows that a linkage exists between consumers and producers were by consumers purchase raw sweet potato directly from the producers at farm gate, consumers with rural and urban retailers were consumers purchase raw sweet potato and consumers with rural and urban processors were consumers purchase processed sweet potato. The nature of transaction was found to be on cash basis.

Table 25: Consumption of Sweet potato

Variable	Frequency	Percentage
Weekly	19	63.3
Twice a week	7	23.3
Monthly	4	13.3

Source, Field survey 2015

Table 26 presents the result on reason for consuming sweet potato

Table 26: Reason for Consuming Sweet potato

Variable	Frequency	Percentage
As source of food	17	56
Taste and nutritional value	13	43.3

Source, Field survey 2015

Result of the analysis presented in table 26 reveals that majority 56% of the consumers consume sweet potato as source of food while 43.35 consume sweet potato for its taste and nutritional benefits.

Value chain actors and their linkages

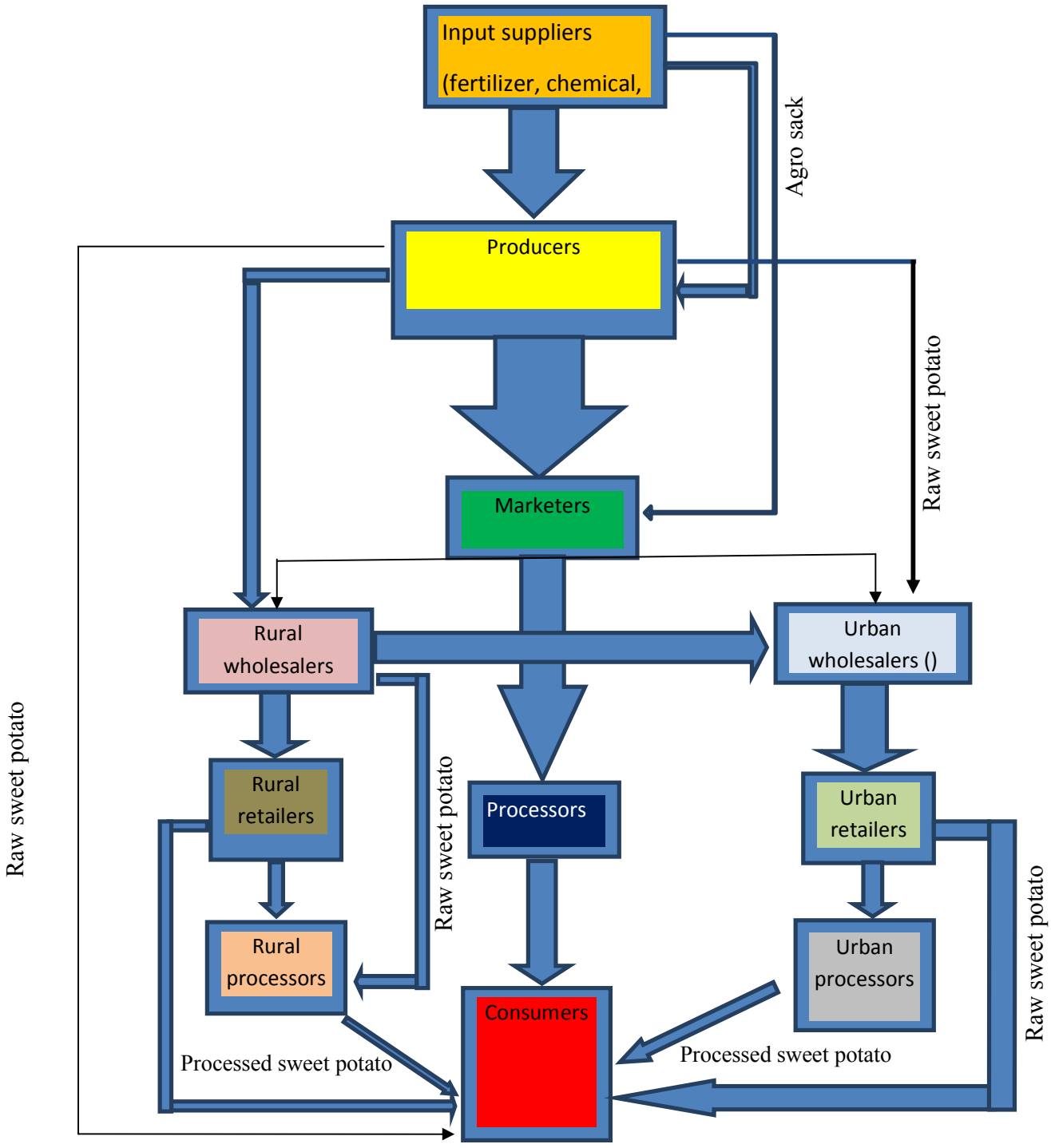

Figure 1: Sweet Potato Flow Chart and Linkages between the actors in the Study

Figure 1 represents flow of sweet potato and the relative volume traded along the value chain. The relative size of the arrows (thickness represents high volume while narrow arrows represent low volume) From the figure, it can be seen that the first actors in the value chain are inputs suppliers, which provide essential services of supplying farm inputs such as seeds, fertilizer, chemicals, farm implements and services (bags) to the producers/farmers, input suppliers are only link to producers and marketers. The second actors in the value chain are the producers, they are the most important part of the value chain, they produce sweet potato in their farms. The producers are link with the marketers (both wholesalers and retailers) as indicated by the thick arrow which shows large volume of sweet potato moves from the producers to the marketers. Higher volume of sweet potato is moved from producers to rural wholesalers than to rural retailers. The producers are also linked with consumer's specifically rural consumers who purchase sweet potato directly from the producers but the volume of flow is very small. The third actors in the value chain are the marketers who purchase sweet potato directly or indirectly from the producers. The marketers are divided into wholesalers and retailers. Wholesalers are mostly link with the producers because they buy in bulk at farm gate. The wholesalers too are divided into rural and urban wholesalers likewise the retailers. Rural wholesalers are linked with urban wholesalers as large volume of sweet potato is moved to urban wholesalers. Very few retailers are link with the producers and mostly they are rural retailers because of their proximity with the producers and volume of flow is relatively low. Urban wholesalers are link with urban retailers likewise rural wholesalers are link with rural retailers. Urban retailers are link with urban processors of sweet potato while rural retailers are link with rural processors of sweet potato. The figure also depicts a link between retailers and consumers of sweet potato. The fourth actors in the value chain are

the processors, they transform sweet potato into more acceptable form to consumers. The processors are divided into rural and urban processors. A link exists between rural processors and rural retailers and between urban processors and urban retailers with volume of flow higher between urban processor and urban retailer. Both rural and urban processors are linked to the consumers by providing form utility to the consumers. The fifth actors in the value chain are the consumers, they are link with producers with very low volume and retailers by purchasing raw sweet potato, they are also linked with processors by purchasing transformed form of sweet potato.

4.4 Costs and Returns of the Various Enterprises along the Sweet Potato value chain

4.4.1 Cost and Returns of Sweet Potato Producers

Gross margin analysis was used to determine the cost and returns of sweet potato producers in Kano state. It is used to evaluating the efficiency of an individual enterprise or a firm farm so that comparison can be made between enterprises or different farm plans; It is a very useful planning tool in situation where fixed capital is a negligible portion of the farming enterprise as in the case of subsistence agriculture (Olukosi and Erhabor, 1988). The variable costs are cost that varies with level of production. The variable costs include cost of labour, fertilizer, seed vine, land preparation, fertilizer application, weeding, harvesting, and packing. Table 28 revealed that inorganic fertilizer (34.03%) and organic fertilizer (18.18%) accounted for the highest total variable cost, followed by harvesting (9.08%). The average quantity of inorganic and organic fertilizer used was 3844.4kg and 239.52kg respectively, average quantity of pesticide used was 0.5 litres. Average quantity of herbicide used was 0.45L Table 27 revealed that the total

variable cost for cultivating one hecter of sweet potato was ₦81518.69 and the total revenue is ₦210, 888. The gross margin was ₦129, 370.0. Since the total revenue was greater than the total variable cost, the value of gross margin was positive and thus implied that, sweet potato production in the study area can be considered profitable. The result further revealed Gross Ratio (GR) of 0.39 for sweet potato production. The ratio was less than unity; a ratio of less than unity is preferred for any farm business. Olukosi and Erhabor (2008) posited that the lower the ratio the higher the profit.

Table 27: Cost and Returns Analysis of Sweet Potato Production/hectare

Variable inputs	Average quantity	Total cost ₦ /ha	%TVC
Seed vine	12.84	13469.91	16.52
Pesticide (litres)	0.5l	334.03	0.41
Herbicide (litres)	0.45L	459.12	0.56
Organic fertilizer (kg)	3844.8kg	14827.36	18.18
Inorganic fertilizer (kg)	239.52kg	27748.85	34.03
Bag (No)		1097.33	1.34
Labour (mandays)	10 mandays		
Land preparation		5141.62	6.30
Planting		5965.57	7.31
Fertilizer application		479.82	0.58
Weeding		10.4	0.01
Harvesting		7406.84	9.08
Packing		4041.31	4.95
Bagging		536.49	0.65
TVC		81518.69	
Output (kg)		15424.49	
Total Revenue (N)		210,888	
GM (TR-TVC)		129370.07	
GR (TC/TR)	0.39		
	0.38		
OR (TVC/TR			
RNI	1.58		

Source: field survey. 2015

4.4.2 Cost and Returns of Sweet Potato Marketing

Cost comprises of the actual expenses incurred in the performance of the marketing activities as the commodity moves from the farm to the ultimate consumer. Marketing cost and profit margin can both be indicators of efficiency or inefficiency in marketing system. The benefit accrued to individual may be incentive or disincentive to continue in the business (Arene, 2003). Marketing cost incurred include cost of purchase of sweet potato itself, transportation cost, loading and ff loading, storage cost, middlemen charge, union fees, cost of bag and thread,

Table 28: Cost and Returns of (135kg bag) of Sweet Potato Marketing (wholesalers) with Respect to Season

Variable costs	Peak period		Off peak period	
Costs	Cost(₦/135kg)	%TMC	Costt(₦/135kg)	%TMC
a. Purchase price **(PP)**	1917.5	80.29	3617.50	85.57
b. Cost of marketing services (CMS)				
Transport cost	241.25	9.63	353.75	8.28
Govt revenue	27.5	1.09	12.75	0.29
Loading	55.5	2.22	60.25	1.41
Off loading	55	2.19	60.25	1.41
Union fees			12.5	0.30
Middlemen charge	100	3.99		
Temporary market storage				
Cost of bag (₦)	77.5	3.09	78.75	1.84
Cost of thread (N)	30.86	1.23	31.75	0.74
TMC = PP+CMS	2388.13	100	4227.5	100
Returns	Value/bag		Value/bag	
a. Selling price (gross return)	2760		5237.36	
b. Net return = selling price-total marketing cost	371.88		1009.86	
ME	146.28		155.67	
RNI (NR/TMC)	0.16		0.24	

Source, survey data 2015

From the result in table 28, it shows that a wholesaler purchase a bag of sweet potato at an average price of N1917.5 cost of sweet potato accounted for 76.54% of the total marketing cost. Transportation cost accounted for 9.63% of the total marketing cost which is the second most contributing factor to the total marketing cost. Cost of thread

accounted for 1.23% of the total marketing cost which is the lowest contributing factor. The total marketing cost is valued at ₦2388.13 for peak season. On the other hand, during off peak season a wholesaler purchase one bag of sweet potato at an average price of N3617.50, cost of sweet potato accounted for 85.57% of the total marketing cost, followed by transportation cost which accounted for 8.28%. Net marketing margin refers to the difference between selling price and total marketing cost. The result shows that the marketers (wholesalers) had a net marketing merging of ₦371.88 with a marketing efficiency of 146.28% in peak season while for the off peak season the marketers (wholesalers) had a net marketing margin of ₦1009.86 with a marketing efficiency of 155.67%. The return per Naira invested in sweet potato marketing for wholesalers was 0.16 for peak period and 0.24 for off peak period implying that for every naira invested in sweet potato marketing a return of 16k is generated in peak season while for off peak period a return of 23k is generated for every naira invested. The result shows that marketing of sweet potato is more profitable during off-peak season.

Table 29: Cost and Returns Of (135kg) bag of Sweet Potato Marketing (Retailers) with Respect to Season

Variable	Peak Period		Off Peak	
Costs	Cost(₦/bag)	%TMC	Cost(₦/bag)	%TMC
a. Purchase price **(PP)**	2046.67	91.34	3546.66	91.34
b. Cost of marketing services (CMS)				
Storage cost	1.67	0.13	5.17	0.13
Transportation cost	124.83	3.29	127.83	3.29
Govt Revenue(tax)	11.83	0.30	11.83	0.30
Loading	36.33	0.83	32.33	0.83
Offloading	36.33	0.83	32.33	0.83
Union fees	5.33	0.15	5.8	0.15
Middle men charge	10.0	0.44	16.9	0.44
Temporary storage cost	2.71	0.03	1.0	0.03
TMC = PP+CMS	2275.63	100	3779.85	100
Returns	Value/bag		Value/bag	
a. Selling price (gross return)	2873.33		4681.66	
b. Net return = selling price- total marketing cost	597.7		901.81	
ME	141.20		133.30	
RNI (NR/TMC)	0.17		0.20	

Source: Field survey, 2015

From the result in table 29, it shows that cost of sweet potato accounted for 91.3% of the total marketing cost. Transportation cost accounted for 3.29% of the total marketing cost which is the second most contributing factor to the total marketing cost. Temporary market storage cost accounted for 0.03% of the total marketing cost which is the lowest contributing factor. The total marketing cost is valued at ₦2383.33 for peak season. On the other hand for off-peak season, cost of sweet potato accounted for 91.3% of the total marketing cost, followed by transportation cost which accounted for 3.29%, while temporary market storage accounted for 0.03%. The total marketing cost is valued at ₦3882.83. Net marketing margin refers to the difference between selling price and total marketing cost. The result shows that the marketers (retailers) had a net marketing merging of N490 with a marketing efficiency of 141.20% for peak period. On the other hand for off-peak period the marketers (retailers) had a net marketing margin of ₦789.83

and marketing efficiency of 133.30%.The return per Naira invested in sweet potato marketing for retailers was 0.17 for peak period and 0.20 for off peak period implying that for every naira invested in sweet potato marketing a return of 17k is generated in peak period while for off peak period a return of 20k is generated for every naira invested From the result it can be concluded that sweet potato marketing is a profitable venture along the value chain. Level of profitability was higher during off peak period than in peak period. From the Cost and Returns analysis it reveals that sweet potato production has the highest return per naira invested followed by sweet potato marketing and processing.

4.4.3 Cost and Returns of Sweet Potato Processing

Table 30: Cost and Returns for Sweet Potato Processing

Variable Cost	Quantity	Cost(₦/kg)	%TVC
Raw potato	64.7kg	1459.46	50.57
Groundnut oil	3.43ltr	893	30.94
Wood/kerosene		401.67	13.93
Maggi & salt		13.11	0.45
Water		21.31	0.73
Labour		76.67	2.65
Transport		20.33	0.70
TVC		2885.65	
Revenue		3238.08	
GM		352.43	
RNI		0.12	

Source: Field survey,2015

The cost and return analysis shows that the average total variable cost of processing sweet potato was ₦2885.65 while the average total revenue was ₦3238.08. The variable costs of processing sweet potato include cost of raw sweet potato which accounted for the highest variable cost with 50.57%, others include cost of groundnut oil with 30.94%, cost of maggi/salt, cost of water, cost of labour and transportation.. The gross margin was found to be ₦352.43. Further more the result in table 31 shows the return to naira invested was ₦0.12k which implies that for every ₦aira invested a return of 12k is generated

4.5 Constraints Encountered by Actors in Sweet potato Value Chain

Sweet potato value chain actors are faced with constraints along the value chain which hinders their effectiveness. Challenges that are specific to different value chain actors were studied and discussed.

4.5.1 Constraints encountered by sweet potato producers

Low productivity in sweet potato production could be attributed to a number of reasons

Table 31: Constraints Encountered by Sweet Potato Producers. (N=120)

Variable	Frequency	Percentage	Rank
Constraints			
Financial problem	28	23.3	3nd
Unavailability of good vines	3	2.5	62h
High cost and long distance to source of inputs	85	70.8	1st
Poor price at harvest	74	61.7	2rd
Poor access to extension services	7	5.8	5th
High cost of inputs	2	1.7	62h
Dry spell after transplanting	1	0.8	8th

Source field survey 2015

The result in table 30 shows that high cost and long distance to source of inputs was the main constraint encountered by sweet potato producers in sweet potato production, which they was ranked first. Major source of inputs are the state ADPs and open markets. Sweet potato farmers complained of not receiving any form of input from the state Agric extension project officers in terms of sweet potato production while the open markets charged exorbitant prices per unit and they have travel to long distance to purchase inputs mostly from markets in the city. This escalates the cost of production. The bulk nature their product also mean they have to pay for transportation to distant markets. All these results to high cost of production and marketing of sweet potato.

Financial problem was ranked second by sweet potato producers in sweet potato production. Most of the producers depend on personal savings which is not enough to purchase all the inputs required for sweet potato production.

Unavailability of good vines was ranked third. Sweet potato producers complained of unavailability of good vines for propagation..Majority of the producers obtain sweet potato vines from vine propagator who are after money, not the quality of the vines.

Dry spell after transplanting which was ranked first, Majority of sweet potato producers complained that they usually experienced dry spell after transplanting sweet potato vine, sweet potato vine needs moisture for it to grow after it has been transplanted, Inadequate moisture due to dry spell leads to drying of the vines.

Poor access to extension services was ranked fifth as major constraint affecting sweet potato production. 5.8% of the producers reported that they have never had contact with extension workers on sweet potato production. Poor extension service delivery hinders the dissemination of information such as improved seeds, new production techniques etc. While poor price at harvest and high cost of inputs were ranked third and fourth respectively, Adebayo, (2006), reported that major constraints in sweet potato production in Nigeria include High cost of inputs, access extension services, post harvest technologies, access to credit and market. The table further shows the constraints faced by sweet potato producers in marketing sweet potato. From the table it reveals that poor price was ranked first, market glut at harvest was ranked second, unavailable during off peak period was ranked third. The result of the analysis revealed that Poor price and market glut at harvest where the major constraints effecting sweet potato marketing. At harvest sweet potato is in abundance and farmers are forced to sell at lower prices since sweet potato cannot be stored for a long period. It results to lower prices.

4.5.2 Constraints Encountered by sweet potato marketers

Sweet potato marketers encountered some constraints in the course of marketing sweet potato. Table 31 presents the constraints face by sweet potato marketers at each stage of marketing.

Table 32: Constraints Encountered by Sweet Potato Marketers. (N=100)

Variable	Frequency	Percentage	Rank
Constraints in buying sweet potato during peak season			
Shortage of capital	4	6.7	1st
High cost of transportation	7	11.7	2nd
Constraints in buying sweet potato during off peak season			
High cost of sweet potato	37	61.7	1rd
Have to travel long distance to buy sweet potato	23	38.3	2nd
Constraint in transporting sweet potato			
Bad roads	4	6.7	2nd
High cost of transportation	56	93.3	1st
Constraint in selling sweet potato during peak period			
Market glut	60	100	1st
Constraint in selling sweet potato during off peak period			
Low demand by customers	34	56.7	1st
Scarcity of sweet potato	26	43.4	2rd

Source field survey 2015

Constraints in buying sweet potato during peak season: The main constraint encountered by sweet potato marketers in buying sweet potato during peak season was inadequate capital which was ranked first. Majority of the marketers depends on personal savings which are not enough to invest in sweet potato marketing.

Constraints in buying sweet potato during off peak season:. Majority of the marketers complained of high cost of sweet potato. The high cost is as a result of scarcity of sweet potato. 38.3% of the marketers complained they have to travel long distance to purchase sweet potato which makes the marketers to incure additional expenses

Constraint in transporting sweet potato: High cost of transportation was ranked second, majority 56% of the marketers complained of high cost of transportation in transporting sweet potato. The marketers have to pay loading and off loading cost and other charges such as taxes impose in the form of levies especially at road blocks and entry into markets by state and local government officials. Also longer market distance has resulted in incurring higher transportation cost on the roads. The marketers also complained about bad roads as constraint in transporting sweet potato. Most of the rural roads that link to urban markets are bad, this affects the smooth transportation of sweet potato to the market.

Constraint in selling sweet potato during peak season: Majority of sweet potato marketers reported problem of market glut during peak season which results to low price. This is as a result of much sweet potato being harvested and supplied to the market for sell. Due to perishality nature of sweet potato and lack of storage facilities the marketers have to sell their sweet potato at lower prices

Constraint in selling sweet potato during off peak season: majority of the marketer 56.7% complained of low demand by customers in selling sweet potato during off peak season. At off peak season sweet potato is scarce and the supply is limited which force its prices to shoot up as against peak season. The rise in price forced people to abandon sweet potato and go for other substitutes with lower prices.

4.5.3 Constraints Encountered by Sweet Potato Processors

Table 32 presents the result on constraints encountered by sweet potato processors at different stages.

Table 33: Constraints Encountered by Sweet Potato Processors (N=60)

Variable	Frequency *	Percentage	Rank
Constraint in buying raw sweet potato			
High cost during off peak	39	65.0	1^{s}
No enough capital	6	10.0	2rd
Price fluctuation	5	8.3	3th
Constraints in processing sweet potato			
High cost of processing inputs	31	51.7	1st
Injury due to use of knife	5	8.4	2rd
Constraints in selling processed form of sweet potato			
Low demand	20	33.3	1st
High competition	2	3.3	2rd

Source, Field survey 2015

Multiple response *

Constraint in buying raw sweet potato. High cost of sweet potato during off peak season was the main constraint encountered by sweet potato processors in buying sweet potato. The high cost is as a result of low supply of sweet potato which causes scarcity of sweet potato in the market. In adequate capital was ranked second. Majority of sweet potato processors depends on personal savings as source of capital .which is too small for the business and they do not have access to other sources of capital. Price fluctuation was ranked third by sweet potato processors in buying raw sweet potato

Constraints in processing sweet potato: High cost of other processing inputs was the major constraint encountered by sweet potato processors as reported by 51.7% of the processors which was ranked first. Processors have to buy fire wood, groundnut oil and other ingredients. 8.4% of the processors complained of injury due to use of knife in the process of peeling sweet potato.

Constraints in selling processed form of sweet potato: Majority of the processors complained of low demand of processed sweet potato which was ranked first. The low

demand is as a result of availability of other substitutes such as *Akara* commonly known as (*Kosai*). Some of the processors complained of high competition which results to poor turn over.

4.5.4 Constraints Encountered by Sweet Potato Consumers

Table 33 presents the result on constraints faced by sweet potato consumers.

Table 34: Constraints Encountered by Sweet Potato Consumers. (N=30)

Variable	Frequency	Percentage
It causes diarrhea when consume a lot	2	6.7
Scarce during off peak	9	23.0

Source, Field survey 2015

Scarce during off peak: Majority of sweet potato consumers complained of scarcity of sweet potato during off peak season as the major constraint which was ranked first. The scarcity causs increase in price of sweet potato which force consumers to go for other alternatives. Some of the consumers complained that it causes diarrhoea when consumed alot.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The study examines Economic Analysis of Sweet Potato Value Chain in Kano State, Nigeria. Multi stage sampling technique was use for the study. The major actors identified were producers, marketers (wholesalers and Retailers) processors and consumers.

Data were collected using structured questionnaires randomly administered to one hundred and twenty producers, one hundred marketers (fourty wholesalers, sixty retailers), sixty processors and thirty consumers giving a total sample size of three hundred and ten respondents (310). The data collected was analyzed using descriptive statistics, gross margin, marketing margin, net marketing margin and marketing efficiency models.

The major findings of the study indicated that males dominated the value chain at most of the levels except at processing were half of the producers were males while the other half were females. All the producers were male (100%), majority (43.3%) of the producers fell within the age bracket of 35-43 years which shows that they were within the active youthful age. Majority of the producers 98.2% were married. Most of them (30%) had 8-11 members in their households, 56.7% of them had non formal education and they had more than 15 years farming experience. The marketers involve in the value chain are wholesalers and retailers. The study revealed that all the marketers were male. Majority of the wholesalers 40% fell within the age range of 32-45 years, majority of them 42.5% had a household size of 8-10 members and had an average of 15 years in sweet potato

marketing. The study further revealed that majority 97.5% of the wholesalers are married and most of them (47.5%) had primary education. On the other hand majority of the retailers 41.7% fell within the age range of 36-40years, majority 33.3% had household size 8-10 members with an average of 14 years in sweet potato marketing. Majority 98.3% of the retailers are married and most of them 65% had no formal education.

Processors were the next actors identified along the value chain. The study revealed that majority 41.7% of the processors fell within the age range of 32-40 years with a household size of 5-6 members and 7-11 years experience in sweet potato processing. Majority 70% 0f the processors are married and majority 53.3% of them had no formal education.

Consumers were the last actors along the value chain. Result of socio economic characteristics revealed that the mean age of the consumers was 38 years with average household size of 8 members and mean of 18 years experience in consuming sweet potato

Analysis of cost and returns of sweet potato Production, marketing and processing shows that they were profitable with gross margin of N129, 370.07 per hectare for producers and net marketing margin of ₦371.88/135kg (bag) for wholesalers in peak period and a net marketing margin of N1009.86/135kg (bag) for off peak period. On the other hand retailers had a net marketing margin of N490/135kg (bag) for peak period while in off peak period the retailers had a net marketing margin of N798.83/135kg (bag). The processors had a gross margin of N352.43. The study also reveals that sweet potato production has the highest return per naira invested, followed by marketers and processors

The analysis further revealed high cost of inputs, dry spell after transplanting and market glut were the main constraints affecting producers, inadequate capital, scarcity during off peak high cost of transportation, market glut during peak period and low demand by customers during off peak period were the major constraints affecting marketers. Scarcity of sweet potato during off peak, high cost of processing inputs were the major constraints associated with sweet potato processing

5.2 Conclusion

Based on the findings of the study, it can be concluded that the major actors identified along the sweet potato value chain in the study area were producers, marketers (wholesalers and retailers), processors and consumers. The actors in the value chain have similar socio economic characteristic. The study also concludes that sweet potato producers in the study area produce only white flesh variety commonly known as (*Dan China*). All the actors in the value chain are making profit with level of profitability higher in off peak period for both wholesalers and retailers. The study further concludes that sweet potato production has the highest return per naira invested followed by sweet potato marketing and processing. The study also concludes that sweet potato is produced and processed locally into boiled and fried form it has not been considered as lucrative product for investment. With proper guidance, the value chain actors can upgrade their activities and achieve higher benefits.

5.3 Recommendations

Based on the findings of the study, it is recommended that

1. Agribusinesses should be encouraged to establish sweet potato processing industries that will transform sweet potato into various products such as snacks, biscuits or noodles. This could help in increasing the demand for sweet potato which will in turn increase the sweet potato value chain actors income. Therefore intervention that will aid the transformation of sweet potato into more products will increase its production and income along the sweet potato value chain.
2. The value chain actors should be link with financial institutions such as commercial banks, community banks, and rural micro credit institutions to facilitate access to credit. This will help in expanding their capacity, improve profitability and ensure sustainability of the value chain actors,
3. Investment on sweet potato storage should be made by the government and other stakeholders to overcome the problem of perishability and market glut
4. The government in collaboration which the state ADP should establish sweet potato vine propagation centres, this will enable producers of sweet potato to have access to good quality vines at affordable prices.
5. Massive awareness should be made by the government and other stakeholders on the nutritive and health benefit of sweet potato. This will encourage the consumption of sweet potato.
6. There is the need for extension agents in the state to sensitise sweet potato producers on other varieties of sweet potato especially the orange fleshed variety, due to its high vitamin A content which is use in combating vitamin A deficiency.

7. The government and community organizations should aim at constructing durable roads to link rural areas with rural markets, also taxes charged by Local Government Authorities and State Government on transporters should be reduced, this will help in decreasing transportation cost.
8. Producers of Sweet Potato should be encouraged to form Sweet Potato Producers Association to ease sourcing of key inputs and marketing of products. Similarly processors should introduce better finishing to their products especially packaging and labeling
9. The Government should include sweet potato into the menu of its national school feeding programme. This will boost sweet potato production in the state and will increase income of the sweet potato producers and marketers.
10. Opportunity to explore industrial use of Sweet Potato should be explored through research and collaboration.

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Appendix i

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENTION

FACULTY OF AGRICULTURE
BAYERO UNIVERSITY KANO

SWEET POTATO VALUE CHAIN STUDY

Dear respondents,

I am a student of the above named institution from department of Agricutural Economics and extension, conducting research on the topic titled SOCIOECONOMIC ANALYSIS OF SWEET POTATO VALUE CHAIN IN KANO STATE. NIGERIA. Please you are requested to respond accordingly as the information would be use confidentially for academic purpose. Thanks.

PRODUCERS' SURVEY INSTRUMENT

SOCAIO ECONOMIC CHARACTERISTICS OF SWEET POTATO FARMERS

1) Local Government Area …….

2) Name of Village ……....

3) Gender (a) male ( ) (b) female ( )

4) Age……..……

5) Marital Status

a) maried ( )

b) Single ( )

c) Divorced ( )

d) Widow ( )

e) Widower ( )

6) Household size

Household Member	Number
Men	3
Women / wife	2
Childern	7

7) Level of Education

a) Primary ( )

b) Secondary ( )

c) Tertiary

d) Others (specify) ……

8) Years of experience? ……

9) Are you a member of an Association?

a) Yes ( )

b) No ( )

10) If Yes to above, name the association

……
……

11) What kind of benefit do you derive from the association?

……

12 What is your primary Occupation

a) Farming ( )

b) Marketing of Sweet Potato ( )

c) Marketing and rearing ( )

d) Others (specify) ……

13) What is your secondary Occupation?

a) Farming ( )

b) Marketing of Sweet Potato ( )

c) Civil Servant ( )

d) Clergy

e) Marketing and rearing ( )

f) Other (specify) ……..……

FUNCTIONS, ROLES AND RELATIONSHIPS BETWEEN THE MAJOR ACTORS (PRODUCERS)

14) How Long have you been in sweet potato production? ……

15) What is your reason for going into sweet potato production

a) Income generation ( ) (b) Household consumption ( ) (c) Other

16) Which variety of sweet potato do grow?

a) Local ( )

b) Improved ( )

17) What is your reason for choosing the above?

a) High Yield ( )

b) Drought Resistance ( )

c) Disease Resistance ( )

18) Where do you source your sweet potato

a) Market ( )

b) ADP ( )

c) Self propagation ( )

d) Fellow Farmers ( )

(e) Propagators

19) Which system of cultivation do you practice?

a) Sole Cropping ( )

b) Mixing Cropping ( )

20) If sole cropping, why do you practice it?

……
……

21) If Mixed cropping, which crop do you mix sweet potato with?

……
……

22) What benefit do you derive in mixing sweet potato with the crop?

……
……

23) Source of farm inputs?

Farm inputs	Source	From who	Price
Vine			
Fertilizer Organic Inorganic			
Herbicide			
Pesticide			
Other			

a) ADP ( )

24) Where do you source your capital for sweet potato production?

a) Self ( )

b) Loan ( )

c) Friends and Family ( )

25) If loan, state the source of the loan.

……
……...……..

26) Do you have contact with extension agent?

a) Yes ( )

b) No ( )

27) If Yes, how often?

……
……..……..

28) What kind of information do you obtain from the extension agent?

……
……..……..

29) Have you ever attend any training on sweet potato?

a) Yes ( )

b) No ( )

30) If yes which topics where discussed?

a) Production of sweet potato

b) Marketing of sweet potato

c) Sweet potato valve addition techniques

d) Processing of sweet potato

e) Others (specify) ……

……

31) Where do you get technical advice on sweet potato production, marketing, and processing?

a) Research institution ( )

b) Extension Agent, ( )

c) Radio, ( )

d) Fellow farmers. ( )

32) To whom do you sell your sweet potato?

a) Retailers ( )

b) wholesalers ( )

c) Consumers ( )

33) Where do you sell your sweet potato?

a) Farm Gate ( )

b) Rural market ( )

c) Urban market ( )

PRODUCTION ASPECT SWEET POTATO

34) What is the total size of your farm…….(ha)

35) What size do you devote to sweet potato production (2014)……(ha)

36) How did you acquire your farmland?

a) Inheritance ( )

b) Borrowed ( )

c) Purchase ( )

d) Rent

e) Gift

37) If hired or rented how much did pay per annum per ……(ha)

38) If purchase what was the amount paid per (ha)

39) Which system of cultivation do you practice?

a) Animal traction ( )

b) Tractor ( )

c) Manual ( )

40) Which cropping system do you practice?

a) Sole cropping ( )

b) Mixed cropping

41) If sole cropping, why do you practice it?

42) If mixed cropping which crop do you mix sweet potato with?

43) What benefit do you derive in mixing sweet potato with the crop?

44) Provide information to the following

Activity	Month
Optimum period	
Optimum harvesting period	
Optimum market period	

Cost and Returns associated with sweet potato production

What are the resources used in sweet potato production?

S/N	Input	Qty Used (Kg/It)	Cost Unit (N/Kg)	Total Cost (N)	Source Code (A)
1.	Agrochemical a) pesticides b)Herbicides				
2.	a) Fertilizer **organic** a) Farm yard Manure b) Compos **Inorganic** a- Urea b- SSp c- Npk				
	Seed vine a. Local b. Improve c. Bag f. others				

Code a) govt./ADP b) market c) seed company d) store last year

46) Which kind of labour is used on the farm?

a) Family { }

b) Hired { }

c) Family and hired { }

d) Other (specify) ……

47) Complete the table regarding labour requirement in sweet potato production.

	Paid labour		**Unpaid labour**

S/N	Operation	No. of labourers	No. of hours/day	No. of days spent	Unit Cost (N)	No. of labourers	No. of hrs spent/day	No. of days spent
	Land Preparation							
	Planting							
	Fertilizer application 1&2							
	Weeding 1&2							
	Harvesting Packing Bagging							

50) Provide information on sweet potato harvest all plots for 2014

Plot 1

Variety	Total Out put (kg)	Qty sold	Unit price N/kg	Total Cost	Qty stored (kg)	Qty consumed (kg)	Qty gien as gift (kg)	Place of sale code (A)	Type of buyer code (B)
Local									
Improved									

Code (A) a. Farm gate, ( )

b. Local market, ( )

c. Urban market, ( )

d. Rural market, ( )

e. Other (specify)

CODE (B) a. wholesaler ( )

b. retailer ( )

c. farmers ( )

d. consumers ( )

e. other (specify)

plot 2

Variety	Total Output (kg)	Qty sold	Unit price N/kg	Total Cost	Qty stored (kg)	Qty consumed (kg)	Qty gien as gift (kg)	Place of sale code (A)	Type of buyer code (B)
Local									
Improved									

Code (A) a. Farm gate, ( )

b. Local Market, ( )

c. Urban Market, ( )

d. Rural Market, ( )

e. Other (specify)

code (B) a. Wholesaler ( )

b. Retailer ( )

c. Farmers ( )

d. Consumers ( )

e. Other (specify)

Plot 3

Variety	Total Output (kg)	Qty sold	Unit price N/kg	Total cost	Qty stored (kg)	Qty consumed (kg)	Qty gien as gift (kg)	Place of sale code (A)	Type of buyer code (B)
Local									
Improved									

Code (A) a. Farm gate, ( )

b. local market, ( )

c. urban market, ( )

d. rural market, ( )

e. other (specify)

code (B) a. wholesaler ( )

b. retailer ( )

c. farmers ( )

d. consumers ( )

e. other (specify)

SWEET POTATO PRODUCTION CONSTRAINTS

47) What are the major constraints in sourcing farm inputs?

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……
……
……
……..

48) What are the major constraints affecting sweet potato production?

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……

49) What are the major constraints affecting sweet potato marketing?

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51) In what way do you require assistance and from what source

52) What is your suggestion and recommendation on the way to enhance sweet potato production, marketing and processing in your area?

Appendix ii

MARKETERS' SURVEY INSTRUMENT

SOCIO ECONOMIC CHARACTERISTICS OF SWEET POTATO MARKETERS (Wholesalers)

1. Local government Area……
2. Name of village ……..
3. Gender
   a) Male ( )
   b) Female ( )
4. Age……
5. Marital Status
   a) Married ( )
   b) Single ( )
   c) Divorced ( )
   d) Widow ( )
   e) Widower ( )

`````` Household size ……

6. Literacy Level
   a) Non-formal ( )
   b) Primary ( )
   c) Secondary ( )
   d)Tell ( )
   e) Other (specify)……
7. What is your primary occupation?
   a) Farming ( )
   b) Market of sweet potato ( )
   c) Processing of sweet potato ( )
   d) Other (specify)……..
8. What is your secondary occupation?
   a) Farming ( )
   b) Market of sweet potato ( )
   c) Civil servant ( )
   d) Clergy ( )
   c) Processing of sweet potato ( )
   d) Other (specify)……

**Functions, Roles and relationship between the major actors (marketers)**

9. How long have you been in sweet potato marketing? .....
``````

10. What is your reason for going into sweet potato marketing?

……

11. What type of sweet potato marketer do you belong

a) Rural assembler, ( )
b) Wholesaler, ( )
c) Retailer, ( )
d) Other (specify)

12. What type of Wholesaler are you?

a) Insito wholesaler ( )
b) Transit wholesaler ( )

13. If (b) above to which state do you normally transport your Sweet Potato

At what interval do you normally transport your Sweet potato

Interval	Date	Quantity
Weekly		
Twice a week		
Thrice a week		

14. Where do you source your sweet potato?

Source	Place
Farmer	
Rural collectors,	
Rural wholesale	
Urban wholesale	

15. What quantity of potatoes do you normally buy? (bags)

16. Do you buy your sweet potatoe in cash or credit?

17. What is the mode of payment when you purchase your sweet

Potato in credit?

18. What colour of sweet potato are you selling?

a) White flesh b) Red flesh c) Purple flesh d) Yellow flesh

19. Who are your major sweet potato buyers?

a) Whole sellers b) Retailers c) Consumers d) Others (specified)

20. Why did you choose the above buyer?

a) Give better prices b) Under contract c) Consistent and pay cash d) Others

21. Do you transport your sweet potato to the point of sell?

a) yes b) No

22. What do you use in transporting sweet potato to the market

(a) Bus (b) lorry (c) pick –up van, (d)tricycle

23. What is the package sample of sweet potato you normally sell?

a) bag b) basket c) heap d) others

24. Which size of sweet potato is more preferred by the following category of customers?

Category of customer	Size of sweet potato
Consumer	
Processor	
Marketers	

a) Big b) Medium c) Small

25. Do you sell sweet potato in deferent grades?

a) Yes b) No

26. If yes what are the quality of parameters?

a) White Colour b) Yellow Color c) Purple Color d) Others

27. Has your sales been increasing in the past one month?

a) Yes b) No

28. If yes what factors have contributed to your increase sales?

29. If no what factors have hindered your increase sales?

COST AND RETURN ASSOCIATED WITH SWEET POTATO MARKETING

30. Provide information on cost and return of 100kg bag of sweet potato during peak and off peak period

S/N	**Marketing variables**	**Peak Season (100kg/N)**	**Off Season (100kg/N)**
1.	Purchase price		
2.	Storage cost		
3.	Transportation cost		
4.	Government revenue		
5.	Loading and off – loading distance		
6.	Union fees		
7.	Middlemen charge		
8.	Temporary market storage		
9.	Cost of bag Cost of thread		
10.	Total marketing cost		
11.	Selling price		
12.	Total revenue		

31. What is the average buying (bag) of sweet potato from there respective source

Sources	**local (price)**		**improve (price)**	
	Peak	**Off peak**	**Peak**	**Off peak**
Farm gate				
Rural collector				
Rural Wholesaler				

32. What is the average selling price for different sweet potato grades

Garde	Price~heap		Price~basket		Price~bag	
	Peak	**Off peak**	**Peak**	**Off peak**	**Peak**	**Off peak**
White flesh						
Yellow flesh						
Purple flesh						

Red flesh			

33. specify the average quanatiy sold with respect to the following period

Period~season	Qty sold (kg)	Cost per kg	Total cost
1. daily | peak season			
2. weekly | peak season			
3. Monthly – peak season			
4. Daily – off season			
5. Weekly - off season			
6. Monthly – off season			

CONSTRAINTS ASSOCIATED WITH SWEET POTATO MARKETING

34. What are the major constraints in sourcing (buying) sweet potato during peak season?

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35. What are the major constraints in sourcing (selling) sweet potato during off peak season?

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36. What are the major constraints in transporting sweet potato to the market?

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37. What are the major constraints in sourcing selling sweet potato during off peak season?

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…….

38. What are the major constraints in sourcing in selling sweet potato during off peak season?

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40. Is the quantity and quality of sweet potato satisfied in the market?

a) Yes b) No

41. If not satisfied, what are your reasons?

Appendix iii

MARKETERS' SURVEY INSTRUMENT

SOCIO ECONOMIC CHARACTERISTICS OF SWEET POTATO MARKETERS (Retailers)

1. Local government Area……
2. Name of village ……..
3. Gender
   a) Male ( )
   b) Female ( )
4. Age……
5. Marital Status
   a) Married ( )
   b) Single ( )
   c) Divorced ( )
   d) Widow ( )
   e) Widower ( )

`````` Household size ……

6. Literacy Level
   a) Non-formal ( )
   b) Primary ( )
   c) Secondary ( )
   d)Tell ( )
   e) Other (specify)……
7. What is your primary occupation?
   a) Farming ( )
   b) Market of sweet potato ( )
   c) Processing of sweet potato ( )
   d) Other (specify)……..
8. What is your secondary occupation?
   a) Farming ( )
   b) Market of sweet potato ( )
   c) Civil servant ( )
   d) Clergy ( )
   c) Processing of sweet potato ( )
   d) Other (specify)……
``````

Functions, Roles and relationship between the major actors (marketers)
(RETAILERS)

9. How long have you been in sweet potato marketing? .....
10. What is your reason for going into sweet potato marketing?
……

11. Where do you source your sweet potato?

Source	Place
Farmer	
Rural collectors,	
Rural wholesale	
Urban wholesale	

12. What quantity of potatoes do you normally buy? (bags)

13. Do you buy your sweet potatoe in cash or credit?

14. What is the mode of payment when you purchase your sweet

Potato in credit?

15. What colour of sweet potato are you selling?

a) White flesh b) Red flesh c) Purple flesh d) Yellow flesh

16. Who are your major sweet potato buyers?

a) Whole sellers b) Retailers c) Consumers d) Others (specified)

17. Why did you choose the above buyer?

a) Give better prices b) Under contract c) Consistent and pay cash d) Others

18. Do you transport your sweet potato to the point of sell?

a) yes b) No

19. If yes how fer (km) is the selling point from your store?

20. What is the package sample of sweet potato you normally sell?

a) bag b) basket c) heap d) others

21. Which size of sweet potato is more preferred by the following category of customers?

Category of customer	Size of sweet potato
Consumer	
Processor	
Marketers	

a) Big b) Medium c) Small

22. Do you sell sweet potato in deferent grades?

a) Yes b) No

.23. If yes what are the quality of parameters?

a) White Colour b) Yellow Color c) Purple Color d) Others

24. Has your sales been increasing in the past one month?

a) Yes b) No

25. If yes what factors have contributed to your increase sales?

26. If no what factors have hindered your increase sales?

COST AND RETURN ASSOCIATED WITH SWEET POTATO MARKETING

27. Provide information on cost and return of 100kg bag of sweet potato during peak and off peak period

S/N	**Marketing variables**	**Peak Season (100kg/N)**	**Off Season (100kg/N)**
1.	Purchase price		
2.	Storage cost		
3.	Transportation cost		
4.	Government revenue		
5.	Loading and off – loading distance		
6.	Union fees		

7.	Middlemen charge		
8.	Temporary market storage		
9.	Cost of bag Cost of thread		
10.	Total marketing cost		
11.	Selling price		
12.	Total revenue		

28. What is the average buying (bag) of sweet potato from there respective source

Sources	**local (price)**		**improve (price)**	
	Peak	**Off peak**	**Peak**	**Off peak**
Farm gate				
Rural collector				
Rural Wholesaler				

29. What is the average selling price for different sweet potato grades

Garde	Price~heap		Price~basket		Price~bag	
	Peak	**Off peak**	**Peak**	**Off peak**	**Peak**	**Off peak**
White flesh						
Yellow flesh						
Purple flesh						
Red flesh						

30. specify the average quanatiy sold with respect to the following period

Period~season	Qty sold (kg)	Cost per kg	Total cost
1. daily | peak season			
2. weekly | peak season			
3. Monthly – peak season			
4. Daily – off season			
5. Weekly - off season			
6. Monthly – off season			

CONSTRAINTS ASSOCIATED WITH SWEET POTATO MARKETING

31. What are the major constraints in sourcing (buying) sweet potato during peak season?

……
……
……
……

32. What are the major constraints in sourcing (buying) sweet potato during off peak season?

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…….

33. What are the major constraints in transporting sweet potato to the market?

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34. What are the major constraints in sourcing selling sweet potato during off peak season?

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…….

35. What are the major constraints in sourcing in selling sweet potato during off peak season?

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…….

39. What are the major constraints in storing sweet potato?

……
……

……
……

46. Is the quantity and quality of sweet potato satisfied in the market?

a) Yes b) No

47. If not satisfied, what are your reasons?

Appendix iv

PROCESSORS SURVEY INSTRUMENT

SOCIO ECONOMIC CHARACTERISTICS OF SWEET POTATO PROCESSORS

1. Local Government area ……

2. Name of the village ……..

3. Gender: a) Male ( ) b) Female ( )

4. Age ……

5. Marital status

a) Married b) Single c) Divorce d) Widow
e) Widower

6. Household size…….

Household members	Number
Men	
Women	
Children	

7. Literacy level

a) Non-formal ( ) b) Primary ( )c) Secondary ( ) d) Tertiary ( )

8. What is your Primary occupation?

a) Farming b) Marketing of sweet potato c. Civil Servant
d) Others specified

9. What is your secondary occupation?

a) Farming b) Marketing of sweet potato c) Civil servant d) Clergy e) Processing of sweet potato f) Others specified

FUNCTIONS, ROLES AND RELATIONSHIP OF SWEET POTATO PROCESSORS

10. What is your reason for processing sweet potato?

a) Household consumption b) Income generation c) Self employment d) Others

11. Where do you learn sweet potato processing

a) Parents and relative
b) Nighbour
c) Other (specify)

12. For how long have you been in sweet potato processing?
13. What was the source of capital for the business?

a) Personal savings
b) Cooperative
c) Friends
d) Other (specify)

14. What is the type your business enterprise?

a) Single ownership
b) Partnership
c) Other (specify)

15. What category of processing do you belong?

a) Service provider
b) Selling to consumer
c) For consumption
d) Other (specify)

16) Which one is your main activity?

17) What quantity do you normally process?

Activity	QTY process - day(bag)	Price~(bag)
Service provider		
For consumers		
For consumption		

18. What is your estimated annual income generated from sweet potato processing?

19. What processing technology do you use?

a) Cooking
b) Frying
c) Drying
d) Other (specify)

20. State the reason for choosing the technology above?

……
……..

21. Where did you source your sweet potato for processing?

Name of market	Distance to market	From who	Qty source	Rank
I		Farm gate ( ) Wholesale ( ) Retailer ( )		
ii.		Farm gate ( ) Wholesale ( ) Retailer ( )		
Iii.		Farm gate ( ) Wholesale ( ) Retailer ( )		

22. What quantity of sweet potato do you process per day (kg)

Cost and return Associated with sweet potato processing

23. Complete the following table on variable cost of sweet potato processing

Input	**Quantity**	**Unit price**	**Total cost**	**Code (A)**
Raw potato				
Oil/ groundnut oil				
Wood/kerosene/gas				
Other ……				

Code (A)

a) Market

b) ADP

24) Labour and other services in sweet potato processing?

Service providers	Service providers	No of labour hired	No of days	Hrs/day	Total cost
Women Female child					
Male child Transporters Other (specify)					

NB: specify unit of measurement

25. Give the following information for fixed assets use in processing of sweet potato

Type of equipment	Purchase(yr)	Purchase value(N)	source	Lifespan(yr)	capacity
Knife/fork					
Basket					
Pot/……					
Bowls/……					
Others……					

26. What is the nature of the product after processing?.....

27. Specify the following after processing:

1) Quantity processed ……

2) Quantity consumed……

3) Quantity sold

4) Other (i.e gift)…….

28) Who is responsible for selling the product after processing ?

a) Husband { }

b) Son/Daughter { }

c) Relatives { }

d) Other { }

29. What determines price after processing?

a) Consumers demand

b) Market price

c)Cost of raw potato

d) Competitors

e) Other (specify) ……

CONSTRAINTS AFFECTING SWEET POTATO PROCESSING

29. What are the major constraints in sourcing sweet potato for processing?

a) ……

b) ……

c) ……

d) ……

30. What are the major constraints in processing sweet potato?

a) ……

b) ……

c) ……

d) ……

31. What are the major constraints in selling processing form of sweet potato?

a) ……

b) ……

c) ……

Appendix v

SWEET POTATO CONSUMERS SURVEY INSTRUMENT

SECTION A: SOCIO ECONOMIC FEATURES OF THE RESPONDENTS

1. What is your Name (Respondent: optional)? ……...

2. What is your Age? { }

3. What is your gender? Male { } Female { }

4. What is your marital status?

a) Single { }

b) Married { }

c) Divorce { }

d) Widow { }

5. What is your Household size? ……

6. How long have you been using sweet potato?

……..……..

7. What is your average annual income?

8. How often do you consume sweet potato?

(a) Daily, (b) weekly, (c)twice a week, (d) monthly.

9. What is your reason for consuming sweet potato?

……

…….....

SECTION B: COMMODITY FACTORS INFLUENCING CONSUMERS PREFERENCE

8. Which type of sweet potato do you prefer?

Colour	Ranking (1-5)
White flesh	
Yellow flesh	
Red flesh	
Purple flesh	

Code. 1 least preferred ( )
5 Most preferred ( )

9. Complete the table bellow using the key provide

S/N	variables	Option 1	Option 2	Option 3	Option 4	Comment (if any)
1.	Price					
2.	Colour					
3.	Suitability					
4.	Cleanliness					
5.	Shape					
6.	Cooking duration					

Key:

Price (not affordable =1, fairly affordable =2, affordable=3, very affordable =4)

Colour (not attractive =1, fairly attractive =2, attractive=3, very attractive=4)

Suitability (not suitable=1, fairly suitable=2, suitable=3, very suitable=4)

Cleanliness (not clean=1, fairy clean=2, clean=3, very clean=4)

Shape (not shape=1, fairy shape=2, shape=3, very shape=4)

Cooking duration (high duration=1, moderate duration=2, low duration=3,)

10. Cooking duration (high duration=1, moderate duration=2, low duration=3,)

Processed form	Ranking	Reason
Cooked		
Roasted		
Fryed (chips)		
Flour		

11. What problems do you encountered in consumption of sweet potato?

a. ……
b. ……
c. ……
d. ……....