2

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Baseline Analysis of Plantain (*Musa sp.*) Value Chain in Southwest of Nigeria

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Executive Summary

Nigeria is the largest producer of plantain in West Africa, having an annual production of about 2.4 million metric tons, with about 49% of farming households producing plantain as their main crop. Presently in Nigeria, plantain production is becoming a significant economic activity for income for both large scale and small-holder farmers, and it is one of the primary commodities for investment across the south zone in Nigeria, occupying a strategic position for rapid food production. With the potential for industrial processing of plantain, which has recently been adopted, and the increased interest in production by small and large-scale farms in the country, it is believed that Nigeria will continue to be one of the world's largest producers of plantain. In view of the significant contributions of plantain to the economic development and food security of both rural and urban households in Nigeria, it is imperative to understand the network, linkages, flow, volume and value added among actors in the Plantain Value Chain. Hence, the main objective of this study is to analyze the various activities of the key actors in the plantain value chain across the southwest region.

The study was carried out in southwestern, Nigeria. The region was selected because it is one of the major centers of plantain production in Nigeria. Large volume of plantain is traded in urban centers located in the zone. Also, the prospect for value addition is promising due to the presence of emerging processing industries (Adeoye *et al*, 2013). The zone is made up of six states namely Lagos, Oyo, Ogun, Osun, Ekiti and Ondo States. It falls on latitude 6^{o} to the North and latitude 4^{o} to the south. It is marked by longitude 4^{o} to the east. It is bounded in the North by Kogi and Kwara states, in the east by Edo and Delta states in the south by Atlantic Ocean and in the west by Republic of Benin.

Using random sampling technique, the study collected data from 300 producers and sed the snowball sampling technique in selecting 15 marketers, processors and consumers per state to give a total of 45 respondents for marketers, processors and consumers respectively. Based on the study objectives, data collected were analyzed with the use of descriptive statistics, Heckman selection model, multiple ordinary least square (OLS) regression, Stochastic frontier production function, Harrod-Domar growth equation, and the Commercialization index (HCI).

Results show that plantain production is mainly dominated by males who are monogamously married with an average household size of 7. The mean age of the farmers is 49 years ± 13 years with Osun state having older farmers and majority has at least primary school education. The average farm size is less than I hectare (0.67ha). Majority of the farmers (82%) belong to farmers association while about 64% also belong to cooperative societies.

Results further suggests that majority (90%) of the farmers require 180,000 to fill the financing gap being presently experienced so as to produce at the frontier level. However, the mean credit amount per season that farmers in the study area had access to was, ₦13,215. The access to credit among the farmers was positively influenced by their need for credit, the value of their asset and membership of cooperative society while credit procedure and interest

charged on credit negatively impacted on access to credit by farmers. However, the amount of credit eventually gotten by the farmers was positively influenced by the need for credit and land ownership.

The average technical efficiency of plantain producers in the study area is 0.53 with a standard deviation of 0.13 and the average quantity of bunches produced annually by farmers is 617 bunches with a standard deviation of 438 bunches, while the mean annual income from plantain production by the farmers is ₦304,369.8 with a deviation of ₦287,404.5. Plantain farmers cultivated plantain majorly for the income it generates for the household as the greater majority of the farmers (94%) sell their plantain than consumed at the household. Motorcycle is the most used mode of transportation by the farmers, as majority (63%) use motorcycle in transporting plantain from their farms to the major points of sales before vehicles are used by purchasing marketers. The major factor that the farmers consider in determining price of their plantain is the period of the year (off-season and on-season) and the major constraints faced by these plantain producers is finance in the form of credit, representing 46%. This is closely followed by the menace of pest and disease representing 16%.

Plantain marketing in Southwest involves mainly the marketing of fresh plantain, plantain chips and plantain flour. Plantain marketing in the southwest is largely dominated by the female gender as represented by 96% in the study and result further shows that majority of the marketers(60%) are below the age of 40 years with most of them (72%) being monogamously married. The greater majority (80%) of the marketers had at least primary school education, 76% of them have household of between 4 and 7 members and many of the marketers (62%) belong to marketer's associations. Study further showed that vast majority of the plantain marketers (about 91%) are involved in marketing fresh plantain, about 7% are involved in marketing plantain flour while those who market plantain chips are only about 2%. Those involved in plantain chips marketing are young men, representing 4% of the marketers. Many of the marketers are involved in plantain marketing mainly because of its market acceptability, easy sales and the quick income it generates. Majority (76%) of the marketers use personal funds in their plantain marketing business and 70% of the marketers use vehicular transportation to move plantain especially fresh plantain to their points of sale or major markets. Close to half (47%) of the marketers depend heavily on the season or the period of the year in determining the price of their plantain product. This is more common with fresh plantain and plantain flour.

Plantain flour marketers have the highest mean annual net income (₦97,000) closely followed by fresh plantain marketers (₦84,015.96) and then marketers of plantain chips (₦72,700). Also, in terms of marketing efficiency, plantain flour has the highest market efficiency (2.22) followed by fresh plantain (1.58) while plantain chips marketers has the least efficiency in terms of marketing. Lack of finance is the most limiting (46%) amongst the other constraints as many of the marketers complained of not having enough funds to do the business as they would have loved.

Plantain processors in the study area consist majorly of micro-processors who are involved in processing plantain to prolong the shelf life of the crop. Plantain processing is largely dominated by the female gender as represented by 93%. Majority (83%) of the processors are below the age of 50years with 74% having at least primary school education. Majority (71%) of the processors are monogamously married with 73% having household size ranging from 1 to 7. The most common plantain product processed by plantain processors are plantain chips, plantain flour and, roasted plantain. Market acceptability and improved shelf life of plantain are the major motivating factors for plantain processors to be involved in plantain processing. More than half (52%) of plantain chips processors sell their plantain chips mostly directly to individual buyers and 68% of plantain flour buyers are individual consumers. Plantain flour processors have the highest net annual income (₦146,470) followed by plantain chips processors (₦113,600), while roasted plantain processors have the least (₦57,500) net annual income. The average monthly cost incurred by plantain processors is highest for chips processors (₦7,175.80) followed by plantain flour processors (₦6,705.56), while roasted plantain processors have the least cost (₦3,538.75). However, plantain flour processors have the highest monthly profit (₦12,824.35) followed by plantain chips processors (₦10,225.80) and then roasted plantain (₦6,874).

Most of the processors get their fresh plantain from itinerant bulk gatherers who go from farm to farm to gather plantain into bulk and then sell either at a specific location near the farms or at the local market. Majority (46%) of the processors got their funds from loan obtained from cooperative society while 30% of the processors are using their personal funds in the plantain processing business. Financial constraint in the form of lack of credit facilities is the highest constraint faced by plantain processors, followed by irregular supply of fresh plantain upon which the processors depend heavily for their business.

Plantain consumers consist of those who consume plantain products in its various forms. Half of the consumers interviewed are from 40 years and below while the remaining half is above 40 years of age with 94% of them having at least primary school education. About 63% of the consumers are females with the remaining being males and a total of about 86% of the consumers are married and living with their spouse(s). Majority of them (75%) have household members ranging between 5 and 10. Also, majority (87%) of the consumers are village consumers while the remaining are consumers who dwell in cities across the study area. Thus for about half (47%) of the consumers, farming occupies the highest source of income. Expenditure on food takes the largest share of household expenditures, closely followed by education. Study shows that the mostly consumed plantain products by consumers is fried plantain (Dodo), followed by cooked plantain mostly by village consumers. However, city plantain consumers consume fried ripe plantain (Dodo), plantain chips (ipekere) and plantain flour more than village consumers while village consumers consume cooked plantain and roasted plantain more than city plantain consumers. Majority of the consumers (43%) consume plantain because they believe it is nutritious, closely followed by those (28%) who consume plantain because of the taste. Fried ripe plantain is the plantain form mostly prepared by consumers in their households and this is followed by cooked plantain.

The mean weekly expenditure on the various forms of plantain by consumers in the study area is ₦455.65 ± ₦226.43 and the average income proportion spent monthly on plantain by consumers is 3.25% ± 1.98%. The average price per bunch is ₦512.5. The frequency of plantain consumption weekly among city consumers is higher than that of village consumers. Village consumers get their raw plantain directly from the farmers followed closely by local market while city consumers get raw plantain mostly from the markets in their neighborhood and others purchase directly from plantain retailers.

It can be concluded from the results of this study that plantain production in the study area is largely small scale and constrained majorly by lack of finance in the form of credit for the farmers to embark on large scale plantain plantations.

The marketing of plantain is dominated by females who are financially constrained and depend on their meager personal funds, especially for fresh plantain marketers. The lack of finance coupled with irregular supply of plantain, especially during off season, affects the volume of plantain marketed. Transportation of fresh plantain remains a major challenge for fresh plantain marketers resulting to losses and hence reduced profit. Availability of vehicles specially designed for transportation would go a long way in reducing marketer's losses and ensure improved income. Marketing of plantain flour is more profitable and efficient and should be encouraged especially during off-season when fresh plantain is scarce.

Plantain processing in the study area is largely done by micro-processors who use crude methods of processing as they are also constrained by finance to be able to access modern means of processing plantain and thus produce less volume of processed plantain. The processors are largely women and they help in solving the challenge of quick ripening and spoilage of plantain by processing it into plantain flour and unripe fried plantain chips. There is a need for a concerted effort to provide these processors with modern processing equipment. This will encourage further production and ensure employment as well as improved income for the various actors in the plantain value chain.

Plantain consumption cuts across various status and age grade and this makes plantain an important food security crop in the study area. It is mostly consumed at home as fried ripe plantain (dodo) and in the cooked form. Plantain flour consumption is more common in the cities across the region due to its perceived health benefits while unripe fried plantain chips serves as snacks easily consumed by city dwellers as well as travelers across the study area. The perceived nutritious values, as well as taste of the various forms of plantain product are the main drivers of plantain consumption.

Section A: Introduction

Importance of Plantain

Plantain is a multipurpose crop with great processing potential. This major food staple and cash crop is important in the rural and urban economy, social and cultural life in sub- Saharan Africa (IITA, 2009). It is the fourth most important food crop in the world after rice, wheat and maize, and is used as food, beverages and cooked foods (Phillip et al. 2009, Nelson et al., 2006; Ogazi, 1995). Plantain is an important food and cash crop (Nkendah and Akyeampong, 2003; Nwosu and Lawal, 2010) with outstanding and proven medical and industrial relevance (Faturoti et al., 2007). Nigeria is one of the major plantain producing and consuming countries in Africa, and is ranked among the 20 most important plantain producing countries worldwide (FAO, 2011). The demand for plantain has increased tremendously in the last one decade as a number of local processing industries have emerged which use it industrially for making bread, cakes, biscuits (Ogazi 1996). With increasing urbanization, bananas and plantains are fast becoming more and more important as cash crop, in some cases providing the sole source of income to rural population, thereby playing an important role in poverty alleviation (Frison and Sharrock, 1999). Plantains has low labour requirement for production compared with other food crops such as cassava, maize, rice and yam (Maricot and Lancaster, 1998). The crop's status as a poverty alleviating crop is enhanced by the fact that the crop has extended period of harvest thus becoming more and more important as cash crops and in some cases providing the sole source of income to the rural population (Gold *et al*., 1991).

The contributions of plantain to the income of rural households in major producing areas in Nigeria continue to increase tremendously in the last few years. Unlike some other starchy staples whose demand tend to fall with rising income, demand for plantain increases with increasing income (Akinyemi *et al.*, 2010). Nigeria is regarded as the largest producer of plantain in West Africa, having an annual production of about 2.4 million metric tons. It is also noted that about 49% of farming households in Nigeria produce plantain as main crop (Nweke, 1996). Presently in Nigeria, plantain production is becoming a significant economic activity for income for both large scale and small holder farmers, and it is one of the primary commodities for investment across the south zone in Nigeria, occupying a strategic position for rapid food production (Fakayode, 2011). With the potential for industrial processing of plantain, which has recently been adopted, and the increased interest in production by small and large scale farms in the country, it is believed that Nigeria will continue to be one of the world's largest producers of plantain (Akinyemi, 2010).In view of the significant contributions of plantain to the economic development and food security of both rural and urban households in Nigeria, it is imperative to understand the network, linkages, flow, volume and value added among actors in the Plantain Value Chain (Adeoye *et al.*, 2013), in order to identify and meet the financial needs of these actors to enable increased commercialization of the crop.

Plantain and Cocoa-Based Farming System

Plantain/Cocoa intercropping is one of the most common plantain cultivation methods in West Africa, and is frequently utilized in non-plantation farming in countries in the region Under the cocoa-based farming system, plantain is planted alongside cocoa (Theobroma cacao), where it serves as a nurse crop during the early stages of development. This is common in the Western states of Nigeria and in the Ikom area of Cross River state, where cocoa is an important cash crop (EPAR, 2013). In most instances, plantain production increases with expansion of the cocoa plantation. This system is expected to expand with a recent cocoa rehabilitation program being embarked on by the government (Bayeri et al., 2004; Akinyemi et al., 2010).

Nigeria plantain production in Nigeria comes from the plants which are components of the multi-storey cropping systems in homestead gardens, backyard farms in urban and peri-urban areas and in intercropping with food and cash crops in the outlying(distant) farms (Okigbo, 1983).However, the most often encountered production systems in south-western Nigeria consist of few plantain stands in food crop farms and those established as natural shade to nurse seedlings in cocoa plantations and for boundary demarcation (Adelaja and Olaniyan, 2000). The cocoa belt located in the southern states where the lowland rainforest agro-ecological characteristics support the good growth and yield of the tree crop and the associated plantains maintained at various densities and levels of management also forms the major center of plantain production where the original focus is cocoa production with plantain only being used to nurse the cocoa trees. These predominant traditional production, systems are characterized by low productivity (Awotide et al, 1999)but the continuous availability of harvestable bunches makes the contribution of plantain to the subsistence economy substantial and a guarantee to all-year-round food security and rural income generation.

Plantain production dominates in the cocoa-based farming system in which it provides natural shades in plantations at the juvenile stage [Opeke, 2003]. Thus, cocoa-based agroforestry is the main practice and this also explains largely the dominance of men in the cultivation of plantain as (Akalumbe, 1998). The cocoa is usually allocated to the best lands in the distant farms not subject to the existing land tenure and bush fallow systems which benefits the plantain. Plantain farms are small in size (<2.4 ha) as related to the fact that most farmers in the cocoa trade are smallholders who own a few trees to about 3 ha land planted to cocoa (Ojo, 2005). The plantain farms are mainly in intercropping mixtures with other crops while sole plantain farms appear to be on the increase probably because of the growing awareness of plantain as a profitable venture and so being promoted for the alleviation of rural poverty.

Plantain and Food Security

Food security has been defined by the FAO Committee on World Food Security as the "economic and physical access to food, of all people, at all times". This implies that food should be available throughout the year to sustain household energy and health, and to meet nutritional requirements. The availability of food must be coupled with the ability of every household to acquire it: it must be affordable, especially by the poor. According to FAO,

increased production and consumption of domestically produced food staples such as roots, tubers and plantains will increase food supplies and broaden the food base at household and national level.

More than 70 million people in Africa depend on banana and plantain for food. These major food staples and cash crops are important in the rural and urban economy, and social and cultural life in sub-Saharan Africa (SSA). According to USDA (2012), plantain is one of the most important horticultural crops and it is among the ten most important food security crops that feed the world and has always been an important staple food for both rural and urban populace (CBN, 2003).The crop has the ability to contribute to food security, employment, diversification of income sources in rural and urban areas, and contribution to the gross national product (GNP) (Nkendah and Akyeampong, 2003).Also, the nutritional value has been recognized primarily as sources of energy (at 31g/100g), low fat (0.4g/100g), supply of vitamin A, ascorbic acid, thiamine, riboflavin and niacin and minerals particularly iron, potassium and calcium while the sodium content (351mg/kg) is low in dietary terms and hence recommended for diabetics (Stover and Simmonds, 1987).

Plantain and National Agricultural Transformation Agenda

Over the years plantain has not been given its proper place of consideration in the national agricultural programs of the country. While national programs for crops like Cassava, Rice, Potatoes and other crops have been instituted in the past to boost their production and ensure food security, plantain has often been neglected in spite of its great potentials in ensuring food security and as source of income among majority of small scale farmers in the southern part of Nigeria who are mostly rural dwellers. The little attention given to plantain on the national level probably stems from the attention paid to its production in the past by farmers themselves despite the tremendous potentials of the crop with respect to household food security of the farmers as well serving as a source of quick income when compared to other staple crops. This is probably because plantain is predominantly produced in cocoa producing areas where the farmers use it mainly as a nurse crop for cocoa and thereafter discard with the crop once the cocoa tree is fully established.

However, with the recent increase in the awareness of the potentials of the crop, farmers are beginning to establish sole plantain plantations and cocoa farmers have started realizing the importance of plantain in ensuring food security and income generation, especially during the lean periods when they are waiting for the harvest period of other crops. This recent development, coupled with the springing up of small scale plantain processing outfits has gradually made plantain a crop to be reckoned with as it is widely consumed across rural and urban areas, age range and status. According to Fakayode, (2011), plantain production is becoming a significant economic activity for income for both large scale and small holder farmers, and it is one of the primary commodities for investment across the south zone in Nigeria, occupying a strategic position for rapid food production. With this development, it is therefore pertinent that a national plantain program be vigorously designed and instituted to

promote the production and processing of plantain so as to maximize its potentials for food production, employment as well as improvement of the welfare of small scale farmers.
Recently, the government hinted on the consideration of using plantain flour as a substitute for cassava flour to combine with wheat flour in bread production. However, a lot still needs to be done to promote plantain and bring it to the fore as a national crop that can be leveraged on to generate foreign exchange and boost the gross domestic product (GDP) of the country as it obtains in Uganda, Cameroun and other plantain exporting countries.

Study Objectives

The main objective of this study is to analyse the various activities of the key actors of the plantain value chain across the southwest region. The specific objectives of the study are to:

- Analyze the socioeconomic characteristics of plantain producers and identify driversof plantain production in the study area;
- Examine key drivers of plantain marketing in the study area and analyse the socioeconomic characteristics of plantain marketers;
- Analyze the socioeconomic characteristics of plantain processors and identify drivers of plantain processing in the study area; and
- Identify the drivers of plantain consumption and analyses the socioeconomic characteristics affecting plantain consumption in the study area.

Section B: Empirical Review

Plantain Production

Plantain belongs to the family *Musaceae* and the *Genus Musa*. They are tree-like perennial herbaceous plants 2 to 9m tall, with an underground rhizome or corn. The principal species are *Musa paradisciaea* (French plantain). *Musa acuminate* (Gross, Michel and Cavendish) and *Musa corniculata* (Horn plantain). In terms of cost per hectare, per ton and per unit of food energy, plantains are the cheapest staple food to produce (IITA 1990). It serves as a useful crop for small scale farmers and co-exists easily with established farming systems (Edeoghon and Okoedo-Okojie, 2011). Plantains, like other bananas, require a hot and humid environment. Ideally, the average air temperature should be about 30°C and rainfall at least 100 mm per month. Rainfall should be well distributed throughout the year and dry seasons should be as short as possible. Irrigation is not suitable or economically worthwhile for plantains grown by the family farmer but may become necessary when larger fields are cultivated in areas with a long dry season. As noted by Akinyemi et al. (2010), forest soils, good for cocoa, palm and rubber production, are also the main soil types in the plantain and banana producing regions of Nigeria.
According to Food and Agricultural Organization Statistics (FAO, 2011), plantain production in West Africa is considerably higher than banana production. In 2011, 12.46 million metric tons (MT) of plantains were produced, representing 32.0% of worldwide production, compared to 2.47 million MT of bananas, representing only 2.3% of worldwide production. Figure 7 shows

the highest-producing individual countries in the region along with production for West Africa as a whole with Nigeria coming after Ghana and Cameroun. Worldwide, seven of the top ten plantain producing countries are in Sub-Saharan Africa, including the West African countries of Ghana, Cameroon, Nigeria, and Côte d'Ivoire (EPAR, 2013).

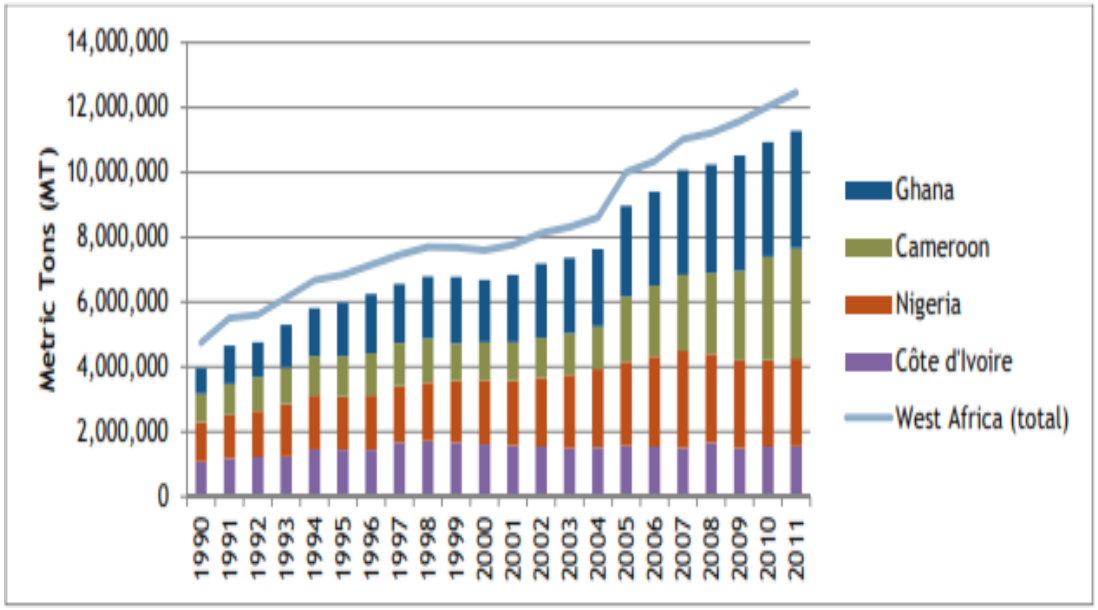

Figure 1: Plantain Production in West Africa 1990-2011
Source: EPAR, 2013

Plantain production in Nigeria

In Nigeria, plantain and banana production is concentrated in the nation's southern regions, which contain fertile forest and laterite soils conducive to plantain and banana growth. The highest production levels are in the states of Akwa-Ibom, Anambra, Benue, Cross River, Akwa-Ibom, Imo, Kwara, Enugu, Plateau, Kogi, Rivers, Edo, Delta, Lagos, Ogun, OndoOsun and Oyo (EkunweandAjayi, 2010; Akinyemi et al., 2010). Four main types of plantain are available with distribution strictly based on their bunch characteristics. These are; the horn type, French type, false type and false horn type. The false horn type is the most widely distributed because of its ability to tolerate poor soil conditions. The producing states include Ondo, Ogun, Osun, Oyo, Cross-river, Imo and Abia State (Robinson, 1996; Ndubizu, 1995). In Nigeria, good quality banana/plantain is produced mainly during the month of October to February every year yet the demand for banana/plantain is all year round (Adewunmi*et al.*, 2009). Main production systems for plantain include the Plantain/Cocoa intercrop, the Bush Plantain system, the Tungya Farming system, the compound production system and the Plantation Production system.

Available trade records and associated indices showed that Nigeria is one of the largest producers of plantain in the world (FAO, 2006). Plantain production in Nigeria has witnessed a steady rise for more than 20 years (Akinyemi et al,2010), and as at 2004, the country produced 2.103 million tons harvested from 389,000 ha (FAO, 2006). This increase, however, has not

been without some depression in plantain production with the country experiencing a great depression in plantain production between1987–1988 and 1990, a situation adduced to be connected with the outbreak of diseases like black leaf streak, caused by Mycosphaerellafijiensis. Effort of all stakeholders in combating the disease through release of improved/resistant cultivars might have been responsible for the steady rise in production as between 1990 and 1994, production increased by 37%. Ten years later, between 1995 and 2004, production increased by 0.47 million tons. The overall production has doubled in the last twenty years (FAO, 2006).

Table 1 shows the production figures for plantain in Nigeria from the year 2000 to 2013, indicating the quantity produced, yield per hectare, as well as the area harvested. As seen in the table, although output increased by 46.10% between 2000 and 2013, yield increased by 25.06% while area harvested increased by 16.90% indicating that increase in output may be associated with increase in land area cultivated and not necessarily due to increase in yield as noted by Akinyemi*et al* (2010).

Table 1: Plantain Production figures for plantain in Nigeria 2001 - 2013

Years	**Quantity Produced (1000 Tons)**	**Yield/Hectare (tons)**	**Area Harvested (1000 Hectares)**
2001	1,999	48.99	408
2002	2,127	49.93	426
2003	2,263	52.02	436
2004	2,421	55.02	440
2005	2,591	57.96	447
2006	2,785	60.94	457
2007	2,991	63.10	474
2008	2,727	59.03	462
2009	2,700	60.00	450
2010	2,676	59.56	449
2011	2,700	60.00	450
2012	2,800	61.40	456
2013	2,780	61.78	450

Source: FAOSTAT, 2015

According to Akinyemi et al. (2010), plantain distribution in Nigeria is complex as farmers whose land lies nearer to major roads harvest the crop at the mature green stage and display it at the roadside or transport the crop to nearby markets, allowing small-scale wholesalers, retailers and consumers to purchase directly. They further stated that in other cases, trade collectors move around farms, collect the produce from farmers and transport it to the cities where they hand them over to wholesalers, who in turn pass the produce on to retailers or vendors for sale to customers. Movement and distribution to major cities and other non-producing regions is usually performed by wholesalers.

Section C: Methodology

Area of study

The study was carried out in southwestern, Nigeria. The region was selected because it is one of the major centers of plantain production in Nigeria (Akinyemi*et al.*, 2010; NPFAS, 2009). Large volume of plantain is traded in urban centers located in the zone (NPFAS, 2009). Also, the prospect for value addition is promising due to the presence of emerging processing industries (Adeoye *et al*, 2013). The zone is made up of six states namely Lagos, Oyo, Ogun, Osun, Ekiti and Ondo States. It falls on latitude 6^{o} to the North and latitude 4^{o} to the south. It is marked by longitude 4^{o} to the east. It is bounded in the North by Kogi and Kwara states, in the east by Edo and Delta states in the south by Atlantic Ocean and in the west by Republic of Benin. The zone is characterized by a tropical climate with distinct dry season between November and March and a wet season between April and October. The southwest Nigeria covers about 114,271 kilometers square land area. The total population is 27,581,992 and predominantly agrarian (NPC, 2013). Apart from plantain, other major food crops reportedly grown in the area include cassava, maize and yam.

Sampling Procedure

Sample size determination

In determining the sample size of plantain producers, the list of plantain farmer given by the farmers' association of each state was used. From the list, Ondo state had 1,345 plantain farmers; Osun state had 1,256 farmers; while Oyo state had 1150 plantain farmers to give a total of 3,751 plantain farmers. However, this study considered the possibility of an over estimated figure by the association as well as the possibility of uncertainties surrounding the current status of the names on the list and thus decided to work with a total of 1,500 to represent the population of active plantain farmers in the 3 states. Thus, using a population size of 1500, a margin error of 5% and a confidence level of 90, a sample size of 306 was determined representing 20% of the population. Using a margin error of 0.04 therefore, a new sample size was calculated using the formula:

$$ME = z\sqrt{\frac{p(1-p)}{n}} \quad \ldots\ldots (18)$$

ME = is the desired margin of error = 0.04

Z = is the z-score, e.g. 1.645 for a 90% confidence interval, 1.96 for a 95% confidence interval, 2.58 for a 99% confidence interval. A confidence level of 90% is however used for this study

P= is our prior judgment of the correct value of p = 20%

n = is the sample size (to be found)

$$0.04 = 1.645\sqrt{\frac{0.2(1-0.2)}{n}} = 270.60 \sim 271$$

However, the study collected data from 300 producers which is a little above the estimated 271 sample size

In determining the sample size of processors, marketers and consumers, there were challenges of getting the list of processors and marketers as in most of the areas visited, they were not as organised as the plantain farmers thus making it difficult to get a statewide list. Thus, the study used the snowball sampling method in selecting 15 marketers, processors and consumers per state to give a total of 45 respondents for marketers, processors and consumers respectively. The total sample size for the study is given in Table 2

Table 2: Sample size of Respondents

Category	Sample size
Producers	300
Marketers	45
Processors	45
Consumers	45
Total	**435**

Sampling Process

A multi-stage sampling procedure was used for this study. The first stage involved the purposive selection of Oyo, Ondo and Osun states. These states were selected because of the predominance of plantain production (Adeoye*et al*, 2013). In the second stage, five Local Government Areas (LGAs) were purposively selected based on the intensity of plantain production. The third stage involved random selection of two villages from which 10 farmers were selected randomly, through the balloting approach, from the list of registered plantain farmers to give100 plantain farmers per state resulting to a total of 300 plantain farmers. For plantain marketers, processors and consumers, 3 respondents were selected per local

government using the snowball sampling technique to give 15 respondents per state for each category, resulting to a total of 45 respondents for each category as seen in table 2.

Method of data collection

Data used for the study were mainly from primary sources. However, secondary data were used in analyzing economic surplus of value chain financing. Primary data on socioeconomic characteristics as well as production quantity, farm size, input quantity were collected using structured questionnaire administered to plantain respondents in the study area while secondary data were sourced from Central Bank of Nigeria (CBN), Federal office of Statistics (FOS), National Bureau of Statistics (NBS), World Council of Credit Union (WOCCU), and academic journals. Data collected includes: quantity of plantain produced, quantity of input and output, market prices for inputs and outputs, sources of funding, socio-economic characteristics of the respondents among others.

Analytical techniques

Based on the study objectives, data were analyzed with the use of descriptive statistics, Heckman selection model, multiple ordinary least square (OLS) regression, Stochastic frontier production function, Harrod-Domar growth equation, and the Commercialization index (HCI). Descriptive statistics were used to describe the socioeconomic characteristics of plantain farmers as well as that of marketers, processors and consumers in the study area. Descriptive statistics were also used mostly in describing others factors relating to marketers, processors and consumers of plantain in the area. However, factors affecting access to finance and commercialization of plantain were analyzed using Heckman selection model and multiple ordinary least square (OLS) regression, while the financing gap experienced by plantain farmers was estimated using the Stochastic frontier production function and Harrod-Domar growth equation. The extent of plantain commercialization amongst producing households was estimated using the household commercialization index (HCI) while the potential economic benefits of value chain financing on plantain production was estimated using the economic surplus model through DREAM software.

Section D: Results and Discussion

Socio-economic Characteristics of Plantain Producers in Southwest Nigeria.

The socioeconomic characteristics of plantain farmers in the study area are shown in table 3 and the corresponding figures below shows the trends of these characteristics across the states covered by this study.

Table3: Socioeconomic Characteristics of Plantain Producers

Variable	Frequency	Percentage
Age		
25-35	50	16.67
36-45	85	28.33
46-55	69	23.00
56-65	67	22.33
>65	29	9.67
Mean age- 49; Std. Dev.-13 ; Min – 25 yrs; Max – 81 yrs		
Gender		
Male	276	92
Female	24	8
Household size		
1-4	49	16.33
5-8	158	52.67
9-12	68	22.67
>12	25	8.33
Mean size – 7 ; Std. Dev.- 3; Min – 1; Max – 18		
Marital status		
Single	12	4.00
Monogamously married	187	62.33
Polygamously married	92	30.67
Widowed	6	2.00
Separated/Divorced	3	1.00
Education		
No formal	34	11.33
Primary	83	27.66
Secondary	133	44.32
Tertiary	50	16.66
Farm Size		
0.002-0.099	30	10.00
0.1-0.49	91	30.33
0.5-0.99	121	40.33
>1.0	58	19.33
Mean size - 0.67; Std. Dev. 0-.47; Min – 0.02ha; Max-2.52ha		

Age

The Table 3 reveals that the mean age of the farmers was 49 ± 13 years with the youngest being 25 years and 81 years being the oldest. Almost half (45%) of the farmers were below the age of 45 years and still within their active working years. Table 4 further gives the breakdown of the age of the farmers, indicating that a greater majority (42%) of the farmers are between the age of 41-59 years while 25% are above 59 years, indicating that a quarter of the farmers are above their active years. However, 33% of the farmers are below the age of 40 years, representing the presence of young farmers that are into plantain production. In general, 75% of the farmers are still within their active years.

Table 4: Classification of Plantain Producers by Age group

Age (years)	Freq.	Percent
<25	2	0.67
26-40	97	32.33
41-59	126	42.00
>59	75	25.00
Total	300	100.00

The classification of the age of plantain farmers across states is shown in figure 3. The figure shows that farmers above the age of 40 years are more in Osun and Ondo states with more years of farming experience while those between the age of 26-40 years are slightly more in Osun than in Oyo and Ondo states. However, plantain farmers in Ondo state are all above 25 years while Oyo and Osun states have few farmers below 25 years.

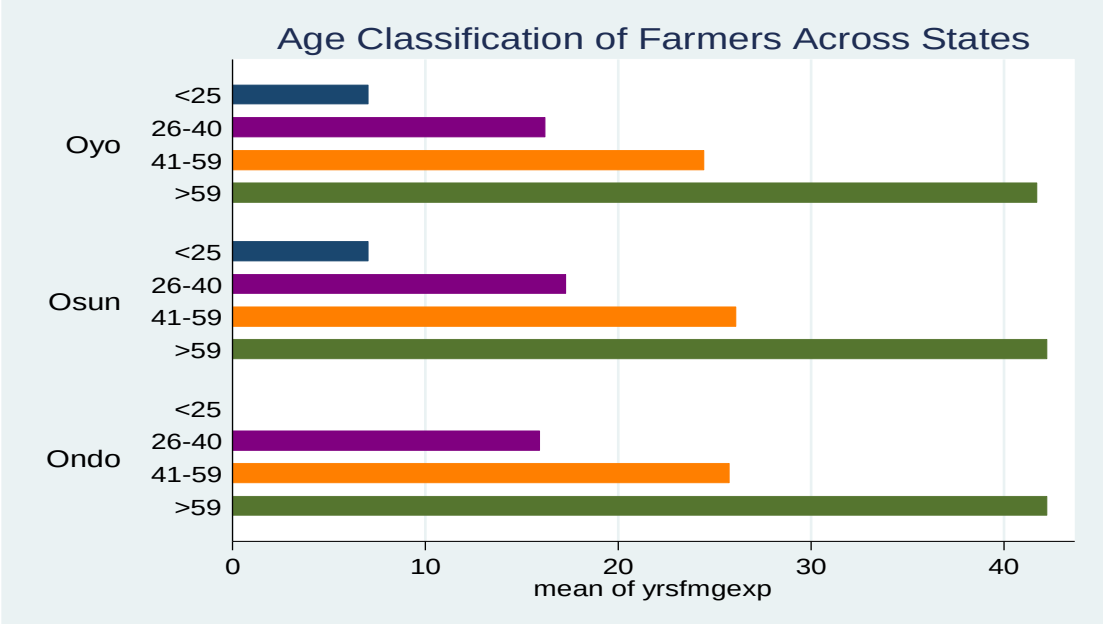

Figure 2: Age of Plantain Producers by State

Gender

Table 3 shows that males dominated plantain production in the study area (92%), suggesting that women in the study area probably considered plantain production too strenuous, hence they engaged in other activities such as processing and marketing along its value chain, a position also noted by Okoruwa et al (2014). Furthermore, Figure 3 shows that Oyo state has more female plantain farmers than Osun and Ondo states with Ondo state having the least

female farmers. Osun state has the highest number of male plantain farmers, followed by Ondo state with Oyo state having the least.

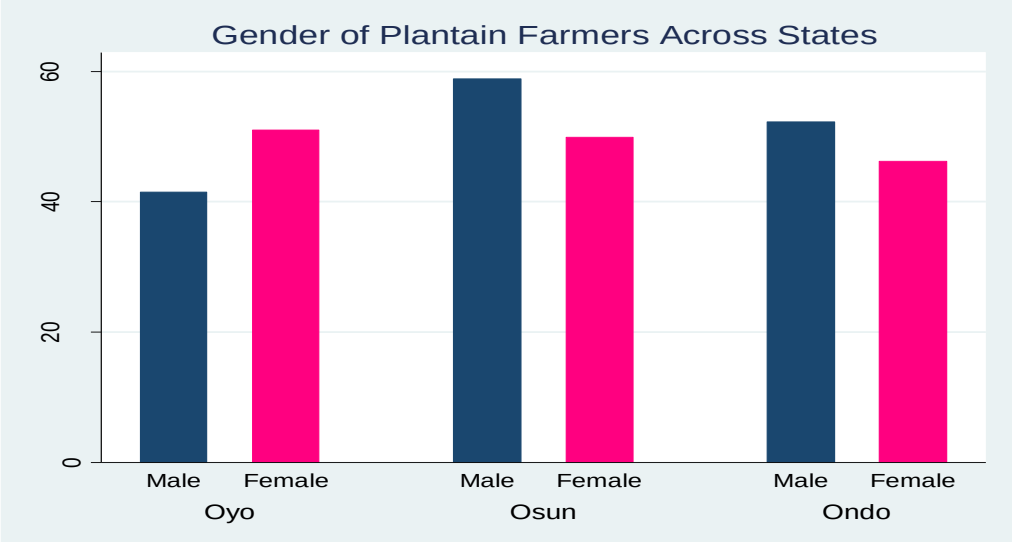

Figure 3: Gender of Plantain Producers by States

Marital Status

The marital status of plantain farmers, as shown in Table 3, reveals that about only 4% of the farmers were single while close to 62% were married to one wife. Thirty-one percent of them had more than one wife while about 3% were widowed, divorced or separated from their spouses.

Household size

Table 3 shows that the mean household size was 7 with 35% of the household members being below the age of 16years, 57% between 16 and 59 years while only 7% were above 59 years of age. Majority of the household members fell within working class group with 43% of the household members being dependents as shown in Figure 3. Household size across the 3 states of Oyo, Osun and Ondo is shown in Figure 4. Ondo state has more households having over 12 members, than Osun and Oyo states respectively. However, Osun state has the highest number of households with members ranging between 1-7 and 8-12 while Ondo state has the least number of households with members ranging between 1 and 7.

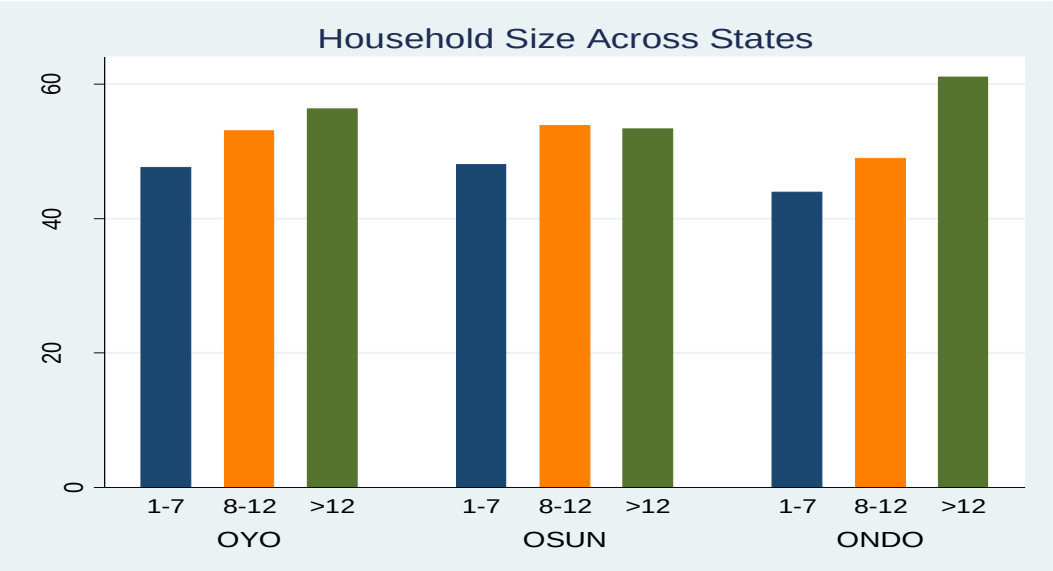

Figure 4: Household size by States

Education

Eighty-nine percent of the farmers had formal education out which 28%, 44% and 16% had primary, secondary and tertiary education respectively. Tijanni (2008) noted that educated farmers can easily be taught new ideas and innovations. The level of education of plantain farmers across the states is shown in Figure 5. The figure shows that Oyo state has the highest number of farmers with no formal education, closely followed by Osun state. However, farmers with at least primary education are more in Osun state while Ondo state has the least. Farmers with at least secondary education are more in Osun state compared to Oyo and Ondo states respectively, while Oyo state has the largest number of farmers with tertiary education. Generally, farmers with no formal education are the largest in all the three states and were mostly the older ones.

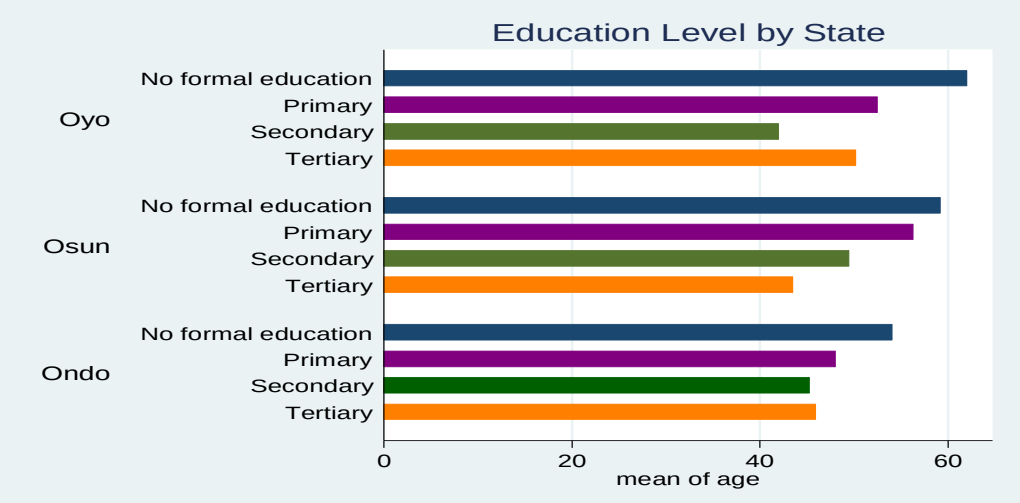

Figure 5: Education status of Plantain farmers

Farm Size

The average size of farm occupied by plantain and banana was 0.67ha ± 0.47 which is slightly below 0.69ha recorded by Amujoyegbe (2012) in forest agro-ecological zone and lower than 0.85ha recorded by Okoruwa et al. (2014). The smallest farm size was 0.02 ha while the largest was 2.52ha. Figure 6 further shows the average farm sizes across the states. The figure shows that Oyo state has higher average farm size of plantain compared to Osun and Ondo states while Ondo state has the lowest average plantain farm size.

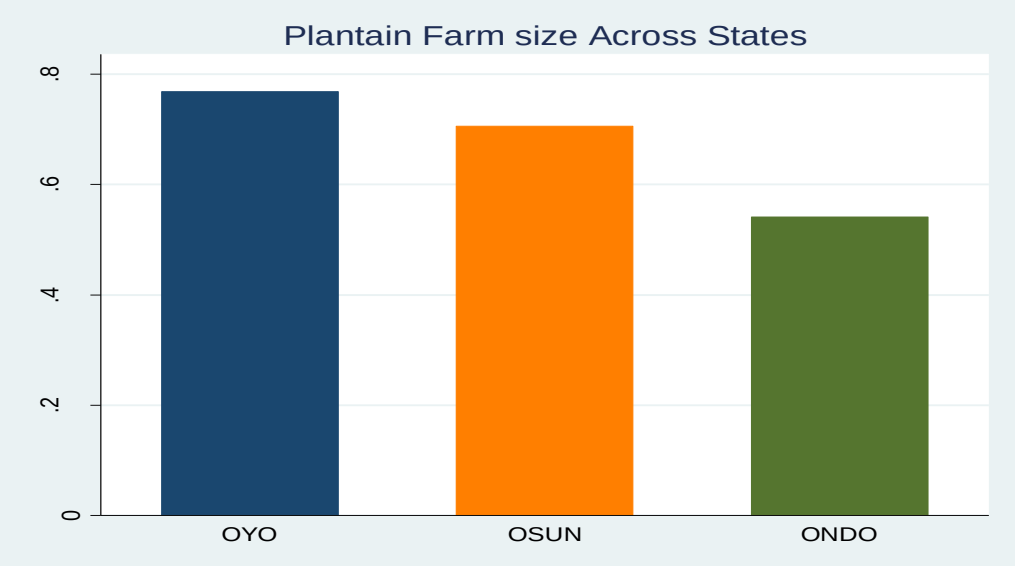

Figure 6: Farm size of Plantain Farmers across States

Membership of Association

The presence and membership of associations by plantain farmers is shown in Table 5. The table shows that only about 36% have the presence of farmers associations in their area and out of this, about 82% are members, showing a large participation. Also, from the table, almost 65% of the farmers have the presence of cooperative societies in their area. However, out of this, only about 47% are members of such cooperative societies. Furthermore, Figure 8 shows the participation of farmers in cooperative and farmers associations across the three states of study. The figure reveals that more farmers belong to farmers association in Osun state (2), followed by Ondo state (3), with Oyo state (1) being the least. However, more farmers belong to cooperative societies in Oyo state (1) compared to Osun (2) and Ondo states (3), with Osun state having the least number of farmers that are members of cooperative societies.

Table 5: Presence and Membership of Associations

Associations	Response	Frequency	Percentage
Presence of Farmers Association	Yes	108	35.64
	No	192	64.36
Total		**300**	**100**
Membership of farmers Association	Yes	89	82.41
	No	19	17.59
Total		**108**	**100**
Presence of Cooperative Society	Yes	194	64.67
	No	106	35.33
Total		**300**	**100**
Membership of cooperative society	Yes	92	47.42
	No	102	52.58
Total		**194**	**100**

Figure 7: Membership of Cooperative and Farmers Associations by state

Financing Plantain Production

Plantain Production and Credit

The need for credit depicts the necessity of having external financing to carry out farming activities such as land clearing, purchasing of plantain suckers and payment of laborers wages. This also shows clearly that the personal funds or savings of the respondents are inadequate to execute their production activities**.** Figure 9 shows that 90% of the respondents need financing in the form of credit while only about 10% showed that they do not need financing in the form of credit. Thus, majority of the farmers in the study area needed finance to carry out land clearing, buy plantain suckers, herbicides and to pay laborers to boost production and increase their outputs so that they can improve their income. However, few of the respondents were content with using their personal funds and these where mostly those who did not want to be indebted to anyone or were simply risk averse in terms of borrowing for fear of not being able to pay back.

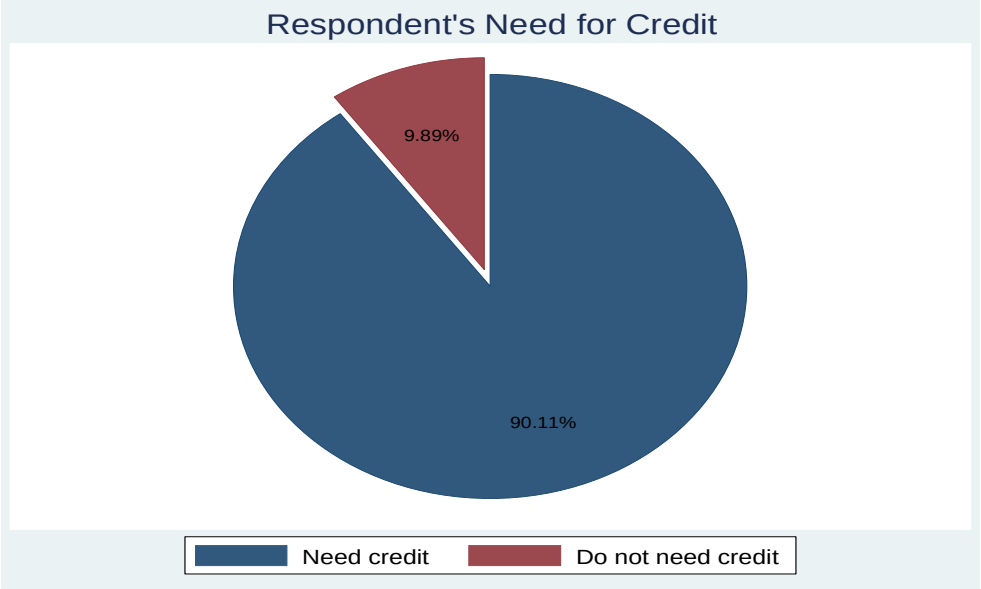

Figure 8: Plantain Producer's Need for Credit

Analysis of sources of credit

Figure 10 further shows the various sources of credit to the plantain farmers. The figure reveals that of those who got credit for their production activities, close to half (46%) of them received credit facilities from cooperative organization, followed by those who borrowed funds from farmers group and micro finance banks or bank of agriculture, representing 16.67% respectively. None of the farmers got credit from commercial deposit money banks as many claimed they could not meet up with their requirements. Six percent borrowed money from family members and friends while 9% got some sort of funding from the government. These set of farmers are those who through special programs created by the government got some sorts of revolving financial assistance for crop production. Six percent also reported getting credit facilities from off-takers who buy their produce. The implication is that about 73% of

those who had access to credit in the study area sourced their credit informally while only 27% sourced credit formally.

Access to credit facility

Figure 10 show that 66% of the farmers had no access to credit facilities for their production while only 34% had access to various forms of credit for production. Lack of credits has been noted as one of the major constraints militating against agricultural productivity among farmers, particularly smallholder farmers (Agwu*et al*., 2012). Credit is expected to enhance farmer skills and knowledge, link farmers with modern technology through the purchase of inputs (planting materials, fertilizer and crop protection), pay wages, invest in machinery, or to smooth consumption as well as markets, ease liquidity and input supply constraints, and thus, leading to increase agricultural productivity, induce market orientation and participation and thus greater commercialization (Lerman, 2004; Martey et al, 2012).

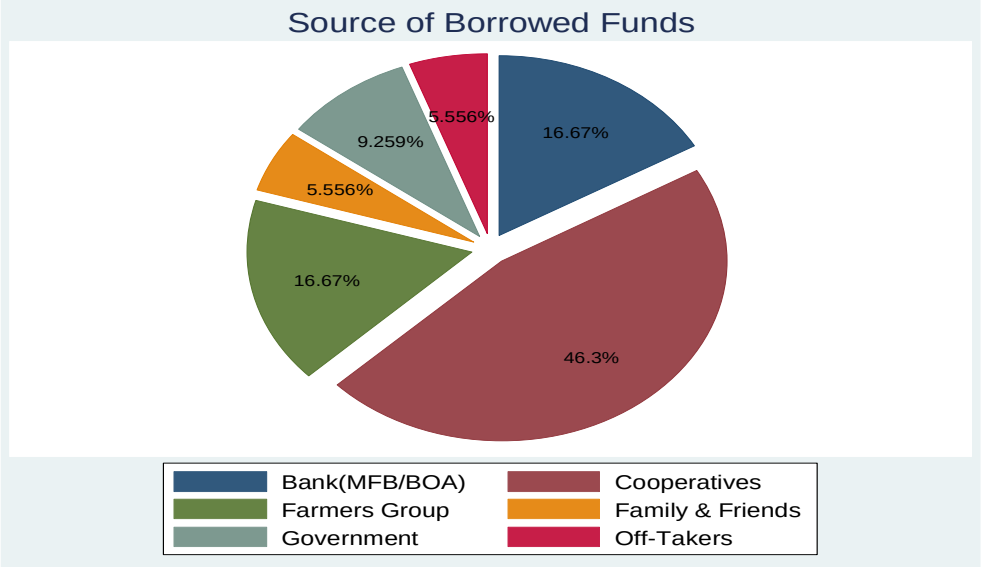

Figure 9: Sources of credit for Plantain Farmers

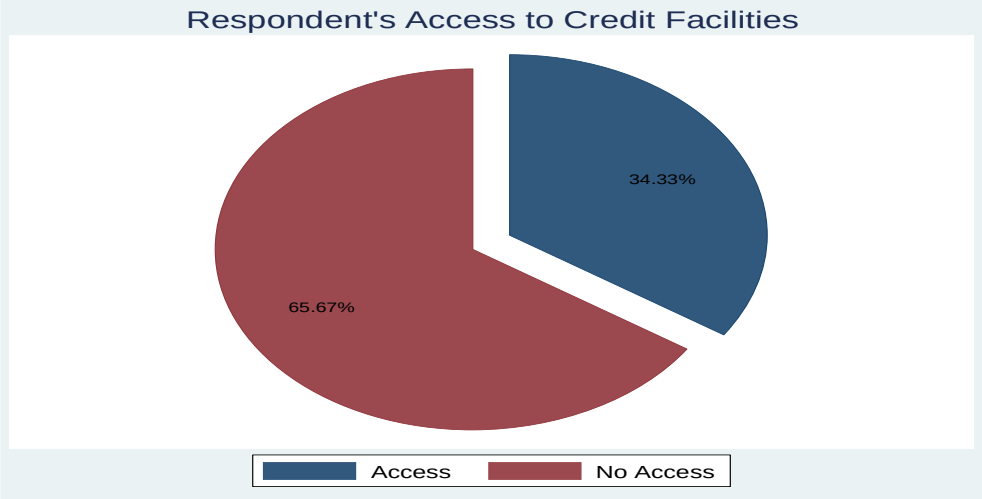

Figure 10: Access to credit by Plantain Farmers

A further analysis of credit need, credit access relative to the farm sizes of farmers is shown in Figure 11. The figure reveals that Oyo state though leads the other states in terms of farm size, has the least number of farmers with credit need as well as access to credit. Conversely Ondo state which is the least in terms of farm sizes has farmers with the highest need for credit and also leads Oyo and Osun states in terms of having access to credit facilities.

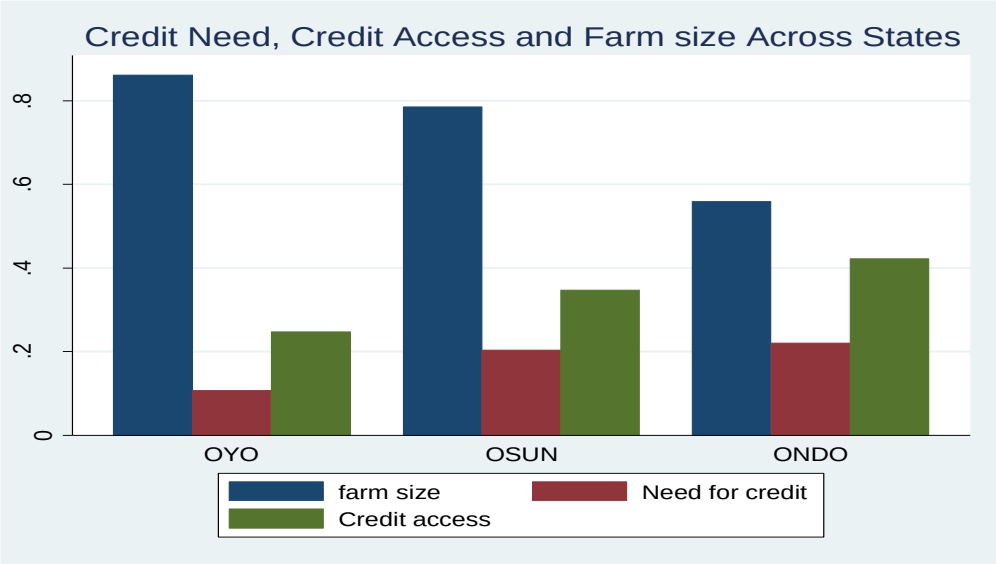

Figure 11: Credit Need and Access Relative to Farm sizes across states

Interest Charged and Farmers Perception

The perception of the farmers as regards the interest charged on the credit they received is shown in Figure 12. The figure shows that 80% of the farmers believe the interest they are charged on the credit granted is favorable. This is probably because majority obtained their credit through cooperative societies as shown in Figure 9 as against receiving credit from commercial banks. Only few (20%) of the farmers believe that the interest charged is not favorable.

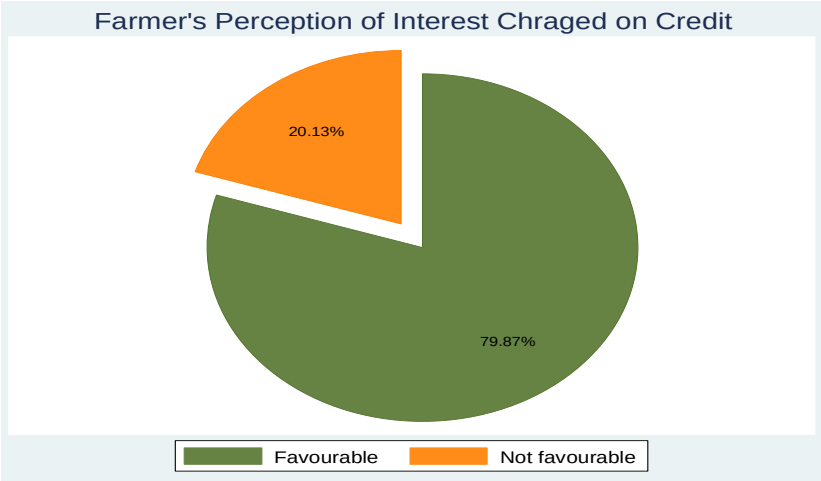

Figure 12: Plantain Producer's Perception on Credit Interest

Financing Gap Estimation

To estimate the financing gap experienced by the farmers, a target production increase for each plantain producer was set through the technical efficiency of the farmer first determined using the stochastic frontier function. Thereafter, the current efficiency of the farmer, the corresponding quantity of plantain in Kg produced at the current efficiency and the target efficiency or expected increase in efficiency due to credit availability were used to estimate the quantity of plantain in Kg expected to be produced at the target efficiency which is the frontier efficiency in this study. The difference in plantain quantity at the current efficiency and that at the target efficiency is then taken as the desired increase in production due to finance availability. Using an adapted version of Harrod-Domar (HD) equation, the financial amount required to produce at the target efficiency was estimated. Thereafter, the amount currently being used by the farmers is subtracted from the estimated finance at the target efficiency and the difference is taken as the financing gap of each farmer. This represents the external financing (in form of credit) that would be required by the farmer. In doing this, it is assumed that: 1) majority of the plantain producers were not producing at the frontier level and that the immediate concern was to provide finance in form of credit that will impact positively on their technical efficiencies to cause increase in production at a higher efficiency level (frontier level)compared to the present situation. 2) Credit amount required by each plantain farmer to attain the technical efficiency at the frontier level is proportional to the production frontier (technical efficiency) by a constant known as the Incremental Capital Output Ratio (ICOR). 3) Credit (finance) requirement of each farmer is given by the gap between the credit amount required to produce at the frontier level and the finance used to produce at their present level of efficiency.

Table 6 below shows the estimated financing gap of plantain farmers in the study area. The table reveals that 42% of the respondents have financing gap of not more than ₦60,000, implying with an amount as low as ₦60,000, the efficiency level of close to half of the farmers can be boosted to produce at the frontier level of efficiency so as to increase output and further improve the commercialization of plantain. Also, 32% of the farmers experienced financing gap of not more than ₦120,000 while only about 6% experienced financing gap of not less than ₦300,000. This implies that only very few (6%) of the farmers would require an amount as large as ₦300,000 to produce at the frontier level. In addition, the table showed that to produce at the frontier level 75% would require an amount not greater than ₦120,000 while about 89% of the respondents would require an amount not greater than ₦180,000. This suggests that majority (90%) of the respondents would require not less than or equal to ₦180,000 to fill the financing gap being presently experienced and be able to produce at the frontier level with other necessary conditions for production being in place. Table 6 further showed that the mean credit amount per season that farmers had access to was, ₦13,215 while the mean financing in the form of credit required to produce at the frontier level was ₦103,500, showing a financing shortfall of about 87%.

Table 6: Financing Gap Analysis

Financing Gap (₦)	Frequency	Percent
1.200-60,000	127	42.33
60.300-120,000	98	32.67
120,300-180,000	41	13.67
180,300-240,000	13	4.33
180,300-300,000	3	1.00
>300,000	18	6.00
Total	**300**	**100.00**
Variable	**Mean**	**Std. Dev.**
Credit Amount Received (₦)	13,215	83,700
Credit Amount Required (Financing gap) (₦)	103,500	131,700

Factors affecting access to finance by plantain farmers

The results of the selection (probit) and outcome equations of the Heckman model for factors influencing plantain farmers' access to credit in Southwest Nigeria is shown in Table 7. The table showed that the need of farmers for credit, the value of their asset and membership of cooperative society were positively significant. A unit increase in the need for credit, asset value and membership of cooperative society increased access to credit by 118.6%, 2.97e-5% and 55.6% respectively at $p<0.01$. This indicates that farmers who needed credit, and have valuable assets were more likely to access credit facilities. Also, farmers who belonged to cooperative societies were more likely to access credit compared to those who do not belong to cooperative societies or have valuable assets. Conversely, credit procedure and interest charged on credit were negatively significant with a unit increase in each of these constraining access to credit by 57.4% and 5.7% respectively at $p<0.1$. This suggests that the longer the time it took to process credit requests by respondents and the higher the interest charged on credit granted the farmers, the lesser access they had to credit facilities. It further suggests that credit procedure is the most constraining factor with regards to credit access in the study area. Furthermore, Table 7 revealed that the need for credit and land ownership were positively significant with respect to credit amount obtained by farmers. A unit increase in farmers need for credit and ownership of land increased credit amount obtained by 132.8% at $p<0.01$ and 74.1% at $p<0.5$. This indicates farmers in need of credit and who have ownership rights of their farm land are more likely to receive higher credit amount than those who do not as the farm land can be used as a form of collateral for credit collected. It further suggests that ownership of farm land is a major driver of access to credit in the study area. However, years

of farming experience was negatively significant and a unit increase constrained credit amount by 3.1% at p<0.5. This suggest that the more experienced a farmer is, the less amount of credit he would be willing to collect for fear of crop failure and not being able to pay back. Also, long farming experience could also suggest that the farmers have become more knowledgeable in ways to ensure better output and thus more income which may account for the less need for credit.

Table 7: Determinants of Plantain Farmer's Access to Credit

	Probit Analysis			
Variable	**Coefficients**	**Standard Error**	**z**	**Marginal Effect**
Credit Access				
Need for credit	1.186***	0.370	3.20	1.186
Asset value	0.000***	0.000	3.49	2.79e-07
Credit procedure	-0.574*	-0.324	-1.77	-0.574
Credit process duration	-0.301	-0.195	-1.54	-0.301
Credit source distance	-0.194	0.174	-1.11	-0.194
Membership of cooperative society	0.556***	0.183	3.04	0.556
Cost of borrowing (interest on credit)	-0.057*	-0.033	-1.73	-0.057
Extension services	-0.156	0.223	-0.70	-0.156
Household size	-0.026	0.034	-0.75	-0.026
Constant	-0.399	0.486	-0.82	
	OLS			
Credit size				
Need for credit	1.328***	0.307	4.32	
Risk-taking ability	0.308	0.378	0.82	
Income from Plantain	5.55e-07	4.89e-07	0.81	
Years of Farming	-0.031**	0.015	-2.08	
Interest on credit	-0.052	0.055	-0.95	

Farm output	-7.37e-05	-4.54e-05	-1.63
Annual farm investment	-1.66e-06	4.03e-06	-0.41
Land ownership	0.741**	0.307	2.41
Mills Lambda	0.371	0.211	1.76
rho	0.958		
sigma	0.387		

Off-farm Income

The number of farmers who have other sources of income apart from farming is shown in Figure 13. The figure reveals that majority (63%) of the farmers do not have off-farm income and thus depend solely on income accruing from their farm. This gives an indication of their vulnerability to crop failure and other shocks. However, 36% of the farmers have other sources of income on which they can rely on incase of crop failures and also to augment income generated from their farms.

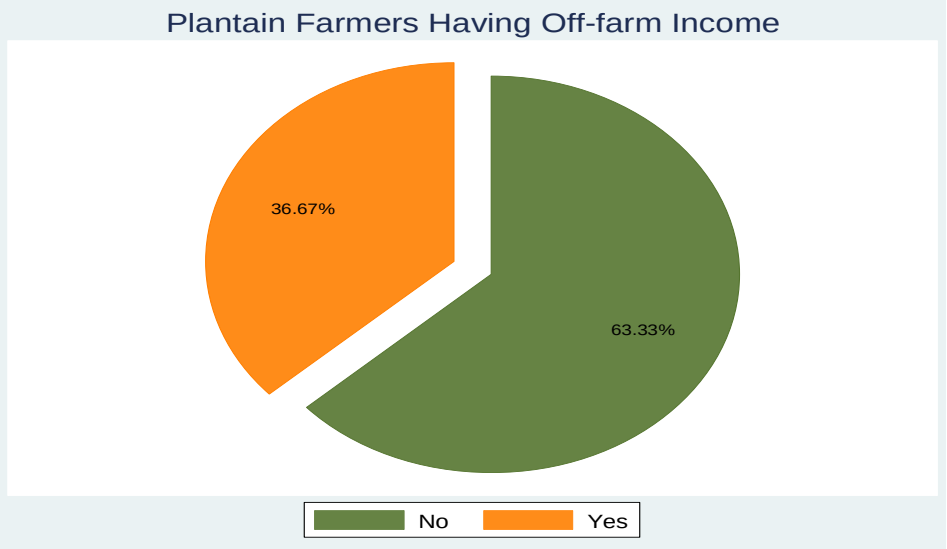

Figure 13: Off-farm Income

Figure 14 further shows off-farm income among plantain farmers across the three states. The figure shows that there are more farmers with off-farm income in Oyo state that in Osun and Ondo states respectively. Ondo state however has the least number of farmers with off-farm income.

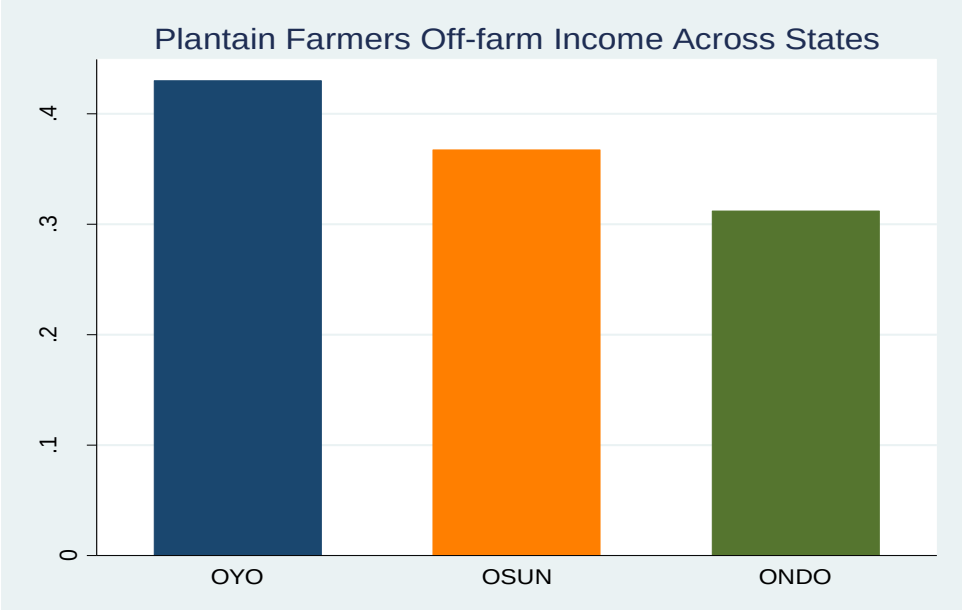

Figure 14: Off-farm Income by State

Plantain Production Parameters

The mean number of plantain bunches produced, income generated, technical efficiency and the average price of plantain is shown in Table 8. The table also gives the standard deviation as well as the minimum and maximum values.

Table 8: Selected Production Parameters

Variable	Mean	Std. Dev.	Min	Max
Bunch quantity	617.24	438.66	20	1750
Average plantain income	304,369.8	287,404.5	20000	1200000
Average Technical Efficiency	0.53	0.13	0.14	0.79
Average Price	700.60	275.94	225	1700

Quantity of Bunches Produced

The average quantity of bunches produced annually by farmers is given as 617 bunches with a standard deviation of 438 bunches. The minimum quantity produced by the farmers was 20 bunches while the maximum was 1750 bunches. A further analysis of the quantity of bunches produced is shown in Table 9. From the table, 21% of the farmers produced not more than 200 bunches while 18% produced more than 1000 bunches annually. The table further shows that more than half (56%) of the farmers produced 600 bunches and below, annually.

Table 9: Quantity of Bunches Produced

Annual Bunch Quantity	Frequency	Percent
1-200	62	20.67
201-400	56	18.67
401-600	50	16.67
601-800	44	14.67
801-1000	33	11.00
>1000	55	18.33
Total	**300**	**100.00**

Income from Plantain Production

From Table 8, the mean annual income from plantain production by the farmers was ₦304,369.8 with a deviation of ₦287,404.5. The minimum income was ₦20,000 while the maximum income was ₦1,200,000. Table 10 further shows that majority (54%) of the farmers earn not more than ₦200,000 from plantain production annually. Furthermore, the table shows that only 9% of the farmers earn above ₦800,000 annually from plantain. However, close to three-quarter (74%) of the farmers do not earn more than ₦400,000 annually.

Table 10: Annual Plantain Income

Income from Plantain	Frequency	Percent
20000-200000	162	54.00
200001-400000	59	19.67
400001-600000	35	11.67
600001-800000	17	5.67
>800000	27	9.00
Total	**300**	**100.00**

Plantain Production Efficiency

As shown in Table 8, the average technical efficiency of plantain producers in the study area is 0.53 with a standard deviation of 0.13. The minimum technical efficiency among the farmers was 0.14 while the maximum was 0.79. Table 11 further shows that 35% of the farmers operated with a technical efficiency of 0.5 and below. However, majority (39%) of the farmers had a technical efficiency of between 0.51 and 0.6 technical efficiency. Only 6% had a technical efficiency of 0.71 and above.

Table 11: Technical Efficiency of Plantain Producers

Technical Efficiency	Frequency	Percent
0.1-0.2	5	1.67
0.21-0.3	12	4.00
0.31-0.4	36	12.00
0.41-0.5	53	17.67
0.51-0.6	117	39.00
0.61-0.7	58	19.33
>0.71	19	6.33
Total	**300**	**100.00**

Point of Sale of Plantain by Producers

The various points from which plantain producers sell their plantain is shown in Figure 15. The figure shows that farmers sell their plantain more at the major markets in their locality followed by sales at the farm gate where they sell their plantain to gatherers who then collate for onward transfer to the markets.

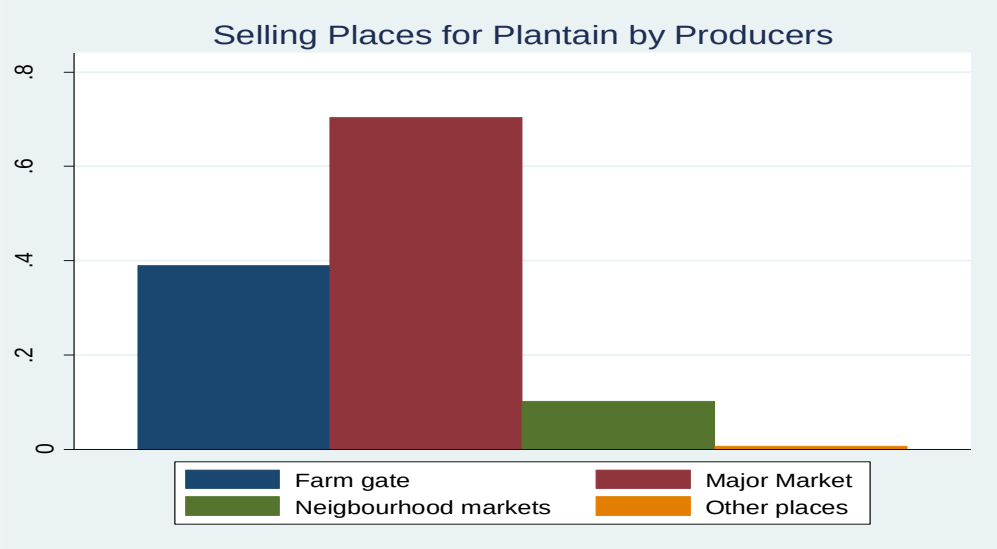

Figure 15: Plantain Point of Sales

Figure 16 further shows the various point of sale for plantain by the producers across the three states of study. The figure reveals that farmers in Oyo state sell their plantain more in the major markets, followed by those in Osun state with Ondo state being the least. However, farmers in Ondo state sell their plantain more at the farm gate followed by those in Osun state while Oyo has the least number of farmers that sell their plantain at the farm gate.

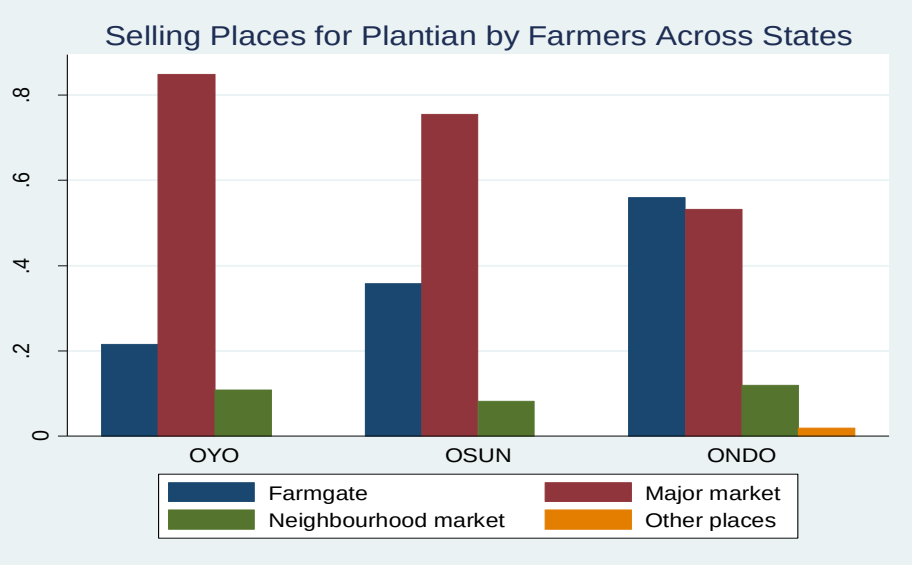

Figure 16: Point of Sale of Plantain across States

Buyers of Plantain from Producers

The various buyers of plantain from the farmers is shown in Figure 17. The figure shows that 45% of the farmers sell more to wholesalers who buy plantain in bulk from their farms than retailers and individual buyers. Also, 40% sell to itinerant gatherers who gather plantain from farm to farm and then sell in retail to buyers. Fifteen percent of the farmers sell to individual buyers who buy directly from farmers displaying their plantain on major roads.

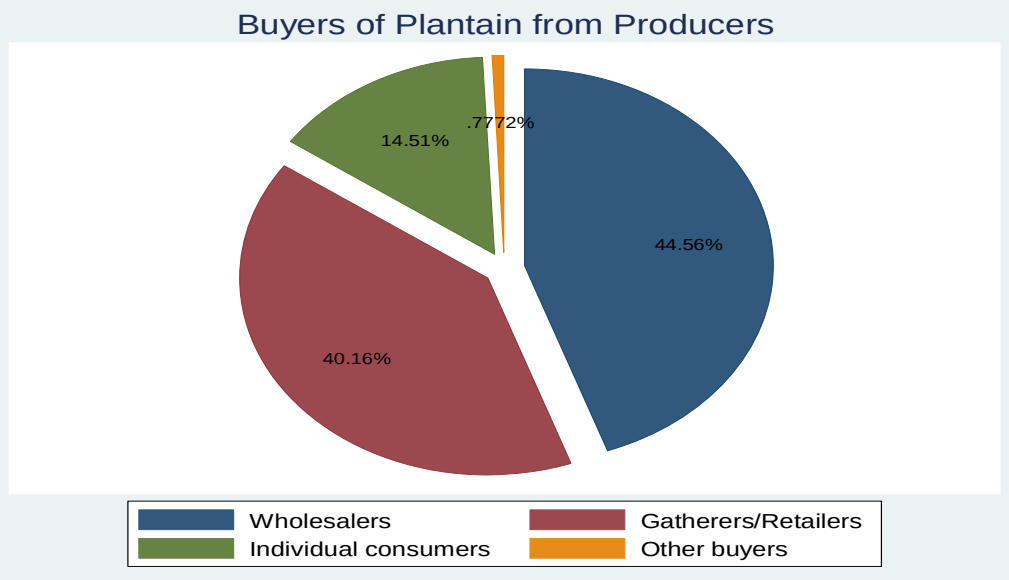

Figure 17: Various Plantain Buyers

Figure 18 further shows the various plantain buyers across the states. The figure shows that farmers in Osun state sell more of their plantain to wholesalers than Oyo and Ondo states. However, farmers in Ondo state sell more to itinerant gatherers or retailers than other buyers

and the state also leads other states in selling to retailers. However, farmers in Oyo state sell more to individual buyers compared to Ondo and Osun states respectively.

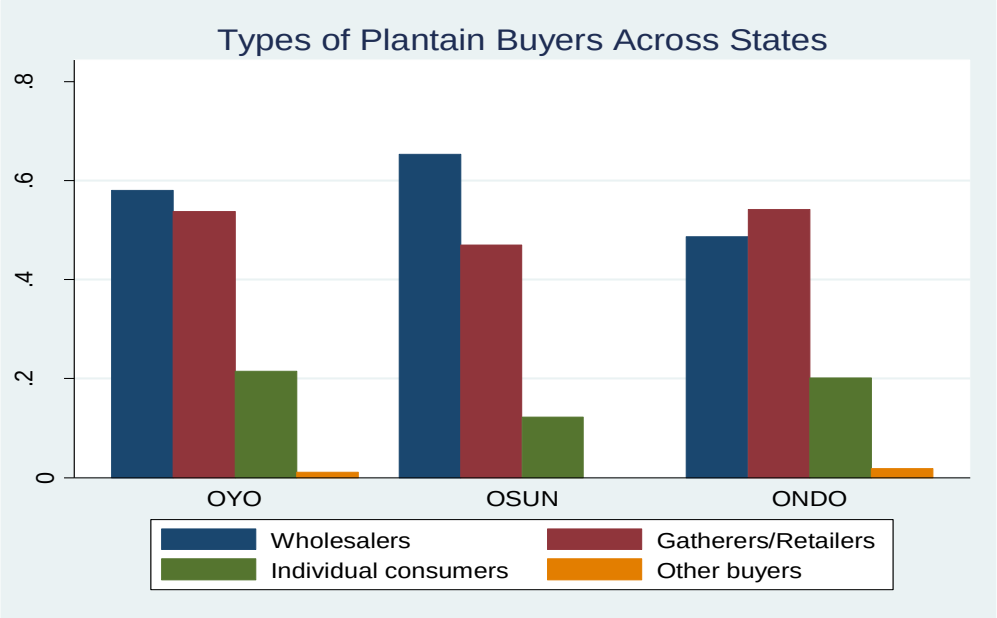

Figure 18: Buyers of Plantain by State

Extent of commercialization of plantain production

The household commercialization index (HCI) of plantain farmers in the study area is as shown in Table 12. The table showed that, only about 1% of the respondents were involved in low commercialization of plantain production with an average production of 1,920kg (192 bunches) annually. This suggests that they produced mainly for household consumption than for the market probably due to the low quantity of plantain they produce. The table further revealed that 5% of the respondents were involved in moderate commercialization of plantain production with an average annual production of 5054kg (505 bunches), indicating that they produce moderately for the market as well as for consumption. However, the greater majority of the respondents (94%) were into high commercialization of plantain with an average annual production of 7503Kg (750 bunches), indicating that out of what was produced by the farmers, a greater proportion was sold out than consumed by the producing household. This further suggests that the respondents cultivated plantain majorly for the income it generates for the household. This agrees with findings that plantain as a crop contributes to diversification of income sources in rural and urban areas (Nkendah and Akyeampong, 2003; Faturoti*et al*., 2007). Also, plantain is an essential component of food safety, where it is an important source of income for millions of producers and retailers (Nkendah and Akyeampong, 2003).

Table 12: Household Commercialization Index of Plantain Production

HCI	Frequency	Percentage	Commercialization Classification	Average Plantain produced (Kg)	Number of Bunches
0 - 30	4	1.33	Low	1920	192
31 - 50	14	4.67	Moderate	5054	505
51 - 100	282	94.00	High	7503	750

Transportation of Plantain by Producers

The various means through which plantain producers transport their plantain from the farm to the point of sales is shown in Figure 19.

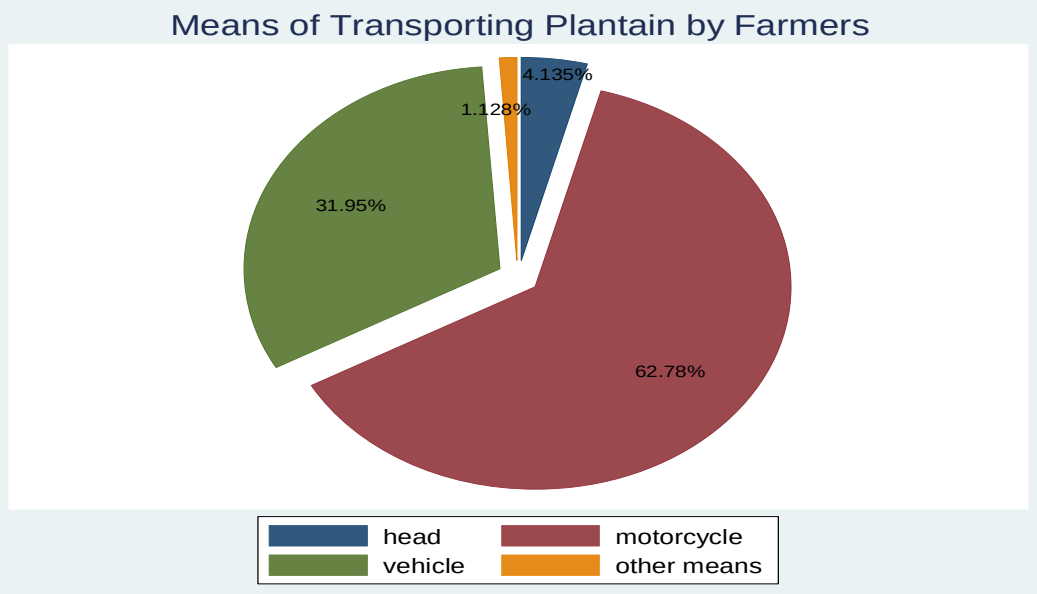

Figure 19: Means of Transporting Plantain by Farmers

The Figure 19 reveals that majority (63%) of the farmers used motorcycle in transporting plantain from their farms to the major points since most of the farms are located deep into the forest and the roads are not motorable for vehicles. This is closely followed by those who use motor vehicles (40%) like trucks and buses to transport their plantain depending on the how motorable the road to their farm is. Figure 20 further shows the means through which farmers transport their plantain across the three states. The figure shows that motorcycle is used more in Ondo state for transporting plantain, closely followed by Osun state. However, Oyo state

farmers used motor vehicles in transporting their plantain more than farmers in Osun and Ondo states respectively. Ondo state also leads other states in the use of other transportation means such as wheelbarrows in transporting plantain from their farms.

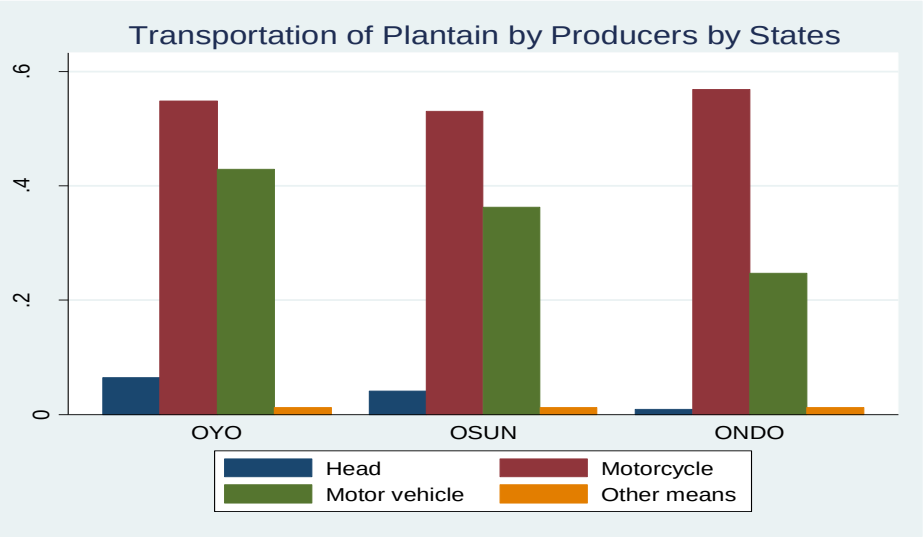

Figure 20: Means of Transporting Plantain by farmers across States

Price Determination by Farmers

Factors considered by plantain producers in determining the price of their plantain is shown in Figure 21. The figure shows that the major factor that farmers consider in determining price of plantain is the period of the year, whether it is off-season or on-season and this represents 34%. Closely following this is buyer's demand for plantain, representing 27% and the location, whether it is a village or city area, represents 16%. Production cost consideration represents 14%.

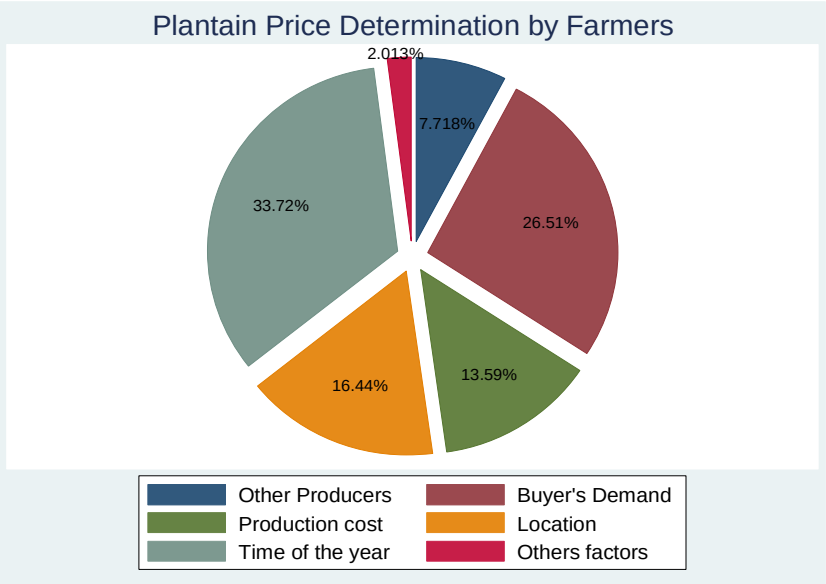

Figure 21: Plantain Price Determination

Actions on Plantain Produced by Farmers

Actions taken by farmers on the plantain produced by them is shown by Figure 22. The figure shows that 81% of plantains, produced by the farmers, are sold while only 10% are consumed at the household level. Those given as gift and lost to wastage represents 5% and 4% respectively. This further indicates that plantain is produced majorly in the study area for the income it generates.

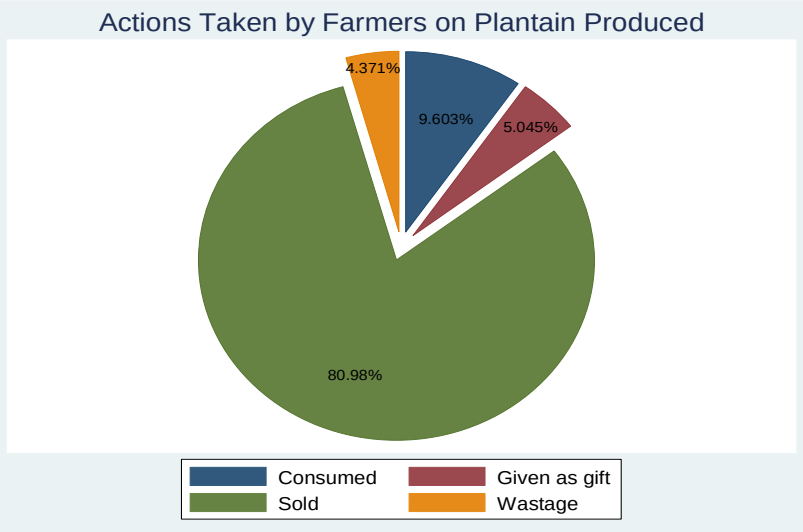

Figure 22: Farmer's Actions Plantain Produced

Actions Taken on Unsold Plantain

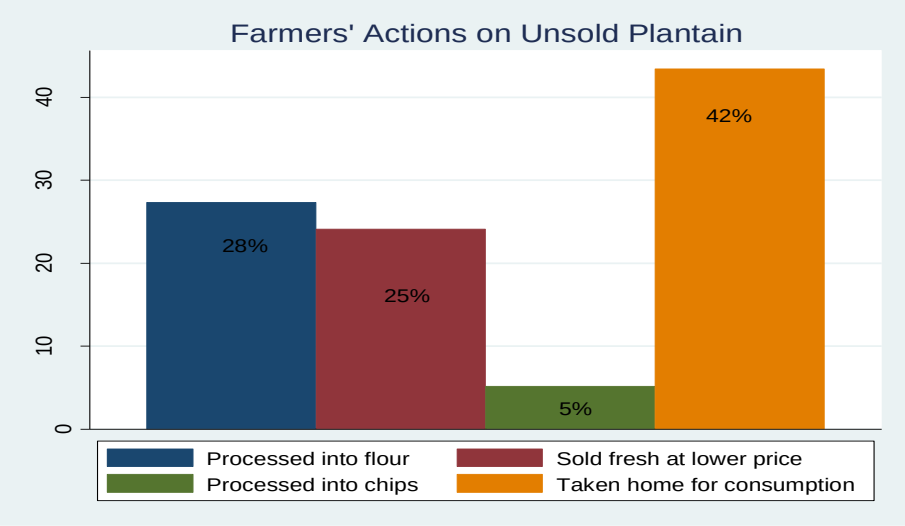

Figure 23: Plantain Producer's Actions on Unsold Harvested Plantain

igure 23 shows the various actions taken by farmers when their harvested plantain is not sold as expected. Majority of the farmers (42%) take their harvested plantain home for consumption in various forms while 28% process the fresh plantain into flour for sale.

However, 25% sell the harvested plantain at lower price on a different day while 5% process the fresh plantain into fried chips for sale.

Plantain Production Constraints

The various constraints faced by plantain producers in Southwest Nigeria is shown in Figure 24. The figure shows lack of finance as the major constraint representing 43%. This is followed by pest and disease representing 16% and then lack of proper pricing of plantain representing 10%. Lack of available healthy suckers for planting, represent 9% and land constraint represents 8%. Water, Agro-chemical, storage, and other constraints such as climate change represents 5%, 3%, 2% and 2% respectively.

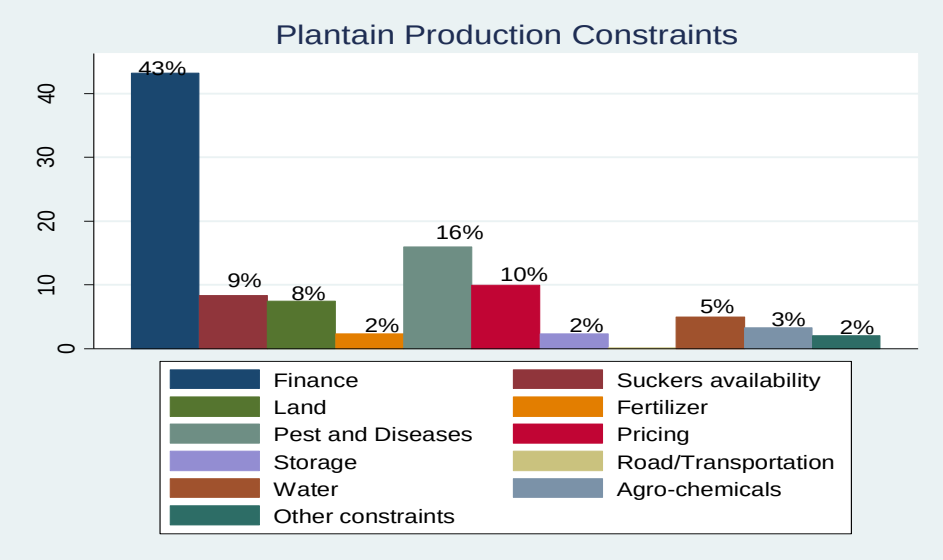

Figure 24: Plantain Production Constraints

Factors affecting Plantain Output

The factors affecting the output of plantain in the study area is shown in Table 13. The table reveals that farm size, household size, membership of association, sucker quantity and quality and years of farming experience are positively significant. Table further shows that a unit increase in farm size increased plantain output by 70% at $p<0.01$. This is expected as increase in farm size available to plantain farmers would mean more space to plant plantain and invariably more plantain output. According to Olawande (2010), farm size may have indirect positive impacts on market participation by enabling farmers to generate production surpluses, overcome credit constraints, where land can be used as collateral for credit, and allow them to adopt improved technologies that increase productivity. A unit increase in household size increased plantain output by 21.5% at $p<0.05$. This suggests that households with more members are able to employ more household members to work on the farm and thus be able to cultivate larger farm sizes with more household labor thereby enabling more output from increased plantain cultivation. Van Anrooy (1997) noted that as household size

increases the productivity of the land rises and exceeds subsistence requirements and this will lead to an increase in marketed surplus. Furthermore, the table shows that a unit increase in membership of associations by the plantain farmers increased output by 28.6% at p<0.05, indicating that the more a respondent is a member of farmer's association, the more likely the possibility of increase in output. Membership of association/group increases access to information important to production and marketing decisions (Olawande, 2010; Agwu et al., 2012). A unit increase in quality plantain suckers increased plantain output by 5% at p<0.1, suggesting that the more the farmers have access to increased supply of quality suckers, the more likely the increase in plantain output obtained by the farmers. Also, a unit increase in farming years of the farmers increased plantain output by 21.3% at p<0.05. This suggests that the more experienced the farmers are, the more knowledgeable they are in ways that they can bring about increase in the plantain output on their farms. Thus, the more experienced farmers are most likely to have more output from the same farm size compared with those with less years of farming experience.

Table 13: Factors Affecting Plantain Output

Plantain Output (kg)	**Coefficient**	**Std. Error**	**t**	**P>t**
Farm size (ha)	0.7000656***	0.0443658	15.78	0.000
Household size	0.2155172**	0.1041087	2.07	0.041
Agrochemicals (litres)	-0.0699536	0.0494722	-1.41	0.161
Credit access	-0.0140561	0.0967576	-0.15	0.885
Gender	0.049661	0.1463516	0.34	0.735
Education (years)	0.0016486	0.1427724	0.01	0.991
Membership of association	0.2861304**	0.1250978	2.29	0.024
Suckers (kg)	0.0582616*	0.0315517	1.85	0.068
Farming experience (years)	0.2136896**	0.1029185	2.08	0.041
_cons	6.874017	0.5190405	13.24	0.000
Number of observations	104			
R-squared	0.7465			
Adj R-squared	0.7222			
Root MSE	0.46967			

*significance @ 10% **significance @ 5% ***significance@ 1%

Socio-economic Characteristics of Plantain Marketers in Southwest Nigeria

Plantain marketing in Southwest involves mainly the marketing of fresh plantain, plantain chips and plantain flour. The socioeconomic characteristics of plantain marketers in the study area are shown in Table 14 and the corresponding figures below shows the trends of these characteristics across the states covered by this study.

Table 14: Socioeconomic Characteristics of Plantain Marketers

Age of Marketers	**Frequency**	**Percent**
18-25	2	4.00
26-32	9	18.00
33-40	19	38.00
41-58	14	28.00
>59	6	12.00
Mean age - 42.2±12.36		
Gender		
Male	2	4
Female	48	96
Total`	50	100
Marital status		
single	3	6
Monogamously married	36	72
Polygamously married	11	22
Education		
No Formal Education	10	20
Primary Education	24	48
Secondary Education	16	32
Household size		
1-3	2	4
3-7	38	76
>7	10	20
Membership of Associations		
Yes	31	62
No	19	38

Age of Plantain Marketers

The age of those involved in plantain marketing in the study area is shown in Table 14. The table reveals that majority of the marketers (38%) are between the age range of 33-40 years while those between the age range of 18-25 years are only 4%. The table further reveals that 60% of the marketers are below the age of 40 years, thus indicating that majority of the marketers are young in age. Only 12% of the marketers are above the 59 years of age. The mean age of the marketers is 42.2 years ±12.36 years. The age of marketers across the three states of study is shown in Figure 25. The figure shows that Oyo state has more marketers above the age of 40 years than Osun and Ondo states respectively. In other words, majority of the marketers in Oyo are older than those in the other states. Ondo state plantain marketers are the youngest as majority are below 40 years of age.

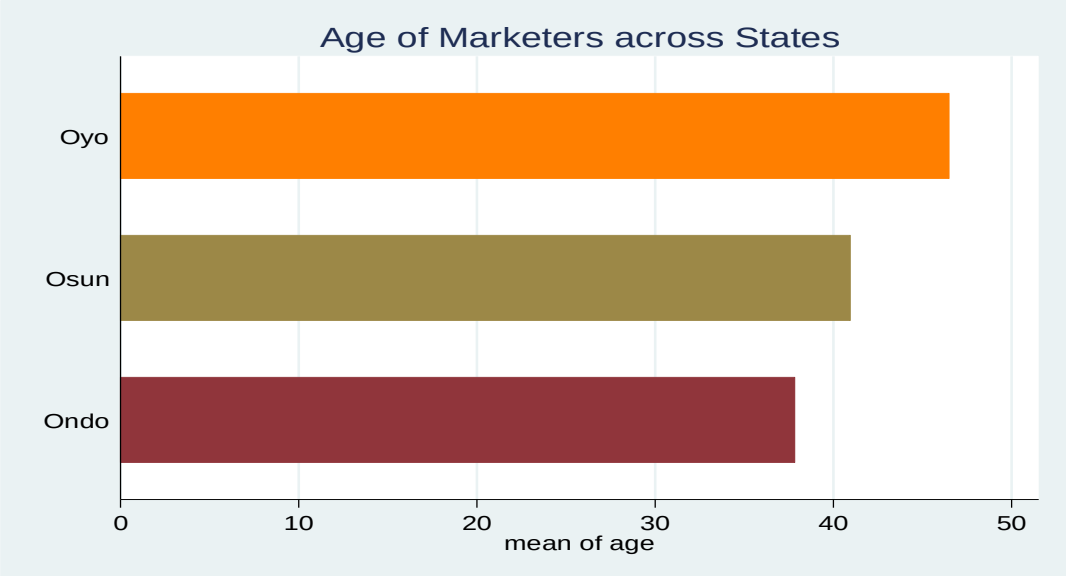

Figure 25: Plantain Marketer's Age by State

Gender of Marketers

Table 14 also shows that plantain marketing in the southwest is largely dominated by the female gender as represented by 96% while only 4% represents the participation of the male gender in plantain marketing. The males involved in marketing were mostly plantain farmers or those coordinating marketing activities of plantain in their locality. Figure 26 further shows that males involved in plantain marketing were mostly found in Oyo state where they are mostly elderly men and then Ondo state. However, Oyo states still has more female marketers than Osun and Ondo states respectively.

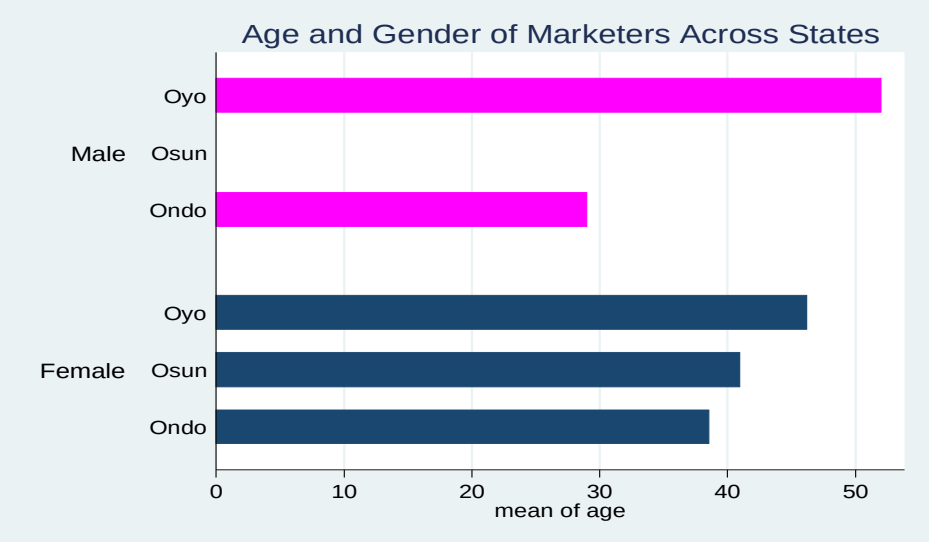

Figure 26: Marketer's Age and Gender by State

Marital Status

The marital status of plantain marketers is shown in Table 14, where majority of the marketers (72%) is seen to be monogamously married while only 6% are unmarried (Single). However, 22% of the marketers are polygamously married. Figure 27 further shows the marital status of plantain marketers across the three states of study. Majority of the plantain marketers in Oyo and Osun states are polygamously married and were the older ones with Osun state having no unmarried marketers. However, Ondo state has no marketer that is polygamously married as majority of the marketers are monogamously married while others are unmarried (Single).

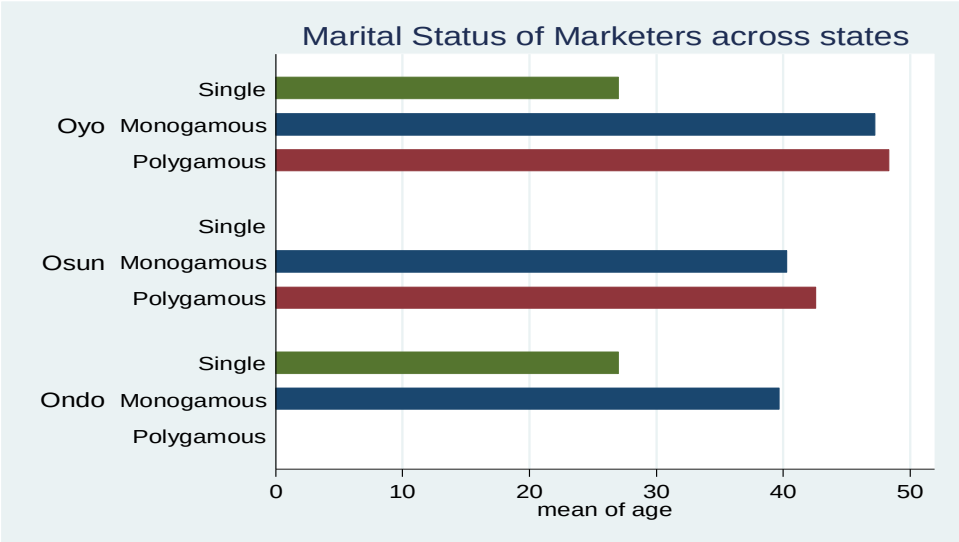

Figure 27: Plantain Marketer's Marital Status by State

Educational Level of Marketers

The category of level of education attained by plantain marketers in the study area is also shown in Table 14 above. The table reveals that close to half (48%) of the marketers had at least primary school education while 32% had at least secondary school education. However, 20% of the marketers had no formal education whatsoever. The educational level of the marketers across the three states of study is shown in Figure 28. The figure shows the age of the marketers and their level of education by state. Oyo and Ondo states have more marketers with no formal education and these are mostly marketers above 40 years of age with Oyo state still having more marketers with at least secondary education than Osun and Ondo states respectively. Ondo state has the least number of marketers with formal education.

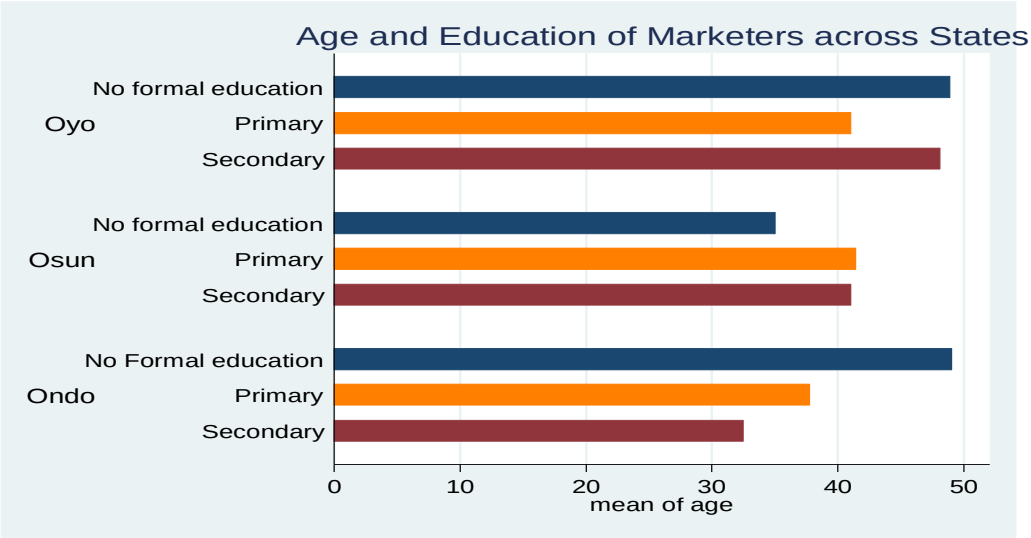

Figure 28: Level of Education of Marketers by State

Household size of Plantain Marketers

The household size of plantain marketers is shown in Table 14 above. From the table, majority of the marketers (76%) have household of between 4 and 7 members while only 2% have household size of below 4 members. Only 20% of the marketers have household size greater than 7 members. Figure 29 further shows household size of marketers across the three states of study. Oyo state has more marketers with household size greater than 4 members than Osun and Ondo states respectively. There are no plantain marketers with household size of less than 4 members in Ondo state. This indicates that plantain marketers across the three states have moderately sized household size.

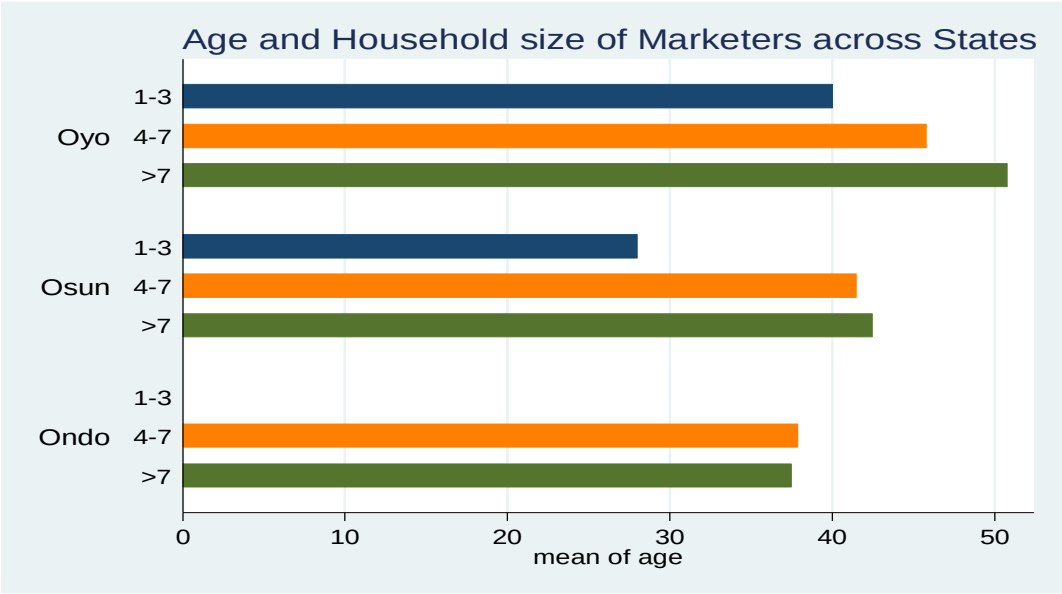

Figure 29: Plantain Marketer's Household Size by State

Membership of Associations

Membership of plantain marketers' association is shown in Table 14 above. From the table, 62% of the plantain marketers belong to marketers' associations while the remaining (38%) do not belong to any marketing association. Figure 29 further shows that Oyo state has more marketers who belong to marketers' association and is closely followed by Osun state. Both states have more marketers who are members of marketers' association than those who are not. However, Ondo state has the least number of marketers who belong to marketers' association and those who do not belong to any association are more among the marketers in the state. Belonging to marketers' associations allows members to agree on purchase price of plantain which often times are exploitative of the farmers and putting them at a disadvantage.

Figure 30: Plantain Marketers Membership of Association across States

Marketing Activities

This section gives details about the various forms of plantain marketed in the southwest as well as the various activities carried out by plantain marketers in the study area.

Forms of Plantain Marketed

The various forms of plantain marketed in the study area is shown figure 30. The figure shows that vast majority (91%) of the plantain marketers interviewed are involved in marketing fresh plantain while 7% are involved in marketing of plantain flour. Those who market plantain chips are only 2%.

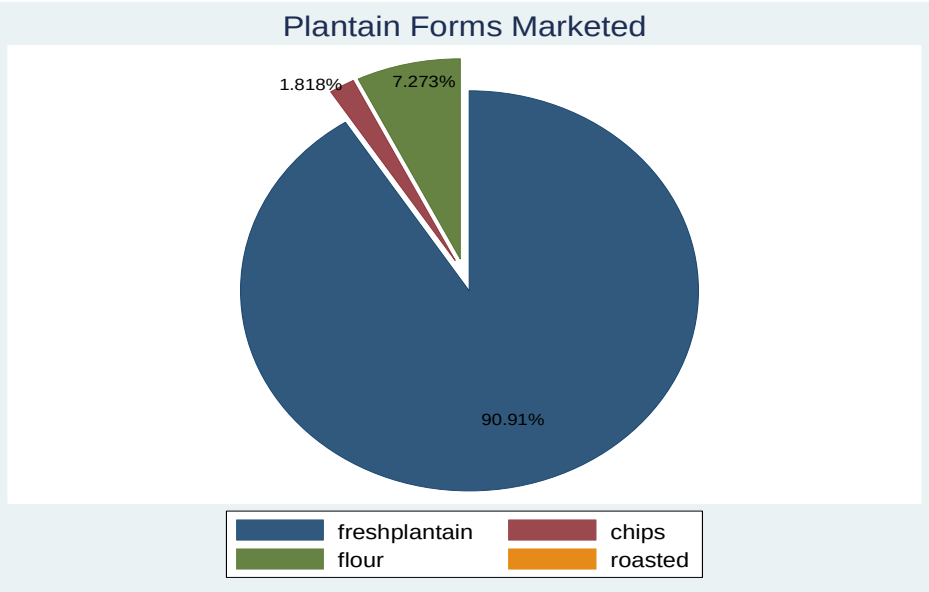

Figure 31: Forms of Plantain marketed by Plantain Marketers

The various forms of plantain marketed across the three states of study are shown in Figure 31. In Oyo state, 95% of the marketers are involved in marketing fresh plantain while the remaining 5% are involved in marketing plantain flour. In Osun state, 90% of the marketers are into fresh plantain marketing, 5% are involved in plantain flour while the remaining 5% are involved in marketing plantain chips. Eighty percent of marketers in Ondo state market fresh plantain while the remaining 12% are into plantain flour marketing. Across the states however, Oyo state has more marketers involved in fresh plantain followed by Osun and Ondo states respectively. Oyo and Ondo states has no marketers involved in plantain chips while Osun state has marketers involved in all the three forms plantain. However, what was observed across the three states as it concerns plantain chips marketing was that youths between the ages of 12 years and 20 years were mostly involved the selling of plantain chips of various types mostly processed by their mothers or guardians.

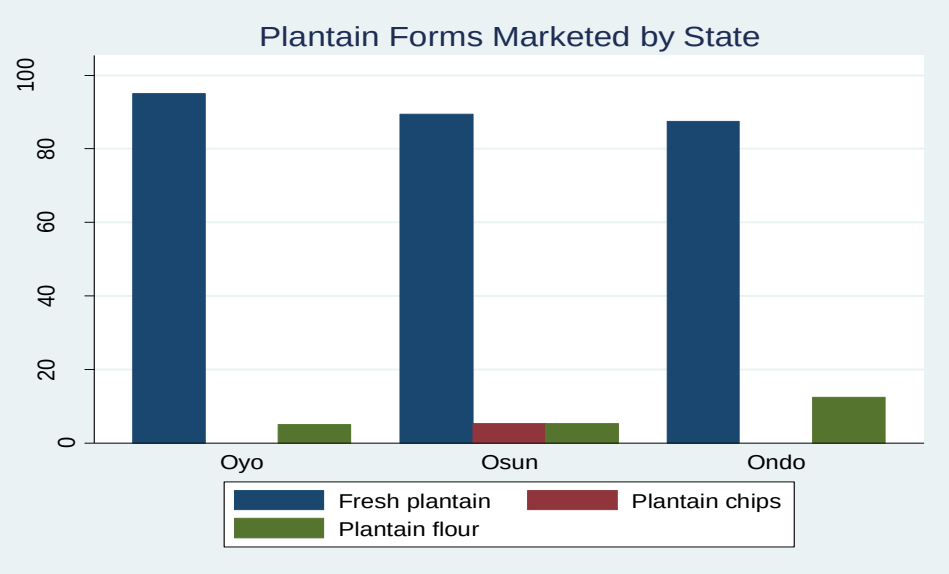

Figure 32: Forms of Plantain Marketed across States

Reason for Marketing Various Forms of Plantain

Fresh Plantain

Marketers gave various reasons of being involved in marketing fresh plantain and this is shown in Figure31. Many of the marketers (42%) sell fresh plantain because it has market acceptability and it is easily purchased while 24% are involved in selling fresh plantain because of the high gross margin obtainable from it sales. Twenty-two percent sell fresh plantain because it is readily available to them, 6% sell it because of its shell life while another 6% sell fresh plantain for other reasons such as to generate quick income for the family and make ends meet.

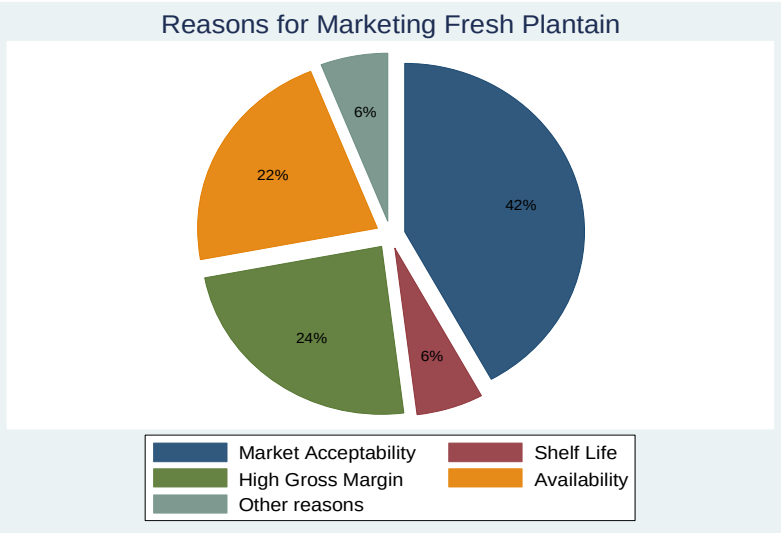

Figure 33: Marketers Reasons for Marketing Fresh Plantain

Plantain Chips

The reasons for involving in plantain chips marketing by marketers is shown in Figure 32. The figure shows that 32% are involved because of the market acceptability of plantain chips while 12% sell plantain chips as a result of its long shelf life. Sixteen percent sell chips because it is easily available to purchase and sell while 14% are involved in its sale because of its high gross margin. However, 24% are involved in selling plantain chips for other reasons such as closeness to urban areas and low capital requirement.

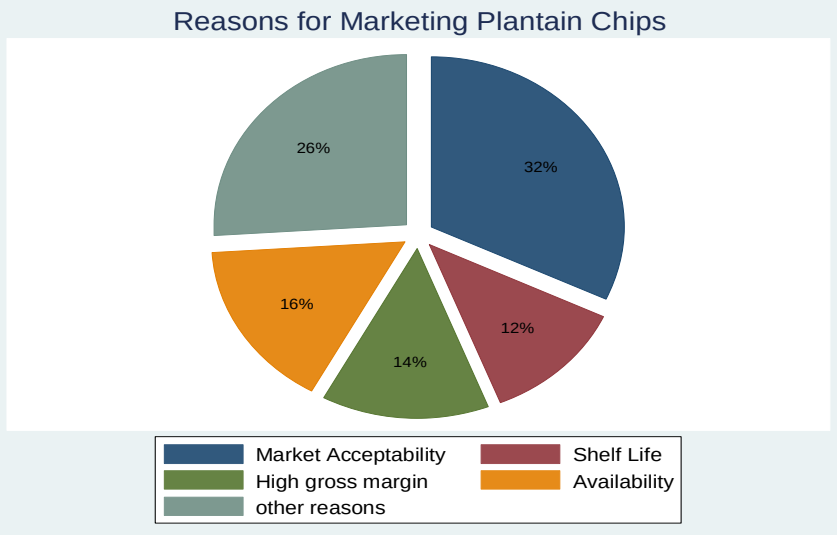

Figure 34: Marketers Reasons for Marketing Plantain Chips

Plantain Flour

Figure 33 shows the reasons adduced by marketers for getting involved in the marketing of plantain flour. As shown in the Figure 25% of the marketers are involved in its marketing because of the long shelf life of plantain flour which make it possible for marketers to preserve it until it is sold, thereby reducing any loss due to spoilage or selling at reduced price. However, a vast majority (75%) of the marketers are involved in the sale of plantain flour due to its market acceptability which continues to grow due to preference for plantain flour compared to other types of flour as a result of health concerns by consumers.

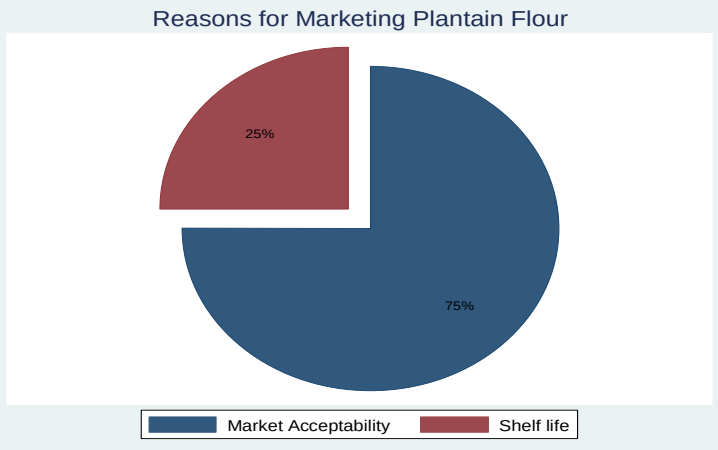

Figure 35: Marketers Reasons for Marketing Plantain Flour

Features of Plantain Marketing

Source of Funds

The various sources of funds for plantain marketers are shown in Figure 34. The figure reveals that majority (76%) of the marketers use personal funds in their plantain marketing business. Fourteen percent of the marketers use money obtained from cooperative society while 6% sourced their trading money from relatives. Only 2% of the marketers use money obtained from microfinance banks while another 2% use money they obtained from friends in their marketing business. The use of personal funds in plantain marketing gives an indication that the majority of the marketers are constrained to the volume that their personal funds can maintain as against the marketing volume they would have been involved in where the required finance is available. This suggest that majority of the marketers are not operating at their desired level due to lack of finance.

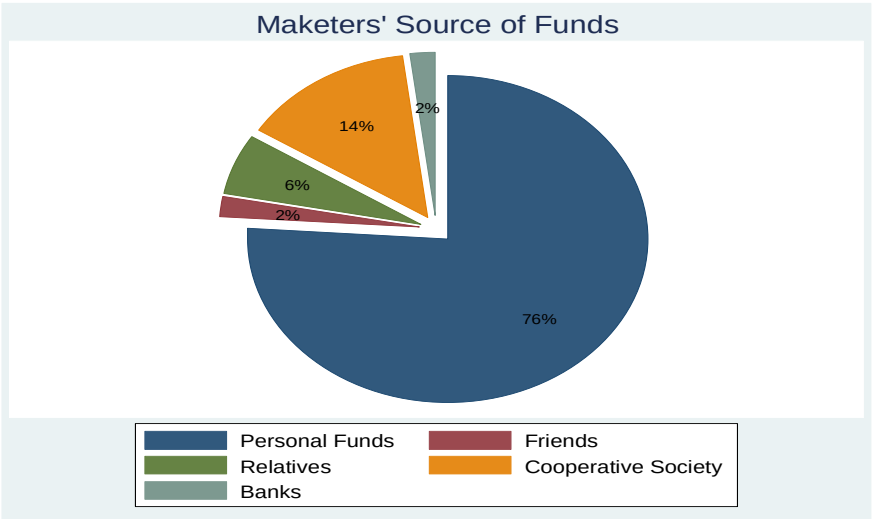

Figure 36: Source of Funds for Plantain Marketers

Means of Transportation

The different means of transportation used by plantain marketers is shown in Figure 35, where 70% of the marketers use vehicular transportation. The use of vehicle is more common with marketers of fresh plantain, probably due to the weight of the plantain. Twenty-one percent of the marketers use motorcycle to transport their plantain. This is also common among itinerant gatherers who use motorcycle to transport plantain from interior farms to major collation point where they are then loaded into buses or trucks. Plantain chips marketers also use motorcycle to transport their products to point of sales. However, only 9% of the marketers carry their products on the head to the point of sale or market. This is more with plantain flour and plantain chips marketers.

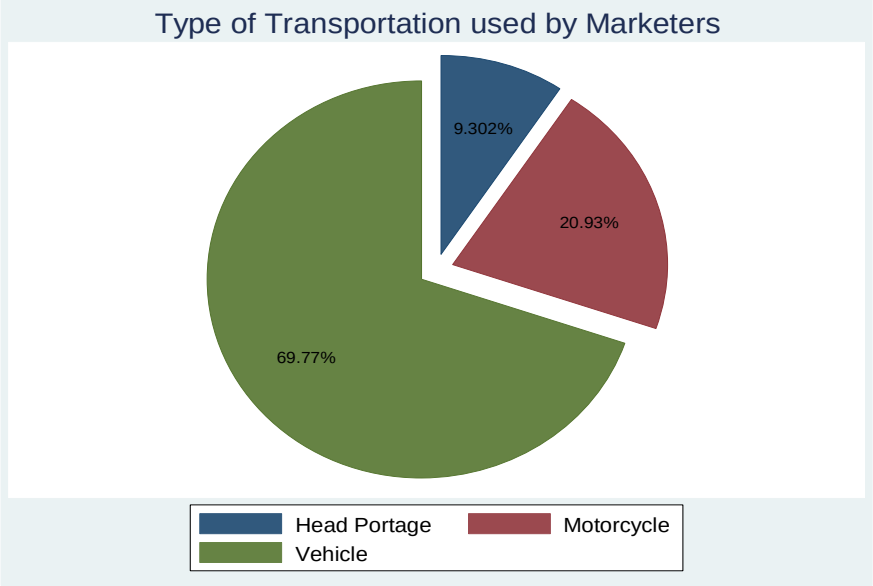

Figure 37: Means of Transportation used by Plantain Marketers

Price Determination

Figure 36 shows the various factors that plantain marketers consider in determining the price to sell their plantain. The figure shows that in considering the price to fix, the time of the year which explains whether it is during the plantain season or off season plays a major role as represented by 47%. Price is usually low during on-season for plantain and high during the off season. Following closely is the marketing cost incurred by the marketer as represented by 27% while demand for plantain by buyers is 18%. The more the demand, the higher the price fixed by the marketers, vice versa. Location consideration in price determination represents only 8%.

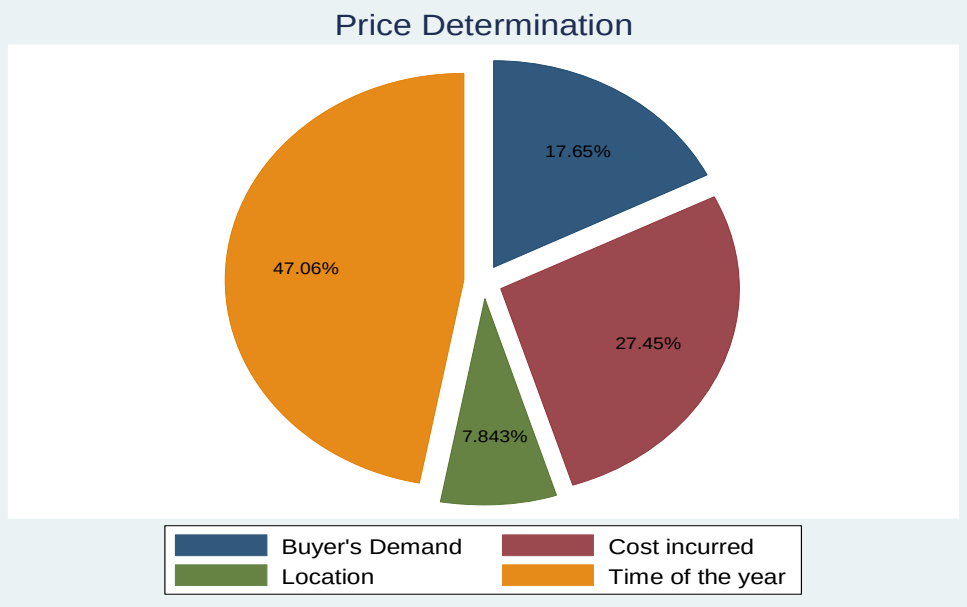

Figure 38: Price Determination by Plantain Marketers

Net Income

The net annual income of marketers of the different forms of plantain marketed in the study area is shown in Table 15. The table shows that plantain flour marketers have the highest mean annual net income closely followed by fresh plantain marketers and then marketers of plantain chips.

Table 15: Net Annual Income of Forms of Plantain Marketed

Net annual Income	Mean (₦)	Standard Deviation (₦)	Minimum (₦)	Maximum (₦)
Fresh Plantain	84,015.96	67,528.75	11,000	275,000
Plantain Chips	72,700	43,122.69	27,500	150,000
Plantain Flour	97,000	42,071.37	55,000	165,000

Fresh Plantain

Table 15 shows that the mean annual net income of fresh plantain marketers in the study area is ₦84, 015.96 with a standard deviation of ₦67,528.75. The minimum net income of the marketers is ₦11,000 while the maximum income stands at ₦275, 000. Figure 37 further shows the income range of the marketers with about half (44.68%) falling within a net income range of ₦51,000 and ₦100,000. Thirty-four percent of the marketers make below ₦50,000 annual net income, while about 11% fall within annual net income of ₦201,000 and ₦250,000. Only 4% have annual net income of above ₦250, 000.

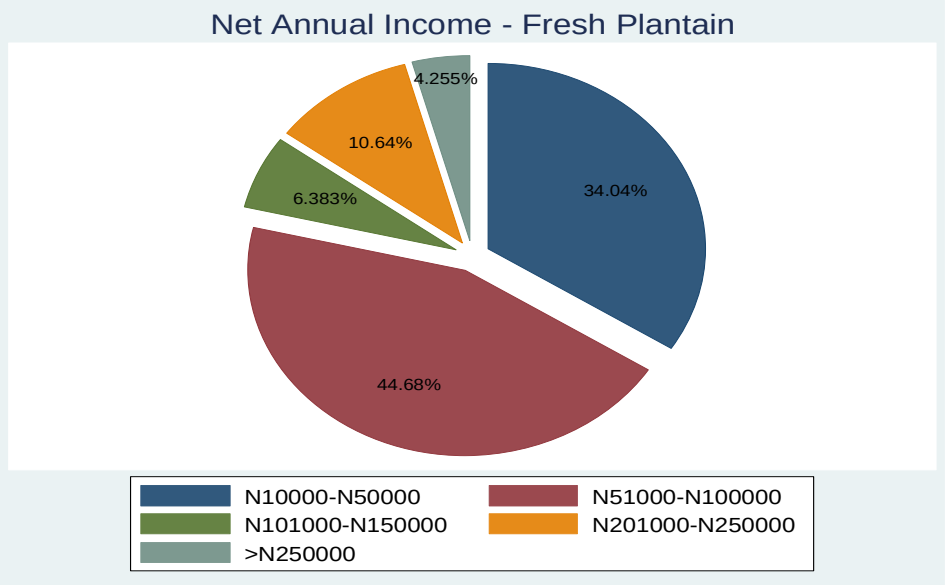

Figure 39: Annual Net Income of Fresh Plantain Marketers

Plantain Chips

Table 15 also shows the net annual income of plantain chips marketers with the mean annual net income being ₦72,700 and a standard deviation of ₦43,122.69. The minimum net income is ₦27,500 while the maximum net income is ₦150,000. A further analysis of the range of net income for plantain chips marketers is shown in Figure 38.

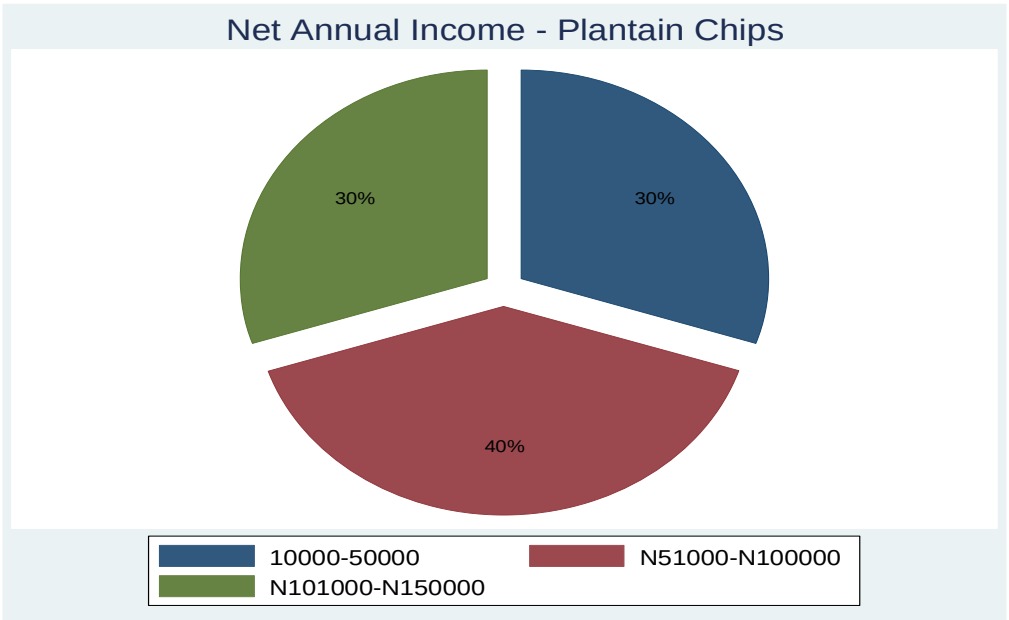

Figure 40: Annual Net Income of Plantain Chips Marketers

The figure shows that 40% of the marketers are within the net income range of ₦51,000 and ₦100,000 while those within the income range of ₦10,000 - ₦50,000 and ₦101,000 - ₦150,000 are 30% and 30% respectively

Plantain Flour

From Table 15, the mean net income for plantain flour marketers is shown to be ₦97,000 with a standard deviation of ₦42,071.37. The minimum net income is ₦55,000 and the maximum is ₦165,000. Figure 39 further shows that 60% of the marketers fall within a net income range of ₦51,000 and ₦100,000 with 20% within a net income range of ₦101,000 - ₦151,000, and another 20% within the net income range of ₦151,000 - ₦200,000.

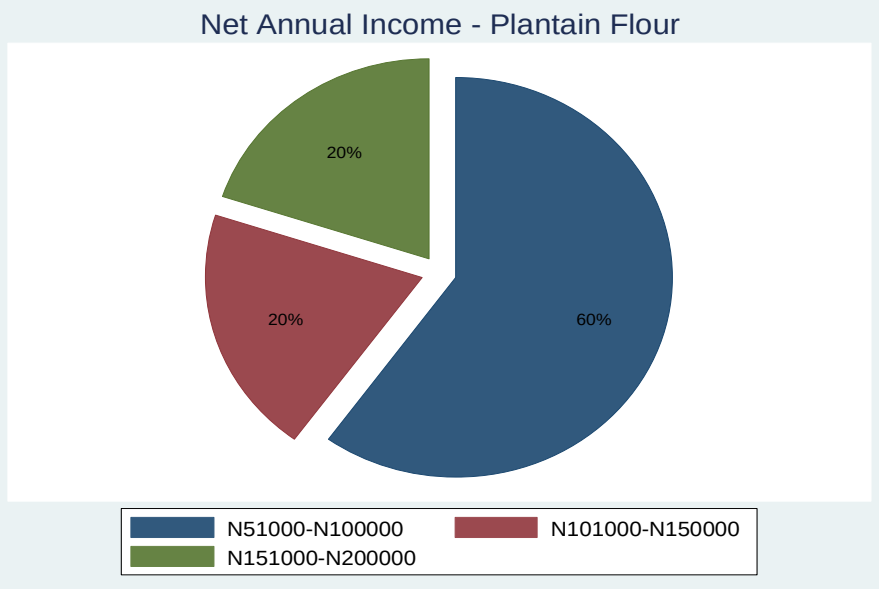

Figure 41: Annual net income of Plantain Flour Marketers

Marketing Efficiency

The marketing efficiency of the marketers involved in plantain chips, plantain flour and fresh plantain marketing is shown in Table 16. The table reveals that plantain flour has the highest market efficiency (2.22) followed by fresh plantain (1.58) while plantain chips has the least efficiency in terms of marketing. This suggests that plantain flour has more returns on investment compared to fresh plantain and plantain chips marketing. This is probably due to the least cost incurred in the marketing of plantain flour.

Table 16: Marketing Efficiency of Plantain Products

Marketing Efficiency	Mean	Std. Dev.	Min	Max
Plantain Chips	1.47	0.69	0.83	3.20
Plantain Flour	2.22	0 .96	1.22	3.46
Fresh Plantain	1.58	0 .66	0.09	5.00

Constraints to Plantain Marketing

The constraints faced by marketers of plantain are shown in Figure 40. Lack of finance is seen as the most limiting (46%) amongst the other constraints as many of the marketers complained of not having enough funds to do the business as they would have loved to due to

financial constraints. This is followed by the challenge of irregular supply (18%) of plantain which is caused by the seasonal nature of the crop as few marketers are engaged in marketing activities during the off-season. Poor pricing represents 14% amongst the challenges facing plantain marketing in the study area while transportation constraints in terms of roads, means of transportation as well as cost of transportation represents 10% of the plantain marketing constraints.

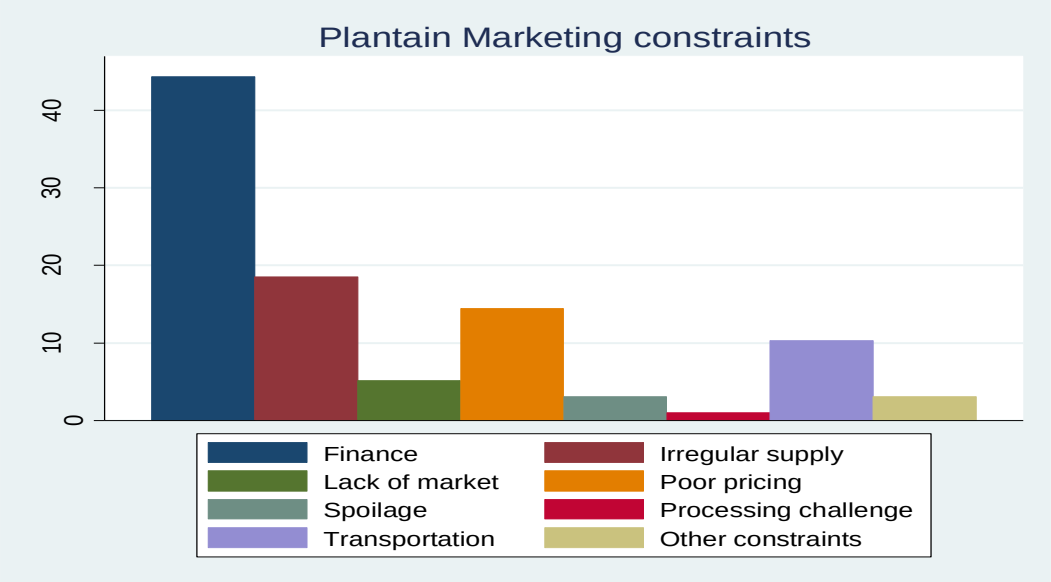

Figure 42: Plantain marketing constraints

Socio-economic Characteristics of Plantain Processors in Southwest Nigeria

Plantain processors in the southwest consist majorly of micro-processors who are involved in processing plantain to prolong the shelf life of the crop. The socioeconomic characteristics of plantain processors in the study area are shown in pie charts and the corresponding bar charts below shows the trends of these characteristics across the states covered by this study. Table 17 shows the mean values of some socio-economic characteristics of the processors.

Table 17: Summary Statistics of Socioeconomic Characteristics of processor

Plantain Processors	Mean	Standard Dev.	Minimum	Maximum
age	45.44	12.83	15	78
Education years	3.68	2.80	0	8
Household size	7.85	5.19	1	22

Age of Plantain Processors

From Table 17 above, the mean age of plantain processors is shown to be 45years ± 12 years, while minimum and maximum age is 15years and 78 years respectively. Figure 41 shows that about 39% of the processors are between the age of 40-50 years while those from 40 years and below make up 44% of the processors. This indicates that majority of the processors are young. However, 17% are above 59years of age

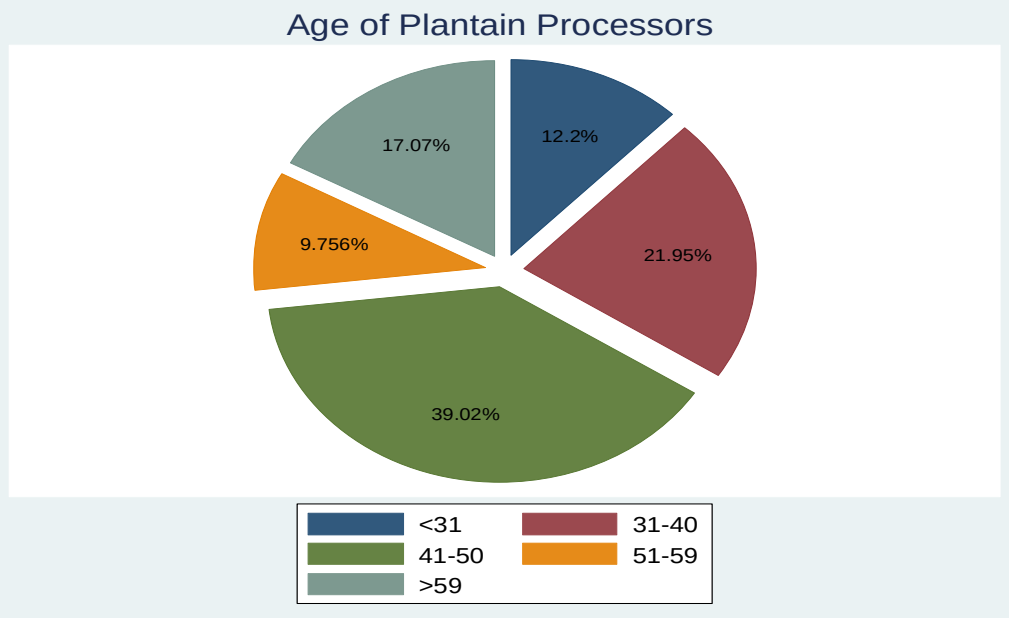

Figure 43: Age of Plantain Processors

The age range of processors across the three states of study is shown in Figure 42, where Oyo state has older plantain processors than Osun and Ondo states respectively.

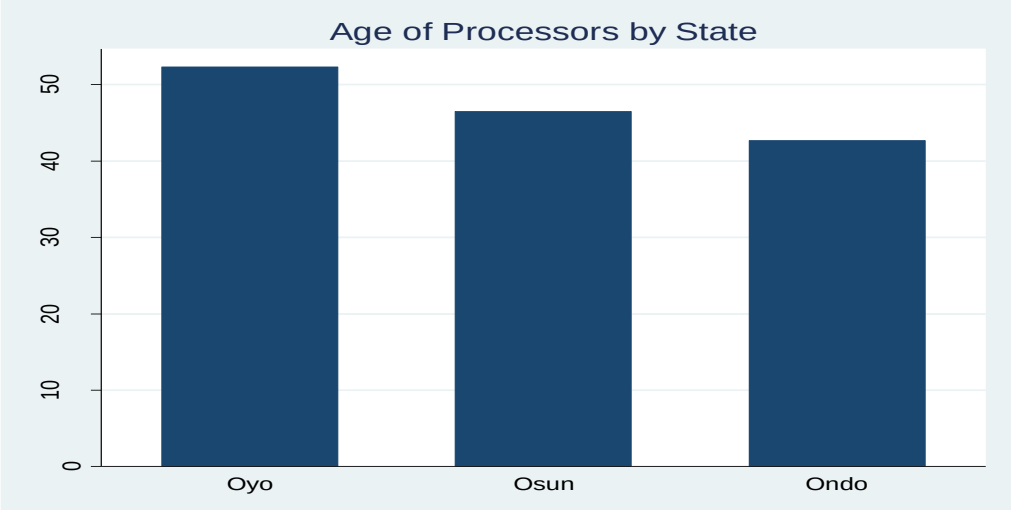

Figure 44: Age of Plantain Processors across States

Level of Education

The mean number of education years of plantain processors is 3.6years ± 2.8years as seen in Table 11. This indicates that the processors have at least primary school education on the average. Figure 43 further shows that majority (54%) have at least some years of primary education while 20% had some years of secondary education. However, only 26% of the processors have no formal education.

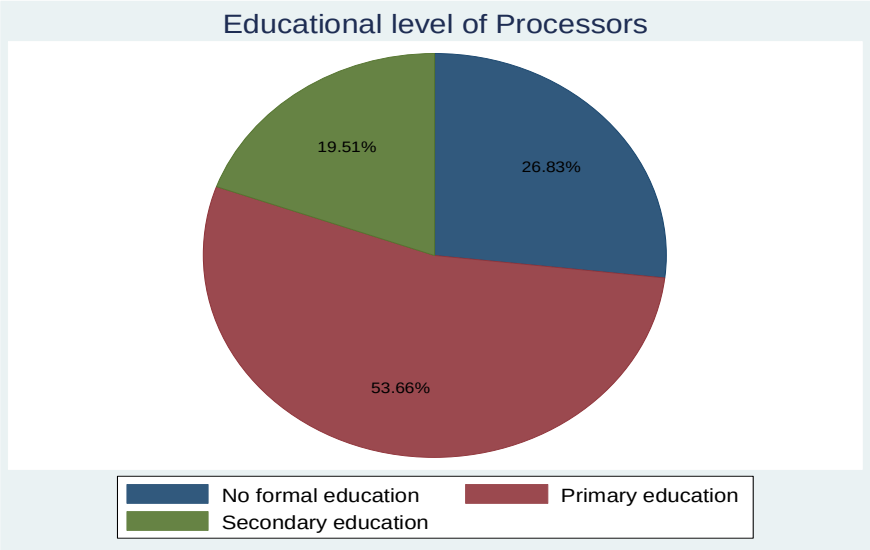

Figure 45: Educational Level of Processors

A further look at the level of education of plantain processors is shown in Figure 44, where Osun state has more processors with no formal education and closely followed by Oyo state while Ondo state has the least number of uneducated plantain processors. Oyo state has no processors with secondary education but leads with those with primary education. Osun state however, has the highest number of plantain processors with secondary education.

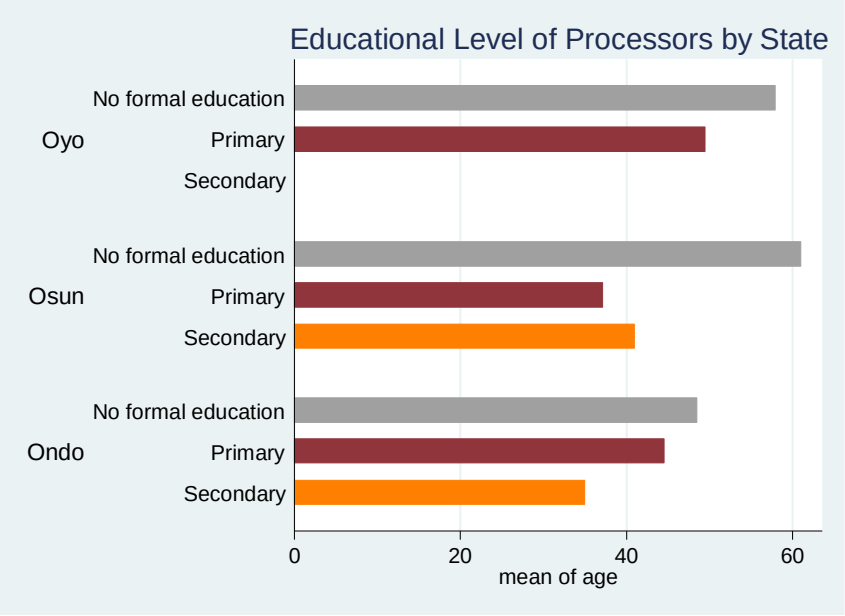

Figure 46: Level of Education of Processors across the states

Household size

The mean household size is seen from table 11 is 8 ± 5 with a minimum of 1 and maximum of 22 household members. Figure 45 show that 56% of the processors have household members of between 5 and 7 while 27% of the processors have household of above 7 members. Only 17% have household size of below 5 members. This suggests that majority of the plantain processors have moderately sized households.

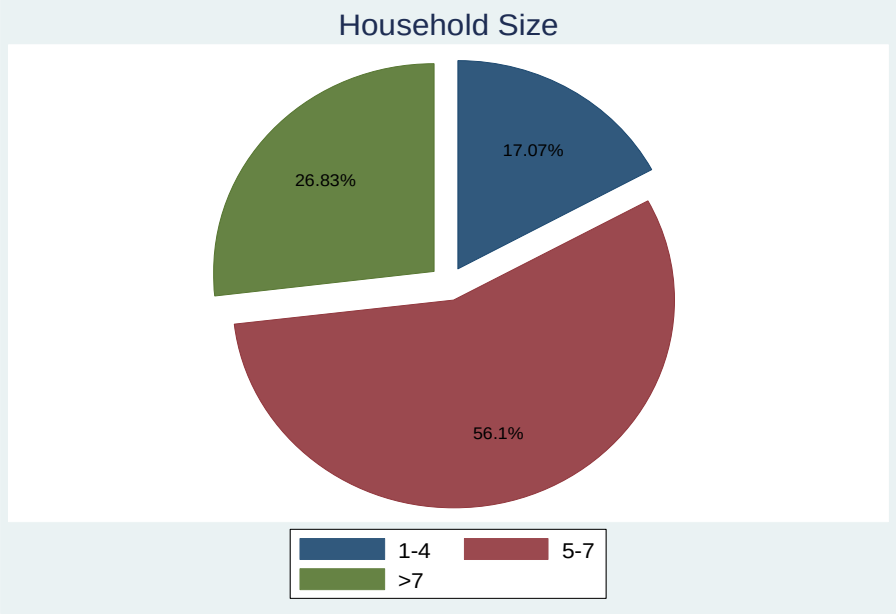

Figure 47: Household size of plantain Processors

Marital Status

Majority (71%) of the processors are monogamously married as seen in Figure 46 while 22% are polygamously married. However, 5% are single while 2% of the processors are widowed.

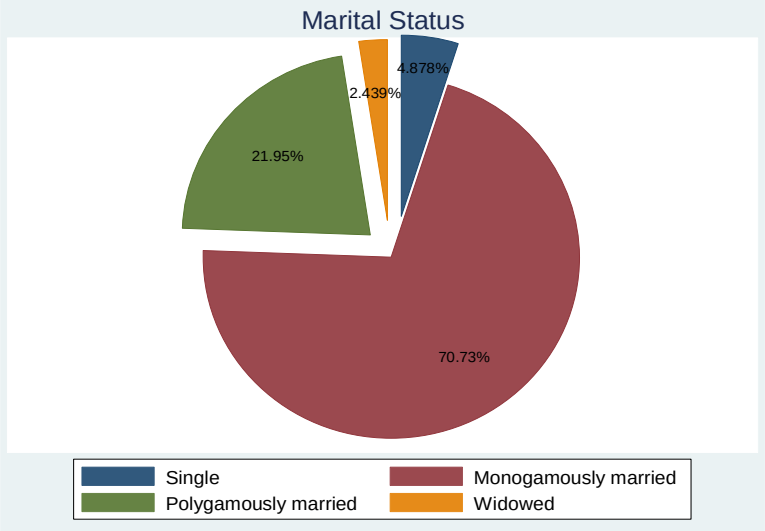

Figure 48: Marital Status of Plantain Processors

Gender of Plantain Processors

The gender of the plantain processors in the study area is shown in Figure 47. From the figure, plantain processing is largely dominated by the female gender as represented by 93%. This suggests that the female gender plays more active role in processing plantain than in its production where the male gender dominates as seen from Table 1.

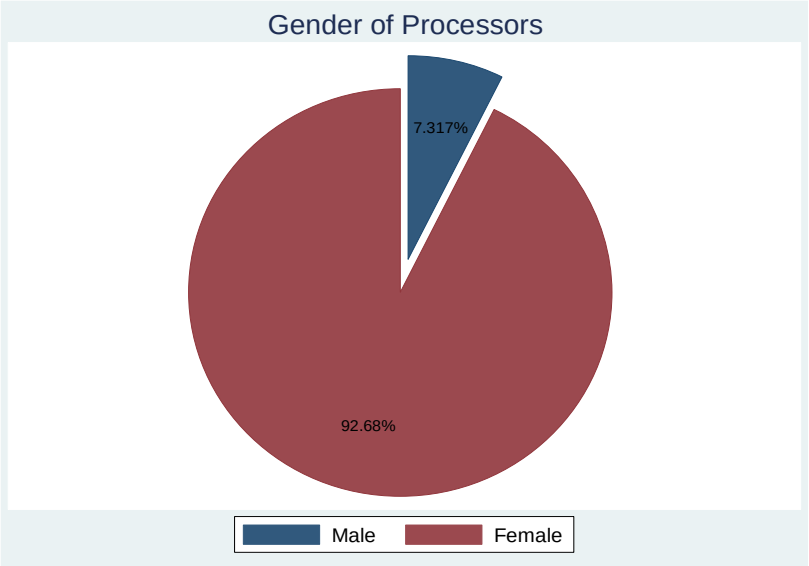

Figure 49: Gender of Plantain Processors

Features of Plantain Processing

Plantain Products

The various products into which plantain is processed into in southwest Nigeria is shown in Figure 47. Three major products namely, plantain chips, plantain flour and roasted plantain are the most common plantain products found in the study area. The figure shows that the most common plantain product processed by plantain processors is plantain chips as 46% of the processors are involved in it. This is closely followed by plantain flour and 41% of the plantain processors are involved in its production. Roasted plantain is represented by 10% of the processors, showing their level of involvement in its production while other products such as cooked plantain and fried mashed plantain (Dodo Ikire) are represented by only 3% of the processors.

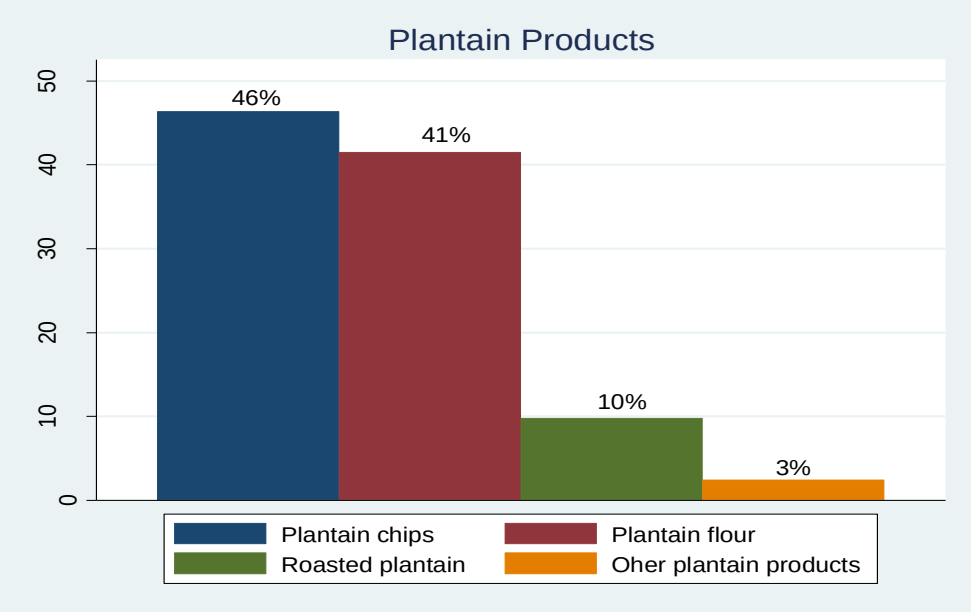

Figure 50: Various Plantain Products

Motivation for Processing Plantain

The various motivation or reasons behind the particular plantain product processed by processors is shown in Table 18. From the table, processors involved in plantain chips production are motivated mostly by the market acceptability (86.67%) of plantain chips as it is easily purchased and consumed across all age grades. Processors of plantain flour is shown in the table to be motivated in producing plantain flour mostly because of its market acceptability (58.82%) and the shelf life (23.53%) of the product which enables them to store for a long time until it is eventually purchased. The market acceptability of plantain flour is also growing fast and is attracting many more plantain processors. Other plantain products such as roasted plantain, cooked plantain and fried mashed plantain are processed by few plantain processors. Fifty percent are involved in it because of its acceptability while 33% are involved due to high gross margin obtainable from such products. Although processors of plantain chips and plantain flour claimed to be motivated mostly by the market acceptability of the products, the market acceptability is however believed to be strongly linked to the profits they derive from processing these products.

Table 18: Motivation behind production of plantain products

Plantain Products	Frequency	percentage
Chips		
Market acceptability	13	86.67
High gross margin	1	6.67
Other reasons	1	6.67
Flour		
Market acceptability	10	58.82
Shelf life	4	23.53
High gross margin	2	11.76
Availability	1	5.88
Other plantain products		
Market acceptability	3	50.00
High gross margin	2	33.33
Availability	1	16.67

Plantain Products Processed Across States

The various plantain products processed across the states by processors interviewed in the study are is shown in Figure 48. Oyo state has more plantain chips as well as roasted plantain processors than Osun and Ondo states respectively.

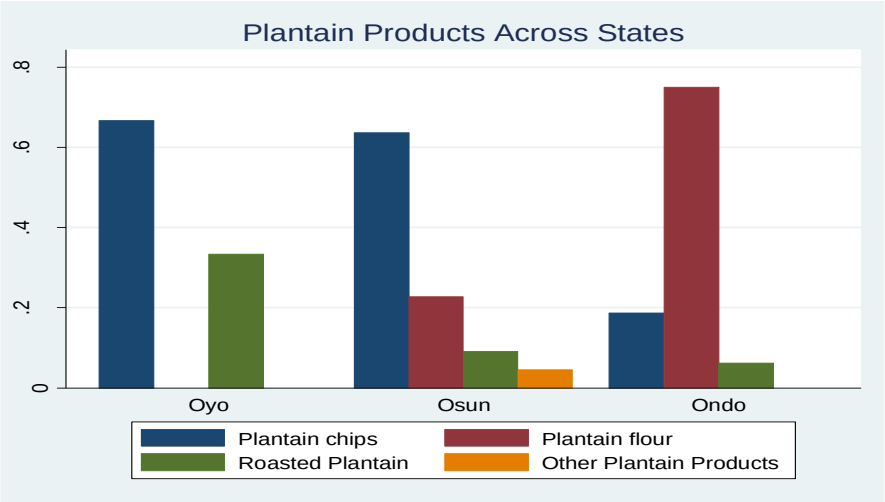

Figure 51: Plantain Products Processed across States

However, Ondo state has more plantain flour processors, closely followed by Osun state. Processors in Osun state are involved in more plantain products than Ondo and Oyo states

Plantain Chips Buyers

The buyers of plantain chips from processors are shown in Figure 50. The figure reveals that processors sell their plantain chips mostly directly to individual buyers who represent 53% of the buyers while retail buyers represent 30% and wholesale buyers who in turn sell to retailers represent 17% of those who buy plantain chips from the processors

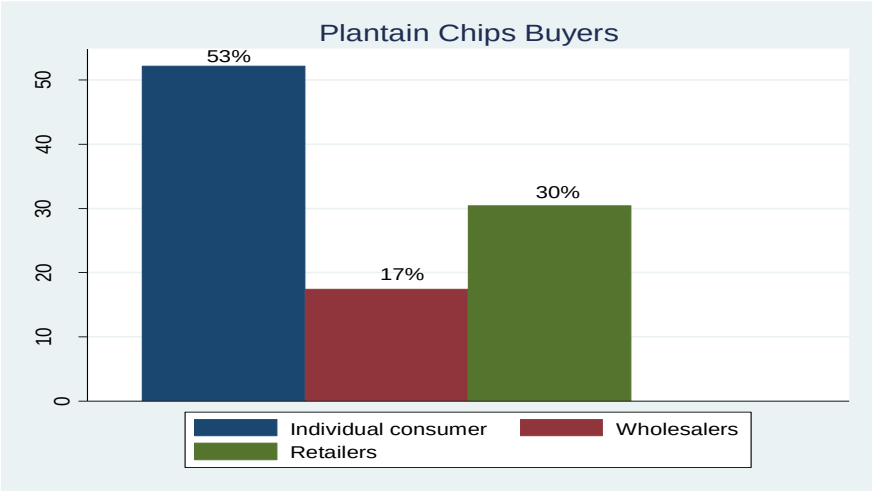

Figure 52: Buyers of Plantain Chips from Processors

Buyers of Plantain Flour

Figure 51 shows the buyers of plantain flour from plantain processors. From the figure, 68% of plantain flour are individual consumers while retail buyers and wholesale buyers are 16% respectively. This shows that plantain flour processors are largely patronized by individual buyers rather than wholesalers or retailers.

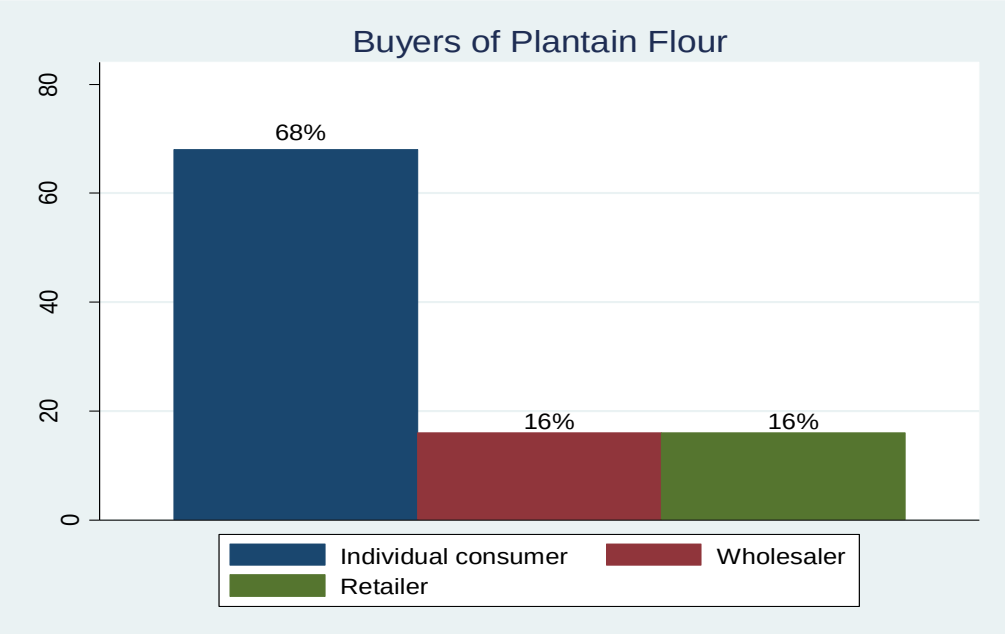

Figure 53: Buyers of Plantain Flour from Processors

Income from Various Products of Plantain

The respective income generated by plantain processors is shown in Table 19. The table shows that the average annual income for plantain chips processors is ₦113, 600 ± ₦85,971, with the minimum annual income being ₦15,000 while the maximum is ₦308,000. The table further shows that the annual income for plantain flour processors is ₦146,470.60 ± ₦116,320.70, with a minimum of ₦15,000 and maximum income of ₦320,000. The annual income for roasted plantain processors is ₦57,500 ± ₦31,754.26 with a minimum of ₦25,000 and maximum of ₦100,000.

Table 19: Net Annual Income Generated by Plantain Processors

Annual Income	Mean ₦	Standard. Dev ₦.	Minimum ₦	Maximum ₦
Plantain Chips	113,600	85,971.59	15,000	308,000
Plantain Flour	146,470.60	116,320.70	15,000	320,000
Roasted Plantain	57,500	31,754.26	25,000	100,000

The table shows that plantain flour processors earn more income than plantain chips processor, while roasted plantain processors earn the least income annually. The income earned by plantain flour is higher due most likely to the less cost incurred in processing plantain flour compared to processing plantain chips and roasted plantain.

Monthly Cost Incurred by Plantain Processors

The average monthly cost incurred by plantain processors is seen in Table 20. The average cost for plantain chips is ₦7,175.80 ± ₦2,359.46 with a minimum of ₦4,025 and maximum monthly

cost of ₦12,633. The cost consists majorly of the cost of fresh plantain, vegetable oil for frying the plantain chips as well as the cost of firewood and kerosene. The table further shows that the average monthly cost for plantain flour processing is ₦6,705.56 ± 1,940.91 with the minimum cost being ₦2,188 and the maximum cost incurred monthly being ₦10,000. The cost consists majorly of the cost of fresh plantain. From the table also, the average cost incurred monthly by roasted plantain processors is ₦3,538.75 ± ₦1,310.98 with a minimum cost of ₦2,075 and maximum cost of ₦5,250 incurred monthly. The cost incurred by roasted plantain processors is majorly from purchase of fresh plantain and charcoal used for roasting the plantain. The trend from the table shows that plantain chips processors incurred the most cost, followed by plantain flour processors and then roasted plantain processors.

Table 20: Average Monthly Cost Incurred by Plantain Processors.

Average Cost	Mean (₦)	Std. Dev. (₦)	Minimum (₦)	Maximum (₦)
Plantain Chips	7,175.80	2,359.46	4,025.00	12,633.00
Plantain Flour	6,705.56	1,940.91	2,188.00	10,000.00
Roasted Plantain	3,538.75	1,310.98	2,075.00	5,250.00

Average Monthly Profit of Plantain Processors

The average monthly profit obtained from the processing of plantain by processors is shown in Table 21. The table shows that the monthly profit from processors of plantain chips is ₦10,225.80 ± ₦5,454.90 with the minimum profit being ₦2,910 and the maximum profit being ₦21,959. The table further shows that monthly profit of plantain flour is ₦12,824.35 ± ₦8,431.37 with a minimum monthly profit of ₦4,581 and maximum profit of ₦37,724. The monthly profit of roasted plantain processors is ₦6,874 ± ₦2,833.23 with a minimum monthly profit of ₦3,321 and maximum of ₦10,179.

Table 21: Monthly Profit of Plantain Processors

Average Monthly Profit	Mean (₦)	Std. Dev. (₦)	Minimum (₦)	Maximum (₦)
Plantain Chips	10,225.80	5,454.90	2,910.00	21959.00
Plantain Flour	12,824.35	8,431.37	4,581.00	37724.00
Roasted Plantain	6,874.00	2,833.23	3,321.00	10179.00

The trend of the profit made by plantain processors is further shown in figure 52. The figure shows that plantain flour processors has the highest monthly profit, followed by plantain chips processors with roasted plantain processors having the least monthly profit due probably to the limited number of plantain fingers that can be processed per time which also contributes to its having the least monthly cost as shown in Table 20. The profit of plantain flour

processors as earlier stated is linked to lower cost incurred during processing compared to plantain chips processing.

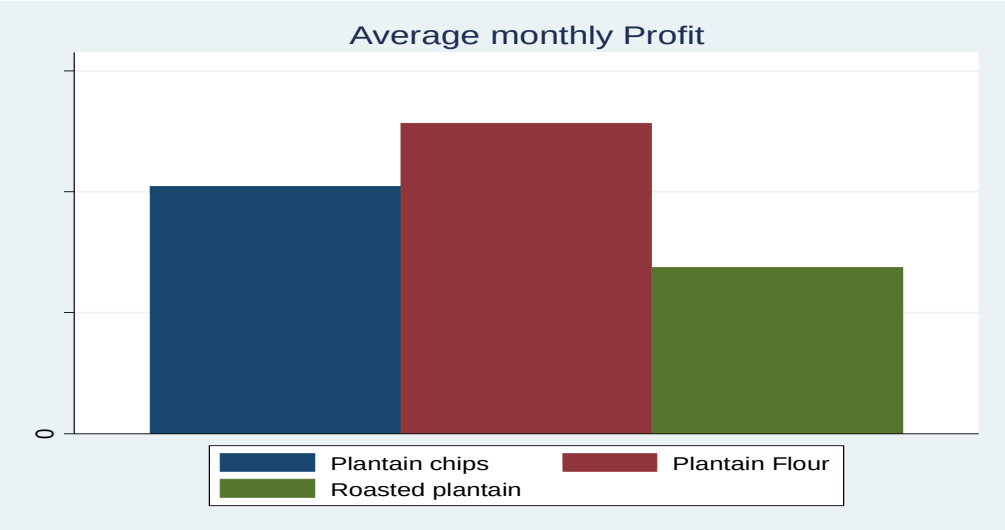

Figure 54: Monthly Profit of Plantain Processors

Sources of Raw Plantain for Plantain Processors

The various sources from which plantain processors obtain fresh plantain for processing their products is shown in Figure 53. The figure shows that most of the processors get their fresh plantain from itinerant bulk gatherers who go from farm to farm to gather plantain into bulk and then sell either at a specific location near the farms or at the local market. This is closely followed by those who source their fresh plantain from retailers in the market while few others get fresh plantain directly from the farmers. However, only very few plantain processors source fresh plantain from their own farms as seen from figure 53.

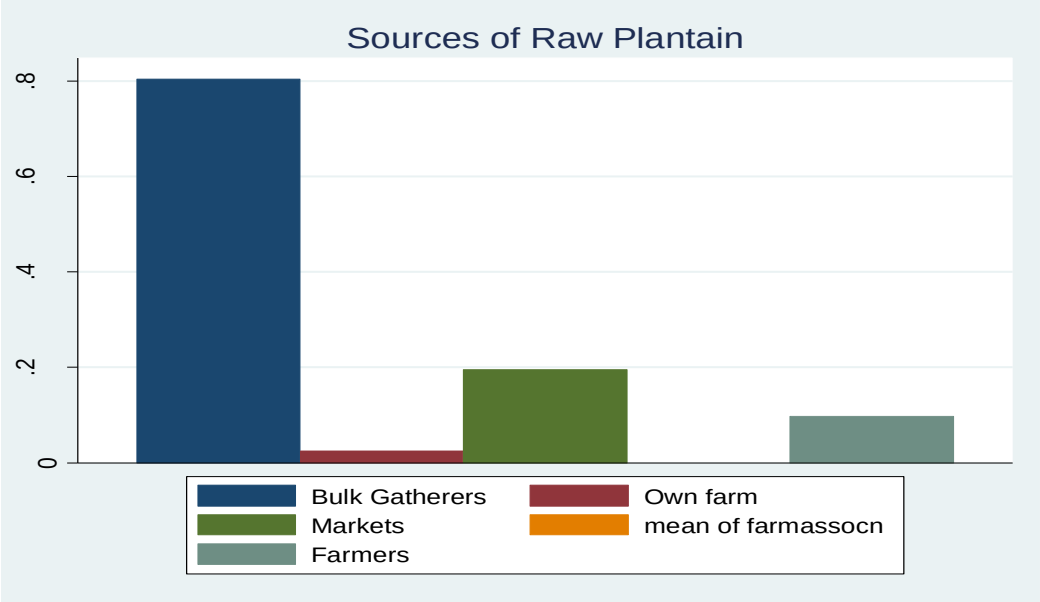

Figure 55: Source of Fresh Plantain for Plantain Processors

Source of Finance for Plantain Processors

The various sources of finance for plantain processors in the study area is shown in Figure 54. The figure shows that close to half (46%) of the processors got funds from loan obtained from cooperative society. Thirty percent of the processors are using their personal funds in the plantain processing business while 12% obtained loans from microfinance banks. However, 5% got funds from family and friends while another 5% received funding from other sources such as charity and gifts. Only 2% obtained finance from Local groups such as ethnic development associations.

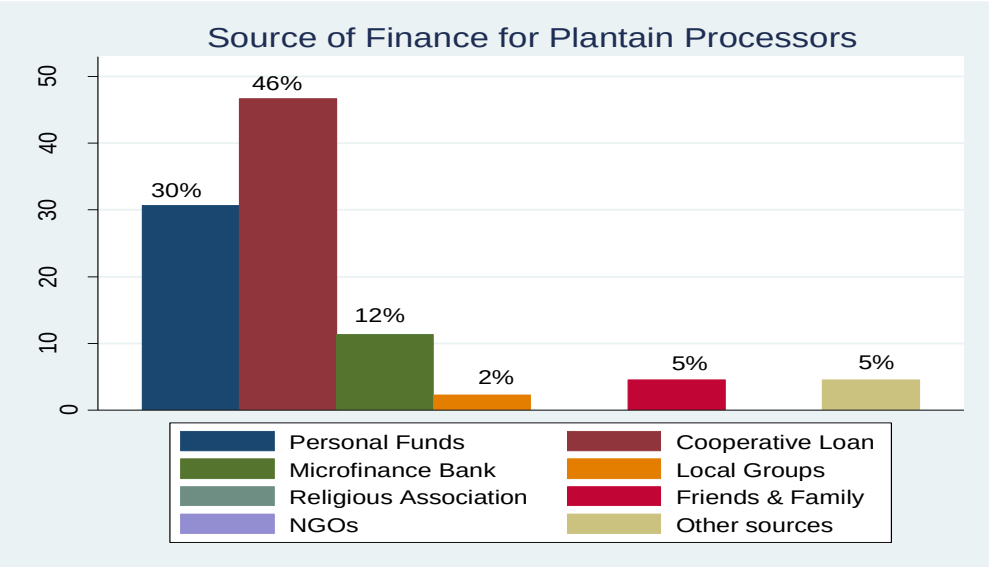

Figure 56: Various Sources of Finance for Plantain Processors

Transportation Means Used by Plantain Processors

The transportation means used by plantain processors in transporting their products to point of sales is shown in Figure 55. The figure shows that 24% of the processors use motor vehicle in transporting their products after processing to the point of sales while 30% use motorcycle in transporting their plantain products. Thirteen percent of the processors use wheelbarrow to transport their plantain products. However, majority (33%) of the processors carry their processed products using their head and trek to their various points of sales especially where the distance to the point of sale is not much.

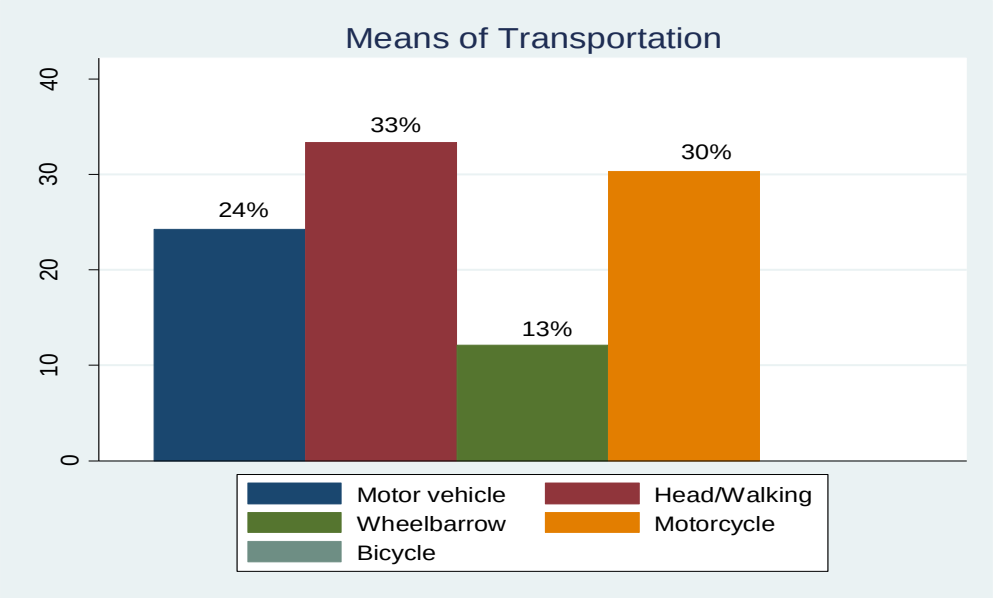

Figure 57: Transportation Means Used by Plantain Processors

Constraints of Plantain Processing in Southwest Nigeria

The constraints facing plantain processing in the study area are highlighted in Figure 56. From the figure, financial constraint is the highest constraint faced by plantain processors representing 44%. This is followed by irregular supply of fresh plantain upon which the processors depend heavily for their business. This is because fresh plantain is usually in abundance and cheap to purchase during on-season but scarce and expensive to purchase during off-season. This constraint represents 28% of the constraints faced by the processors. Following this is lack of market and processing equipment representing 10% and 7% respectively. The absence of well-organized market for processed plantain product and the lack of easy access, due to lack of fund, to modern processing equipment represents a total of 17% of the entire constraints faced by the processors. Other constraints such as poor pricing of processed plantain products, wastages during processing and transportation challenges represents, 4%, 4% and 3% respectively.

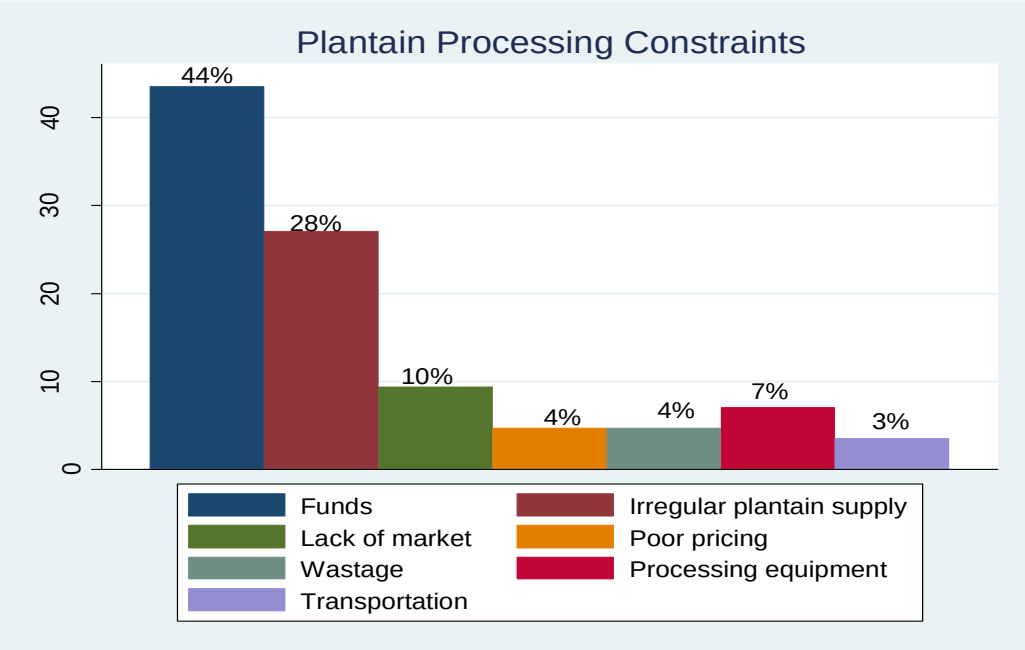

Figure 58: Constraints facing Plantain Processors

Socio-economic Characteristics of Plantain Consumers in Southwest Nigeria

Plantain consumers consist of those who consume plantain products in its various forms. The socio-economic characteristics of these consumers are shown in the table and figures below and are discussed in this section. Table 22 shows the summary statistics of the socioeconomic characteristics of plantain consumers.

Table 22: Summary Statistics of Socioeconomic Characteristics of Plantain Consumers

Plantain Consumers	Mean	Standard. Dev.	Minimum	Maximum
Age in Years	39.60	11.67	20	62
Education Years	5.56	2.71	0	9
Household size	7.1	4.01	1	21

Age of Plantain Consumers

Table 22 shows that the average age of plantain consumers in the study area is 39.6years with the youngest consumer being 20years of age and the oldest being 62years. The age range of the consumers is further shown in Figure 57 where 12.5% of the consumers are between the age range of 18-25years and only 3% are above of 59years of age from the figure, close to half (46.88%) are between the age of 41-59years of age while those between the age of 25-40years of age are 37.5%. consumers whose age is from 40years and make up 50% of the plantain consumers. This confirms the assertion that plantain is widely consumed across various age grades. That half of the consumers are above 40 years of age also suggests that plantain is consumed by older people probably due to its perceived health benefits.

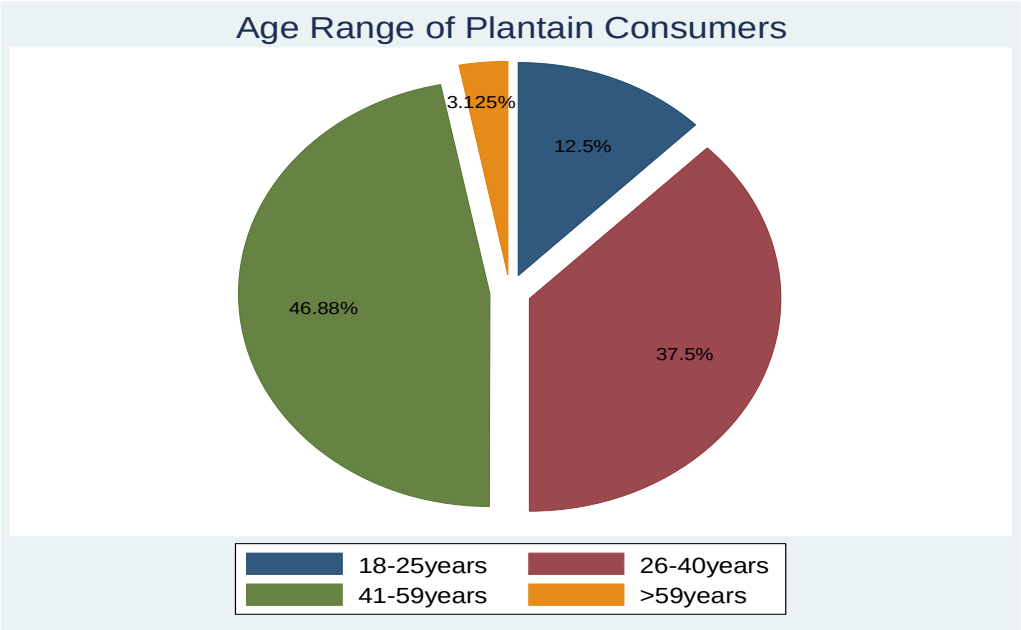

Figure 59: Age Range of Plantain Consumers

Years of Education of Consumers

The mean years of education of plantain consumers is shown in Table 22 as 5.56 showing that the average education level of the consumers is at least primary school. The maximum years of education is 9years indicating secondary school education. Figure 58 further gives a breakdown of the level of education of plantain consumers. The figure shows that 56% of the consumers have at least secondary school education while 38% attended at least primary school. Only 6% have no formal education. Level of education of consumers is believed to influence the form of plantain consumed, whether boiled, fried or roasted.

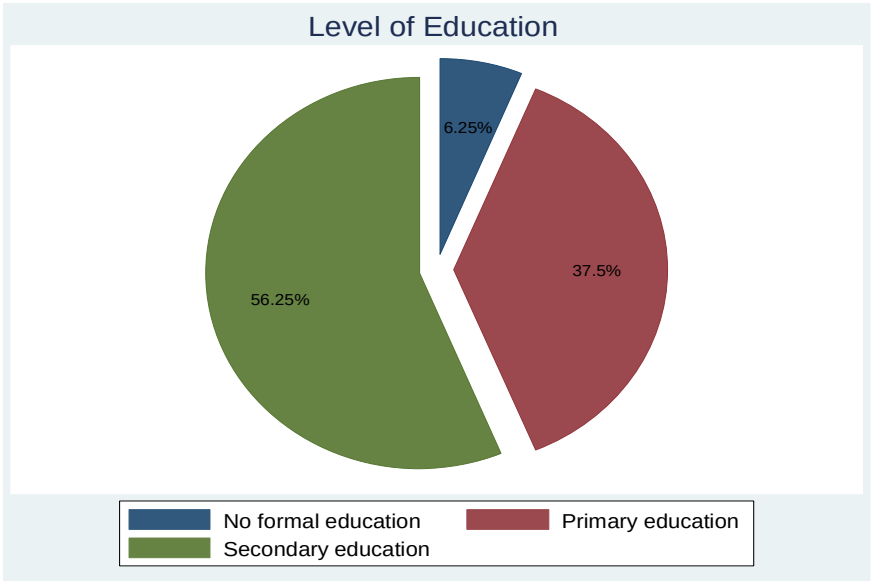

Figure 60: Education Category of Plantain Consumers

Household size of Plantain Consumers

The mean household size of plantain consumers as shown in Table 22 is 7 with a minimum of 1 household member and maximum of 21 household members. A further breakdown of household members' size is shown in figure 59. The figure shows that those with household size between 1 and 4 and above 10 household members are 12.5% and 12.5% respectively. Seventy-five percent of the consumers have household members ranging between 5 and 10 with 59% of this having household size of between 5 and 7 members.

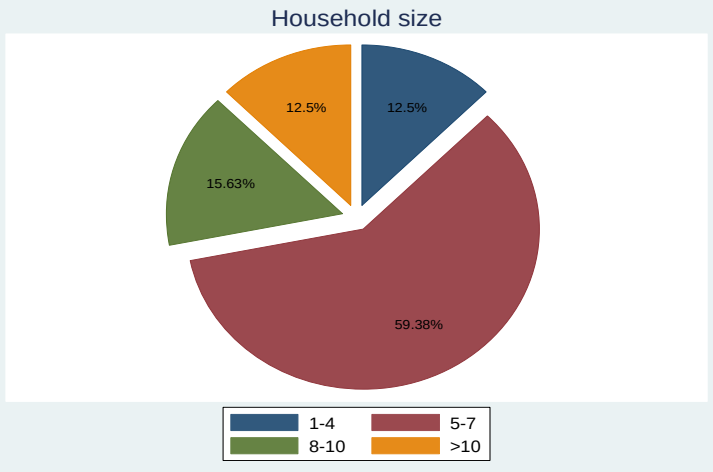

Figure 61: Household size of Plantain Consumers

Gender of Plantain Consumers

The gender of plantain consumers in the study area is shown in Figure 60. The figure shows that of the total consumers interviewed, there are 38% males while the female represents 62%. This indicates that there are more female consumers than their male counterparts in the study area.

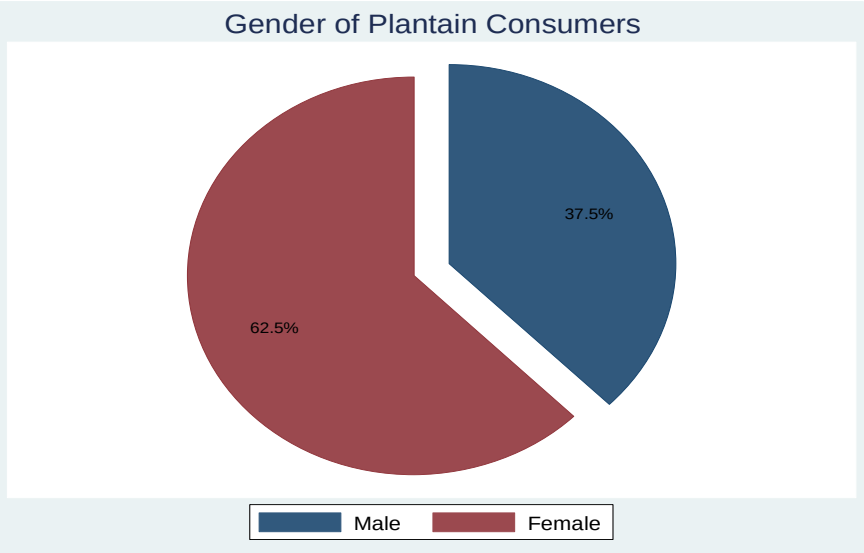

Figure 62: Gender of Plantain Consumers

Marital Status of Consumers

The marital status of plantain consumers in the study area is shown in Figure 61, where 66% of the consumers are monogamously married and 22% are polygamously married. Nine percent are single while 3% are widowed. A total of 86% of the consumers are married and living with their spouse(s) which in part explains the large household size as seen in Figure 60 above.

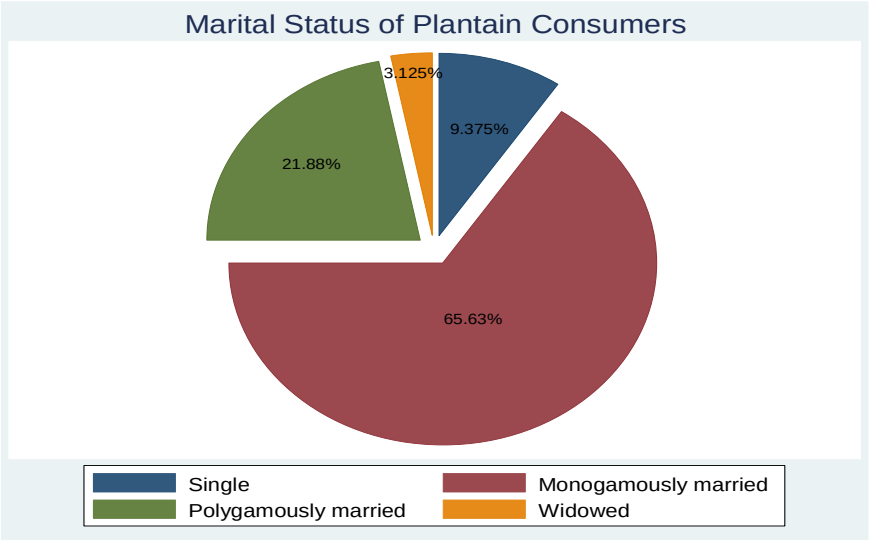

Figure 63: Household size of Plantain consumers

Types of Plantain Consumers

The type of plantain consumers based on location is shown in Figure 62. The figure shows that of the total consumers interviewed, 87.5% are village consumers having proximity to farms where plantain is produced while the remaining 12.5% are city consumer. The type of consumer is important in terms of frequency of consumption, availability of plantain as well as the price of plantain products.

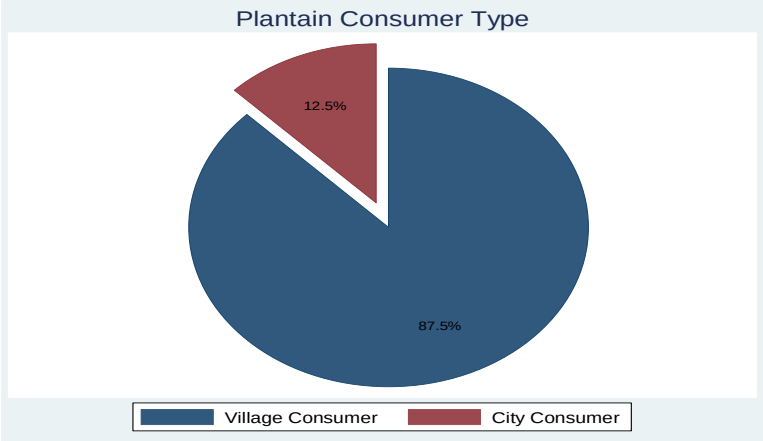

Figure 64: Types of Plantain Consumers

Income Sources of Consumers

The various income sources of plantain consumers are shown in Figure 63. From the figure, farming occupies the highest source of income as about 47% of the consumers get their income from farming activities. Twenty percent of the consumers get their income from trading activities while those whose income comes from teaching, tailoring and processing activities are 8%, 7% and 4% respectively.

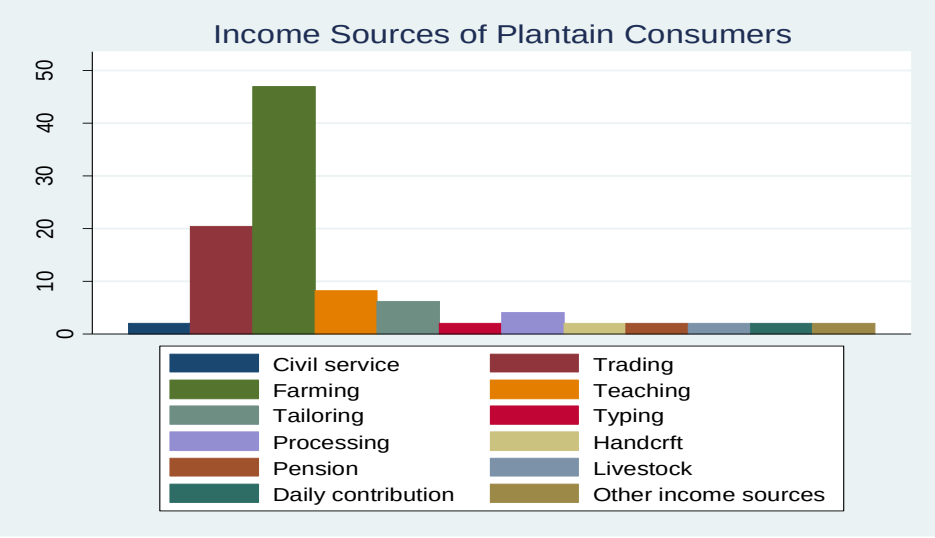

Figure 65: Income Sources of Plantain Consumers

Household Expenditures of Plantain Consumers

Figure 64 shows the household expenditures of plantain consumers interviewed. The figure reveals that expenditure on food takes the largest share of household expenditures, closely followed by education, transportation, clothing and expenditures on soap respectively. The high expenditure on food by household is expected to have implication on plantain consumption by the households.

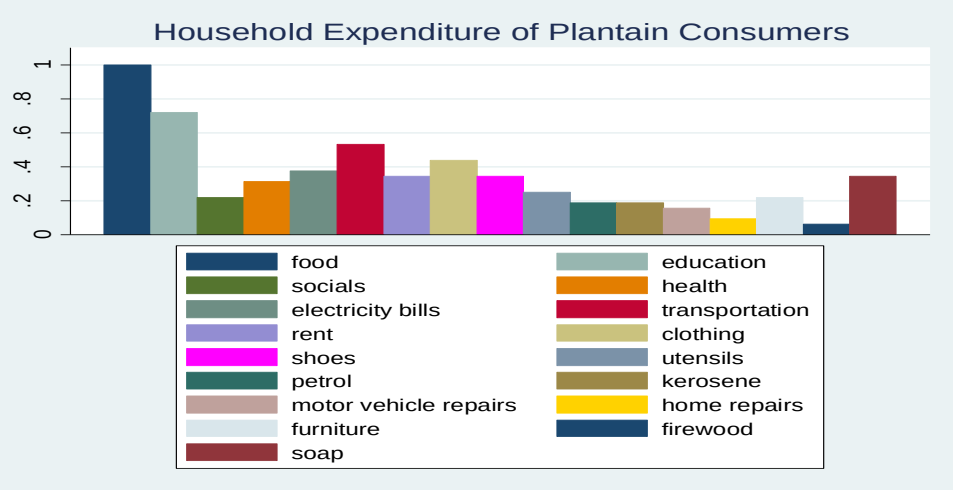

Figure 66: Household Expenditure of Plantain Consumers

Plantain Products Consumed by Plantain Consumers

The various plantain products consumed by consumers are shown in Figure 65. The figure shows that for village plantain consumers, the mostly consumed plantain product is fried ripe plantain (Dodo) and cooked plantain. These are followed by plantain chips (Ipekere) and then roasted plantain (boli). Although plantain flour is consumed by village consumers, it is not however consumed as much as the other forms of plantain. The figure further reveals that city plantain consumers also consume fried ripe plantain (Dodo) more than other forms of plantain while cooked plantain, plantain chips and plantain flour are consumed at equal rate. Roasted plantain is not consumed as the other three plantain products by city plantain consumers. It is also seen from the figure that city plantain consumers consume fried ripe plantain (Dodo), plantain chips (ipekere) and plantain flour more than village consumers while village consumers consume cooked plantain and roasted plantain more than city plantain consumers.

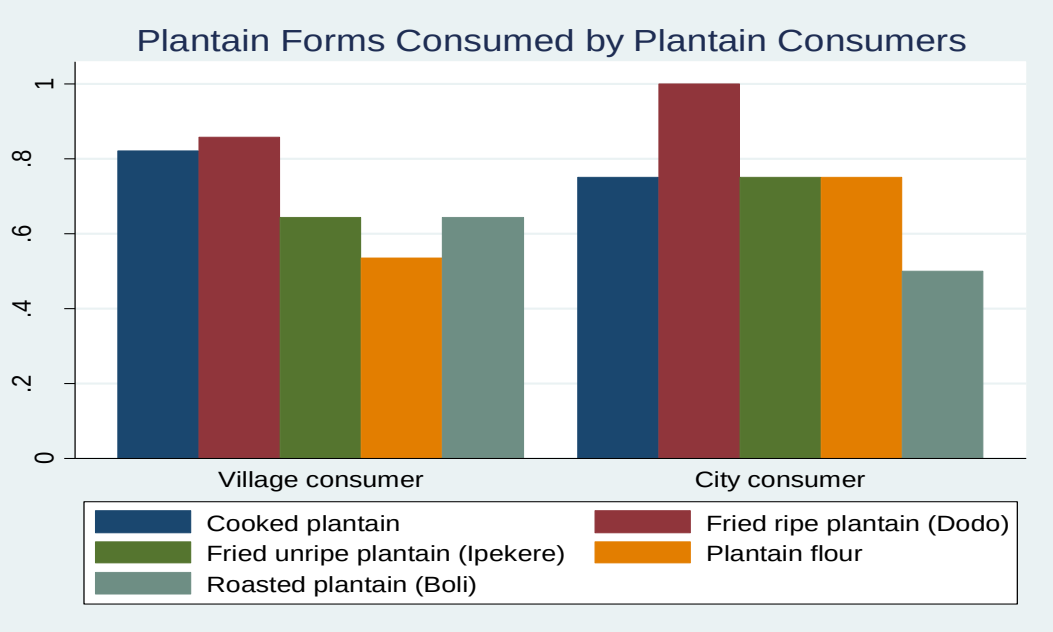

Figure 67: Plantain Products Consumed by Plantain Consumers

The consumption of plantain products across the three states of study is shown in Figure 67. The figure reveals that fried ripe plantain is consumed more in Oyo state. In Osun state, fried ripe plantain, cooked plantain and plantain flour are consumed equally by plantain consumers. However, in Ondo state, consumers consume more of cooked plantain than other forms of plantain. Plantain flour is the least consumed plantain form in Oyo and Ondo states while roasted plantain is the least consumed plantain form in Osun state.

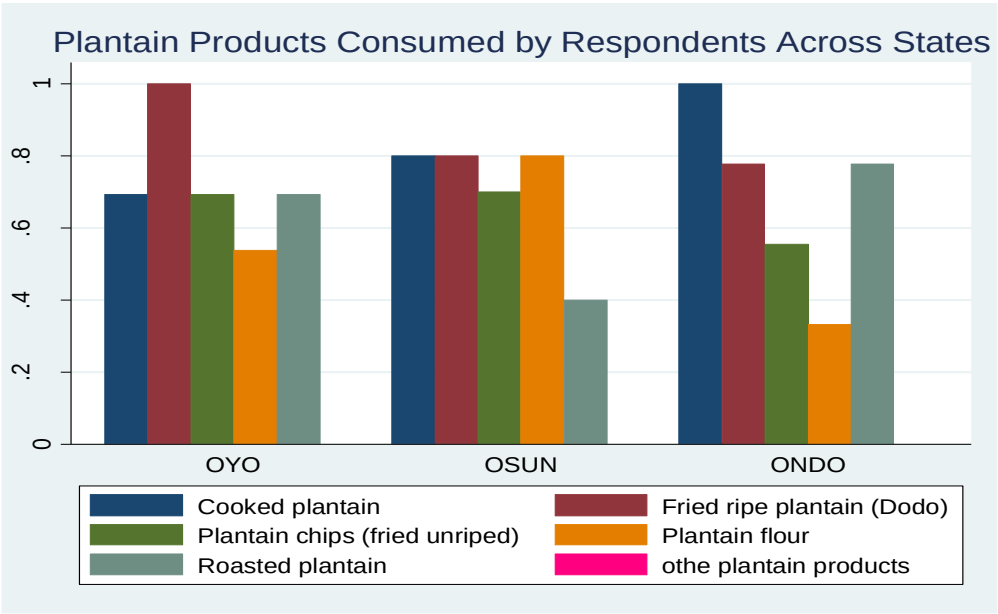

Figure 68: Forms of Plantain Consumed by State

Consumers Reasons for Consuming Plantain

The reasons giving by plantain consumers for consuming plantain are shown in Figure 68. The various reasons given by consumers interviewed were grouped into four major heads and the figure reveals that most consumers consume plantain because they believe it is nutritious, representing 43.33%. This is closely followed by consumers' consideration of the taste of plantain as represented by 28.33%. Others consideration for consuming plantain are health (medicinal value) as well as culture representing 13.33% and 15% respectively.

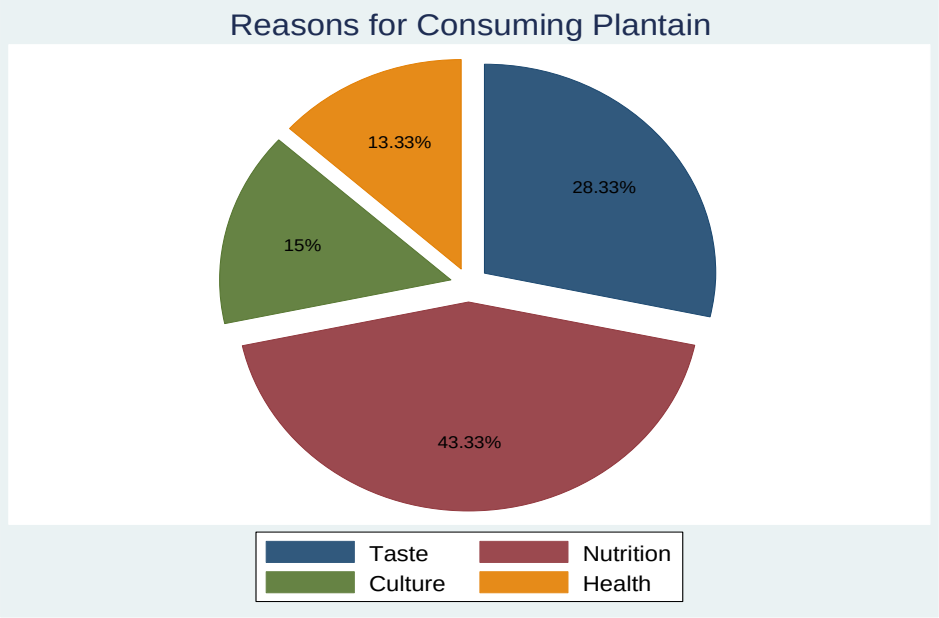

Figure 69: Reasons for Consuming Plantain by Plantain Consumers

A further look at the reasons for consuming plantain as given by consumers across the three states of study is shown in Figure 69. The figure reveals that in Oyo state, nutrition and taste considerations are the major reasons why consumers consume plantain while in Osun state consumers of plantain consider mostly nutrition and health (medicinal value of plantain). In Ondo state, however, consumers pay more attention to nutrition and taste in consuming plantain. Across the states, nutrition stands out as the major consideration in all the three states and it is highest in Osun state. Health (medicinal value of plantain) is the least considered reasons for consumers in Oyo state while in Osun and Ondo states, the culture of consuming plantain is the least consider reason. However, of the three states, Ondo state leads other states in the consideration of culture for consuming plantain.

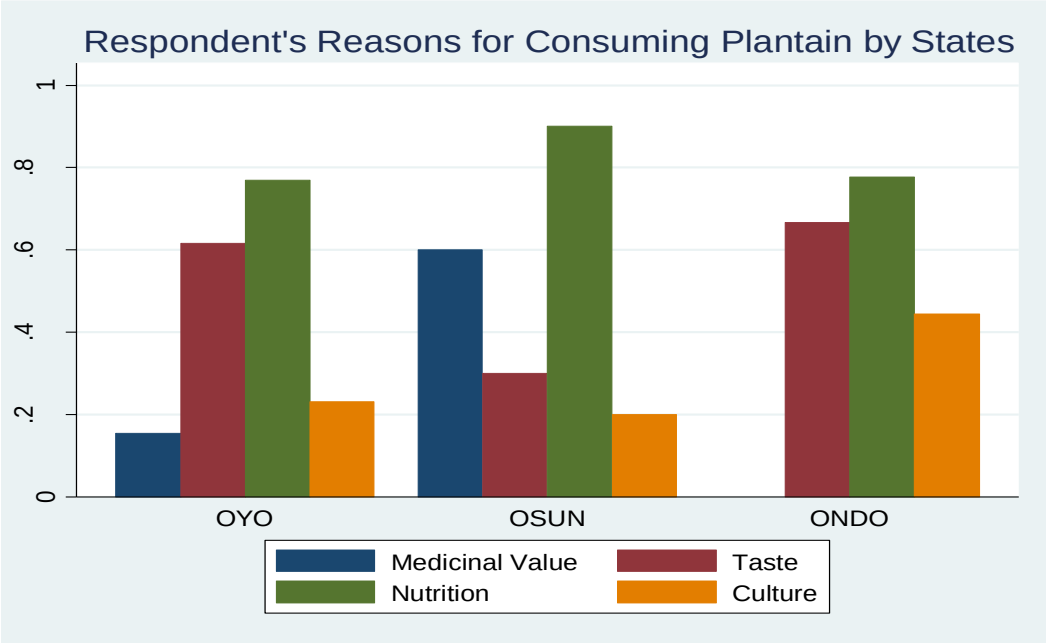

Figure 70: Reasons for Plantain Consumption by State

Plantain Prepared at Home by Consumers

The various forms of plantain prepared by consumers in their households is shown in Figure 70. The figure reveals that fried ripe plantain is the plantain form mostly prepared by consumers in their households and this is followed by cooked plantain. Plantain flour comes in third place followed by roasted plantain. Plantain chips (fried unripe plantain) is the least plantain form prepared at household level as it is easily sold along major roads in the Southwest and can be purchased and consumed as snacks.

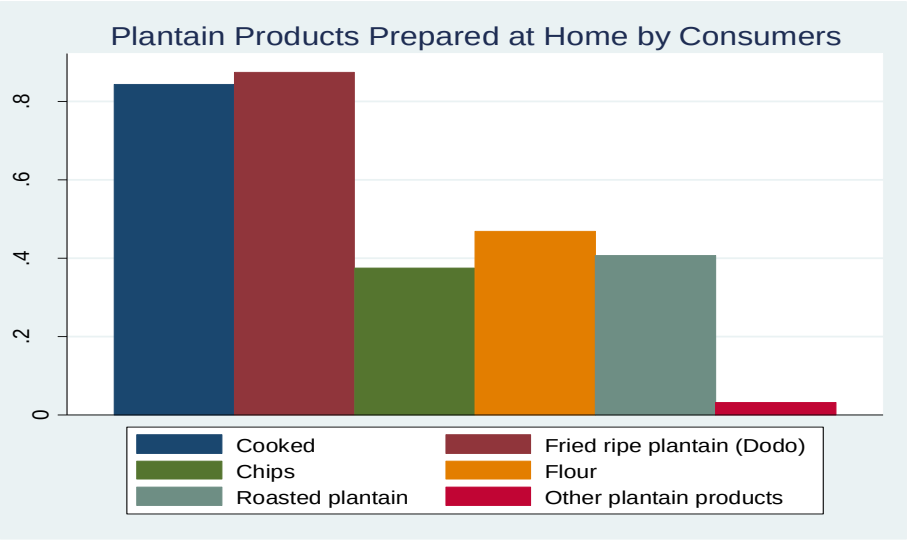

Figure 71: Forms of Plantain Prepared at Home by Consumers

Figure 71 further shows plantain forms prepared at home by consumers across the three states of study. In Oyo state, fried ripe plantain (Dodo) is the mostly prepared plantain form at home by consumers, followed by cooked plantain. However, in Osun state, both fried ripe

plantain and cooked plantain are prepared at the same rate in consumers household and they are the mostly prepared at home in the state, followed by plantain flour. Cooked plantain is the mostly prepared at home in Ondo state, followed by roasted plantain. Plantain flour and plantain chips are the least prepared at home in the state.

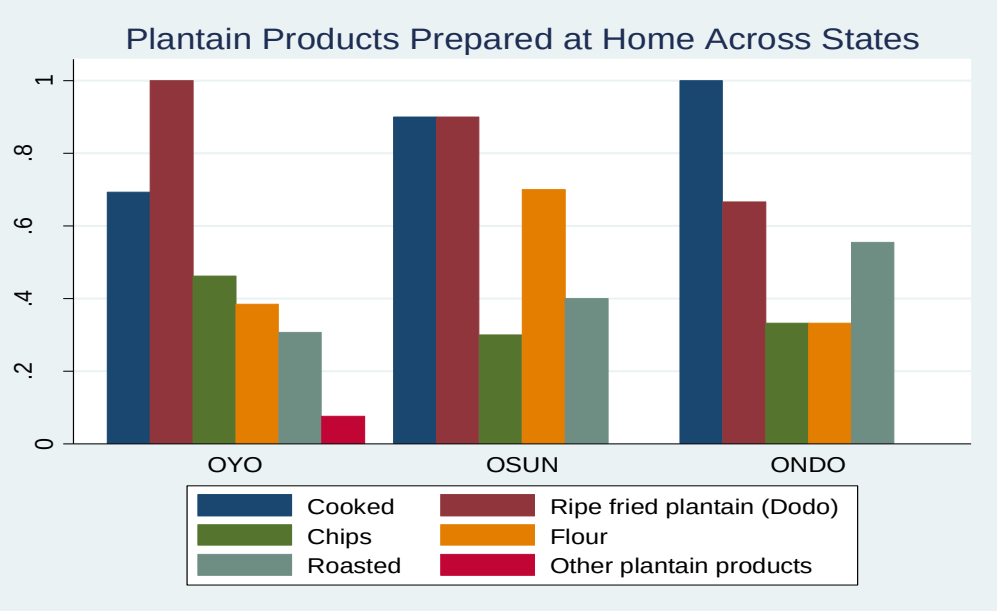

Figure 72: plantain forms Prepared at Home across States

Preference for Plantain Products

Consumers' preference for the various forms of plantain is shown in Figure 72. The figure reveals that across the Southwest region, fried ripe plantain is the most preferred by consumers both in the village as well as in the city as seen in Figure 66 above. Following in line is cooked plantain and it is mostly with plantain flour coming in third place while in the fourth place is roasted plantain. Fried unripe plantain chips and other forms of plantain such as, mashed fried plantain are least preferred by consumers in the perking order. However, plantain chips are preferred as snacks compared to other forms of plantain.

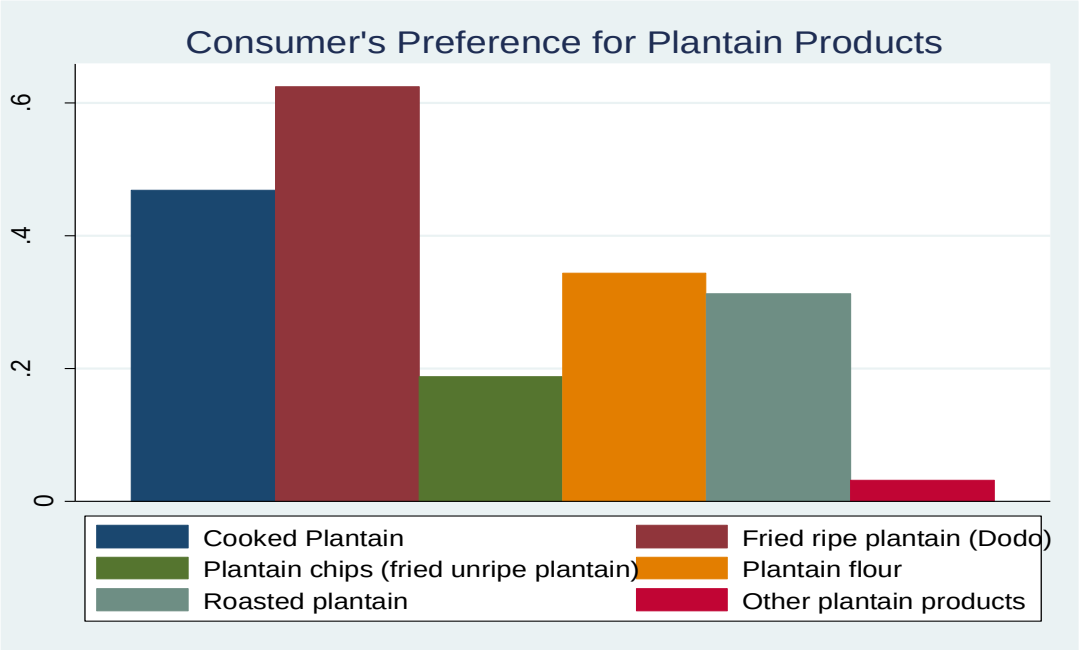

Figure 73: Consumer Preference for Plantain Products

Summary Statistics on Plantain Consumption

Table 23 shows that mean weekly expenditure on the various forms of plantain by consumers in the study area is ₦455.65 ± ₦226.43 with the weekly minimum amount spent on plantain being ₦100 and the maximum weekly expenditure being ₦1000. The average income proportion spent on plantain by consumers is 3.25% ± 1.98% with the minimum proportion being 1% and maximum being 8% of the income of consumers. The table further shows that the average price per bunch is ₦512.5 ± ₦175.51 with the minimum price being ₦200 and the maximum price paid by consumer per bunch being ₦1000. The average number of time consumers consumed plantain per week is 3 times weekly with a minimum of once per week and maximum of 7 times per week.

Table 23: Summary Statistics on Plantain Consumption

Plantain Consumers	Mean	Standard. Dev.	Minimum	Maximum
Weekly expenditure on plantain	₦455.65	₦226.43	₦100	₦1000
Income proportion spent on plantain	3.25%	1.98%	1%	8%
Price per bunch	₦512.5	₦175.51	₦200	₦1000
Number of times consumed per week	3	1	1	7

Frequency of Plantain Consumption

The frequency with which plantain is consumed by both the village consumers and the city consumers is shown in Figure 73. The figure reveals that the number of time plantain is consumed weekly is more in the city than in the village. This indicates that the frequency of plantain consumption in a week among city consumers is higher than that of village consumers

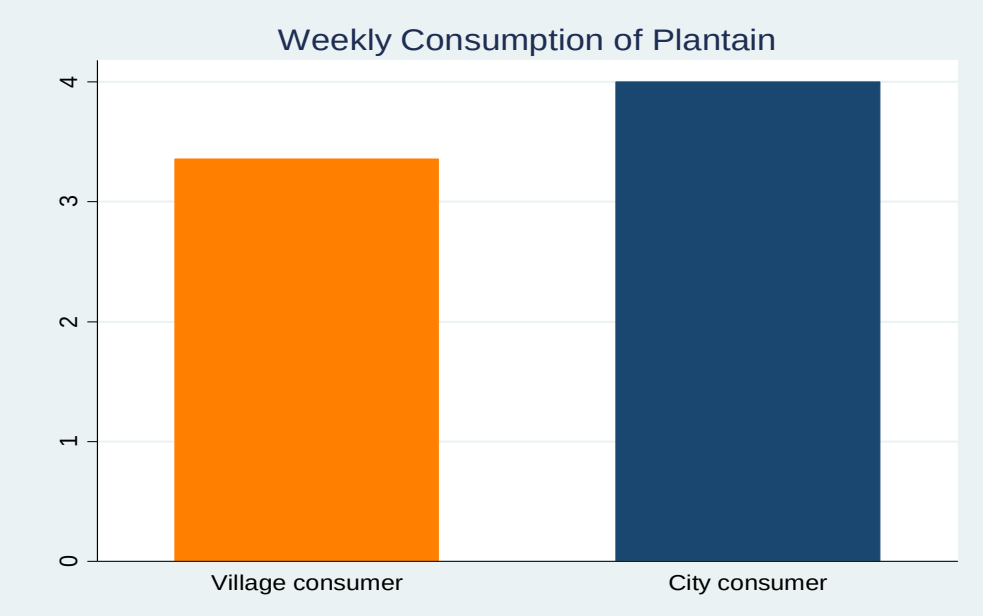

Figure 74: Weekly Consumption of Plantain

Source of Raw Plantain

The various places where consumers get raw plantain for purchase is shown in Figure 74. The figure shows that for village consumers, they get their raw plantain mostly directly from the farmers followed closely by local market in their neighborhood. They also purchase raw plantain from hawkers and retailers. However, city consumers get raw plantain mostly from the markets in their neighborhood and few of the consumers purchase directly from plantain retailers.

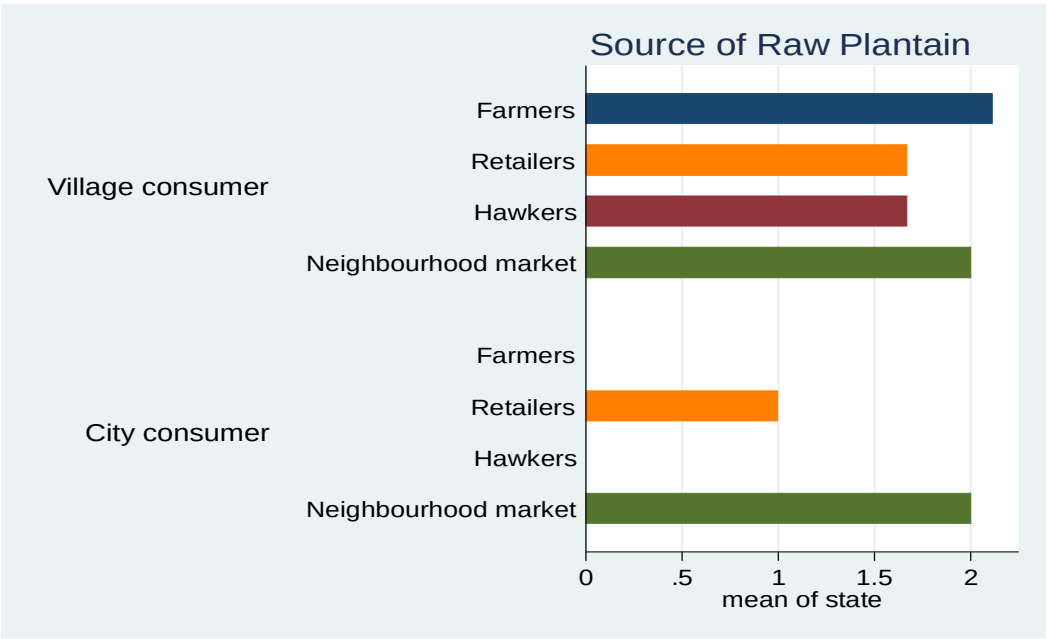

Figure 75: Source of Raw plantain for Consumers

Summary and Conclusion

Summary

Plantain Producers

Plantain production is mainly dominated by males who are monogamously married with an average household size of 7. The mean age of the farmers is 49 years ± 13 years with Osun state having older farmers and majority has at least primary school education. The average farm size is less than I hectare (0.67ha). Majority of the farmers (82%) belong to farmers association while 64% also belong to cooperative societies. Most of the farmers (90%) need finance in the form of credit in carrying out their plantain production. However, only 34% have access to various forms of credit for production, hence, personal funds are mostly used in their production. Study results show that of those who got credit for their production activities, close to half (46%) of them got their credit facilities from cooperative organization, making cooperative society a major source of credit to farmers in the study area. Results further suggests that majority (about 90%) of the farmers require about ₦180,000 to fill the financing gap being presently experienced so as to produce at the frontier level. However, the mean credit amount per season that farmers in the study area had access to was, ₦13,215. Majority of the farmers (63%) do not have off-farm income and thus depend solely on income accruing from their farm. Access to credit among the farmers was positively influenced by their need for credit, the value of their asset and membership of cooperative society while credit procedure and interest charged on credit negatively impacted on access to credit by farmers. However, the amount of credit eventually gotten by the farmers was positively influenced by the need for credit and land ownership.

The average technical efficiency of plantain producers in the study area is 0.53 with a standard deviation of 0.13 and the average quantity of bunches produced annually by farmers is 617 bunches with a standard deviation of 438 bunches, while the mean annual income from plantain production by the farmers is ₦304,369.8 with a deviation of ₦287,404.5. Plantain farmers cultivated plantain majorly for the income it generates for the household as the greater majority of the farmers (94%) sell their plantain than consumed at the household. Motorcycle is the most used mode of transportation by the farmers, as majority (63%) use motorcycle in transporting plantain from their farms to the major points of sales before vehicles are used by purchasing marketers. The major factor that the farmers consider in determining price of their plantain is the period of the year (off-season and on-season) and the major constraints faced by these plantain producers is finance in the form of credit, representing 46%. This is closely followed by the menace of pest and disease representing 16%.

Plantain Marketers

Plantain marketing in Southwest involves mainly the marketing of fresh plantain, plantain chips and plantain flour. Plantain marketing in the southwest is largely dominated by the

female gender as represented by 96% in the study and result further shows that majority of the marketers(60%) are below the age of 40 years with most of them (72%) being monogamously married. The greater majority (80%) of the marketers had at least primary school education, 76% of them have household of between 4 and 7 members and many of the marketers (62%) belong to marketer's associations. Study further showed that vast majority of the plantain marketers (about 91%) are involved in marketing fresh plantain, about 7% are involved in marketing plantain flour while those who market plantain chips are only about 2%. Many of those involved in plantain chips marketing are young men, representing 4% of the marketers. Many of the marketers are involved in plantain marketing mainly because of its market acceptability, easy sales and the quick income it generates. Majority (76%) of the marketers use personal funds in their plantain marketing business and 70% of the marketers use vehicular transportation to move plantain especially fresh plantain to their points of sale or major markets. Close to half (47%) of the marketers depend heavily on the season or the period of the year in determining the price of their plantain product. This is more common with fresh plantain and plantain flour. Following closely, is the marketing cost incurred by the marketer.

Plantain flour marketers have the highest mean annual net income (₦97,000) closely followed by fresh plantain marketers (₦84,015.96) and then marketers of plantain chips (₦72,700). Also, in terms of marketing efficiency, plantain flour has the highest market efficiency (2.22) followed by fresh plantain (1.58) while plantain chips has the least efficiency in terms of marketing. Lack of finance is the most limiting (46%) amongst the other constraints as many of the marketers complained of not having enough funds to do the business as they would have loved. This is followed by the challenge of irregular supply (18%) of plantain which is caused by the seasonal nature of the crop

Plantain Processors

Plantain processors in the study area consist majorly of micro-processors who are involved in processing plantain to prolong the shelf life of the crop. Plantain processing is largely dominated by the female gender as represented by 93%. Majority (83%) of the processors are below the age of 50years with 74% having at least primary school education. Majority (71%) of the processors are monogamously married with 73% having household size ranging from 1 to 7. The most common plantain product processed by plantain processors are plantain chips, plantain flour and, roasted plantain. Market acceptability and improved shelf life of plantain are the major motivating factors for plantain processors to be involved in plantain processing. More than half (52%) of plantain chips processors sell their plantain chips mostly directly to individual buyers and 68% of plantain flour buyers are individual consumers. Plantain flour processors have the highest net annual income (₦146,470) followed by plantain chips processors (₦113,600), while roasted plantain processors have the least (₦57,500) net annual income. The average monthly cost incurred by plantain processors is highest for chips processors (₦7,175.80) followed by plantain flour processors (₦6,705.56), while roasted plantain processors have the least cost (₦3,538.75). However, plantain flour processors have

the highest monthly profit (₦12,824.35) followed by plantain chips processors (₦10,225.80) and then roasted plantain (₦6,874).

Most of the processors get their fresh plantain from itinerant bulk gatherers who go from farm to farm to gather plantain into bulk and then sell either at a specific location near the farms or at the local market. Majority (46%) of the processors got their funds from loan obtained from cooperative society while 30% of the processors are using their personal funds in the plantain processing business. Financial constraint in the form of lack of credit facilities is the highest constraint faced by plantain processors, followed by irregular supply of fresh plantain upon which the processors depend heavily for their business.

Plantain Consumers

Plantain consumers consist of those who consume plantain products in its various forms. Half of the consumers interviewed are from 40 years and below while the remaining half is above 40 years of age with 94% of them having at least primary school education. Sixty-three percent of the consumers are females with the remaining being males a total of 86% of the consumers are married and living with their spouse(s). Majority of them (75%) have household members ranging between 5 and 10. Also, majority (87%) of the consumers are village consumers while the remaining are consumers who dwell in cities across the study area. Close to half (47%) of the consumers, farming occupies the highest source of income. Expenditure on food takes the largest share of household expenditures, closely followed by education. Study shows that the mostly consumed plantain products by consumers is fried plantain (Dodo), followed by cooked plantain mostly by village consumers. However, city plantain consumers consume fried ripe plantain (Dodo), plantain chips (ipekere) and plantain flour more than village consumers while village consumers consume cooked plantain and roasted plantain more than city plantain consumers. Majority of the consumers (43%) consume plantain because they believe it is nutritious, closely followed by those (28%) who consume plantain because of the taste. Fried ripe plantain is the plantain form mostly prepared by consumers in their households and this is followed by cooked plantain.

The mean weekly expenditure on the various forms of plantain by consumers in the study area is ₦455.65 and the average income proportion spent monthly on plantain by consumers is 3.25%. The average price per bunch is ₦512.5. The frequency of plantain consumption weekly among city consumers is higher than that of village consumers. Village consumers get their raw plantain mostly directly from the farmers followed closely by local market while city consumers get raw plantain mostly from the markets in their neighborhood and others purchase directly from plantain retailers.

Conclusion

It can be concluded from the results of this study that plantain production in the study area is largely small scale and constrained majorly by lack of finance in the form of credit for the farmers to embark on large scale plantain plantations. Plantain producers have relatively small sized and transportation remains a challenge as most of the farms lack motorable roads which impacts negatively on production as most of the plantain gets spoilt right on the farms. The

provision of microcredits would have positive impact on improved production of plantain in the region.

Plantain marketing in the study area involves marketing of fresh plantain, plantain flour as well as fried ripe and unripe plantain chips. The marketing of plantain is dominated by females who are financially constrained and depend on their meager personal funds, especially for fresh plantain marketers. The lack of finance coupled with irregular supply of plantain, especially during off season, affects the volume of plantain marketed. Transportation of fresh plantain remains a major challenge for fresh plantain marketers resulting to losses and hence reduced profit. Availability of vehicles specially designed for transportation would go a long way in reducing marketer's losses and ensure improved income. Marketing of plantain flour is more profitable and efficient and should be encouraged especially during off-season when fresh plantain is scarce.

Plantain processing in the study area is largely done by micro-processors who use crude methods of processing as they are also constrained by finance to be able to access modern means of processing plantain and thus produce less volume of processed plantain. The processors are largely women and they help in solving the challenge of quick ripening and spoilage of plantain by processing it into plantain flour and unripe fried plantain chips. There is a need for a concerted effort to provide these processors with modern processing equipment. This will encourage further production and ensure employment as well as improved income for the various actors in the plantain value chain.

Plantain consumption cuts across various status and age grade and this makes plantain an important food security crop in the study area. It is mostly consumed at home as fried ripe plantain (dodo) and in the cooked form. Plantain flour consumption is more common in the cities across the region due to its perceived health benefits while unripe fried plantain chips serves as snacks easily consumed by city dwellers as well as travelers across the study area. The perceived nutritious values, as well as taste of the various forms of plantain product are the main drivers of plantain consumption.

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