

## Plantain Value Chain Mapping in Southwestern Nigeria

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### Abstract

Understanding relationships, opportunities and bottlenecks in a commodity value chain is crucial to the determination of the contribution of a commodity to economic development. The objective of the study was to Map Plantain Value Chain in order to identify the key players, their roles, value added along the chain as well as constraints. Personal Interview and Focus group discussions were used to collect primary data from the actors along the chain. Data were analyzed using descriptive statistics and Value added analysis. The study identified conventional and peculiar actors such as Input suppliers, Producers, Farm-Gate Assemblers, Market-Arena Assemblers, Insitu Wholesalers, Transit Wholesalers, Processors, Retailers and Consumers. The study revealed tremendous dominance of the Midstream sector in the commodity value chain and that Value addition, volume of trade and geographical coverage indices were highest at the midstream sector. The result revealed also that Plantains were traded mostly in unprocessed form and there was low level of export of the commodity. Producers sold most of their product (55%) at the farm gate. Horizontal flow of the commodity was prominent among the actors. Value added at processing level was estimated at ₦111/kg of processed product. The cross cutting constraints among the actors were inadequate credit accessibility, high transportation cost, inadequate market access and inadequate storage facilities amongst others. The study recommends intervention in the area of linking actors in the value chain to prospective markets for them to benefit from the various activities.

**Keywords:** Plantain, Value Chain Map, Value Chain Actors, Value Added, Southwestern Nigeria.

### Background

Plantain is one of the most important horticultural crops and it is among the ten most important food security crops that feed the world (USDA, 2012) and has always been an important staple food for both rural and urban populace (CBN, 2003). Plantain is a versatile food in the kitchen as well as a raw material for many popular delicacies and snacks (Aina *et al.*, 2012). It is among the foremost sources of carbohydrates in humid tropical Africa and contained 35% CHO, 0.2 to 0.5% fats, 1.2% protein, and 0.8% ash (IITA, 2009). Plantains have the potential to contribute to strengthening national food security and decreasing rural poverty (Adejoro *et al.*, 2010). Available trade records and associated indices showed that Nigeria is one of the largest producers of plantain in the world (FAO, 2013). She ranked first in Africa and fifth in the world producing 2,722,000 metric tonnes in 2011 (FAO, 2012). 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.

Value chain can be defined as the full range of activities and participants involved in moving agricultural products from input suppliers to farmers' fields, and ultimately, to consumers (Miller and Jones, 2010). Value chain approach presents a good picture of the process of creating value. Value chain analysis helps in understanding of connection among actors in the chain and the way trade takes place. An agricultural value chain is considered as an economic unit of analysis of a particular commodity or group of related commodities that encompasses a meaningful grouping of economic activities that are linked vertically by market relationships (Getachew, 2012). The first step in value chain analysis is mapping of the core processes and activities in the chain (Mmasa and Msuya, 2011). Value chain mapping is the process of developing a visual depiction of the basic structure of the value chain. Value chain map illustrates the way the product flows from raw material to end markets and presents how the industry functions (McCormick and Schmitz (2001). Visualizing networks will give a better understanding of connections between actors and processes in a value chain, demonstrate interdependency between actors and processes in the value chain and create awareness of stakeholders to look beyond their own involvement in the value chain (Michael *et al.*, 2010).

Most studies on Plantain in Nigeria have been on Production (for example, Baruwa *et al.* (2011), Kainga and Seiyabo (2012) Agronomy (Shaibu *et al.*, 2012, Echezona *et al.*, 2011), Marketing (Oladejo and Sanusi 2008), Processing and Post Harvest losses (Ladapo and oladele 2011, Folayan and Bifarin, 2011). These studies examined Economics of Production of Plantain, Marketing, Processing and Post harvest losses at farmers and wholesalers levels. During the peak season of production, the level of returns to investment at production level has been reported to be low. This may be due to high level of supply which cannot be absorbed by the market. This indicates low level of processing of the commodity; the excess fresh fruits are not being converted to processed products with longer shelf life. To the best of the author's knowledge, there were little or no efforts on the need to visualize network and key activities in the Plantain Value Chain. This study therefore intends to

fill the gap by identifying the key actors, flow and volume of products and value added at each stage of the Plantain Value Chain in Southwestern Nigeria. The constraints at the different level of the chain were also examined.

### **Conceptual Framework**

Value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to final consumers, and final disposal after use (Kapslinky and Morris, 2000). Value chain promotion is an effective way of fostering rural-urban linkages and the concept provides a useful analytical framework for market and sub-sector analysis (ECAPAPA, 2006). The concept of Value chain is discussed from three distinct traditions: the French 'Filière concept', Porter's concept and Wallerstein's concept of Global commodity chain (Raikes *et al.* 2000). The Filière is used to describe the flow of physical inputs and services in the production of a final product, and is essentially similar to the modern value chain concept (Melle, 2007).

The second concept related to value chain is that of Porter (1985). Michael Porter was the first to use the term value chain in the 1980's. He defined the value chain as the various activities which were performed in particular links in the chain. Porter distinguished two important elements of modern value chain analysis and the various activities which were performed in particular links in the chain. He drew the distinction between different stages of the process of supply (inbound logistics, operations, outbound logistics, marketing and sales, and after sales service), the transformation of these inputs into outputs (production, logistics, quality and continuous improvement processes), and the support services the firm marshals to accomplish this task (strategic planning, human resource management, technology development and procurement). He opined that the importance of separating out these various functions is that it draws attention away from an exclusive focus on physical transformation. Confusingly, Porter refers to these essentially intra-link activities as the value chain.

A third concept which has been used to describe the value chain is that of global commodity chains, introduced into the literature by Gereffi during the mid-1990s. Gereffi's contribution has enabled important advances to be made in the analytical and normative usage of the value chain concept, particularly because of its focus on the power relations which are imbedded in value chain analysis (Gereffi *et al.* 2004).

### **Methodology**

#### **Study Area**

The study was carried out in Southwestern, Nigeria. The zone was chosen because of its status as one of the major plantain growing areas in the country. Large volume of plantain is traded in urban centres located in the zone (NPAFS, 2009). Also, the prospect for value addition is promising due to the presence of emerging processing industries. The zone is made up of six states namely Lagos, Oyo, Ogun, Osun, Ekiti and Ondo States. It falls on latitude 6° to the North and latitude 4° to the south. It is marked by longitude 4° to the west and 6° 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 kilometres square land area. The total population is 27,581,992 and predominantly agrarian. Major food crops grown in the area include cassava, cowpea and yam (NPC, 2006).

**Sources and types of data:** Primary data were utilized for this study. Primary data were obtained through the use of pretested questionnaire and Focus Group Discussions. Primary data were collected from agents of the value chain including producers, marketers and processors. The primary data collected include: quantity of plantain produced, marketed, processed, flow of the product, volume of product in the flow, quantity of input and output at the different stages in the chain, market prices for inputs and outputs, as well as associated constraints and opportunities in the chain.

#### **Sampling procedure and Sampling size:**

The study employed multistage sampling technique. In the first stage of the selection two Local Government Areas (LGAs) were selected based on the intensity of plantain production from Oyo, Osun, Ogun, Ondo and Ekiti state. In the second stage, two villages were selected from each local government depending on the intensity of the production of the crop. Finally, farmers were randomly selected from each village based on proportional to size. This gave a total number of 280 producers. List of marketers were obtained from market leaders from which 150 marketers were randomly selected across the region. Processors of plantain flour and chips were randomly selected from the communities to constitute 100 processors for plantain products. A total of 530 respondents were interviewed representing each node of the value chain. Focus group discussions were carried out among the actors in the selected states.

**Analytical Procedure:** Data collected were analyzed using descriptive statistics such as frequency, percentage and tables. Value Chain mapping was analyzed using functional analysis. The core processes, actors involved, flow and quantity of product at each node of the value chain were determined. A flow chart was used to represent the activities in the value chain. Value added is the amount of wealth created by a player in the chain; it

is measured from net sales less the costs of bought-in goods and services (Brown *et al*, 2010).

Value added = (Total sales value) – (Value of intermediate goods)

Total sales value = price x volume of final product sold.

Following Oni (2013), Value Added is mathematically expressed as:

$$VA = PiQ_i - \sum_{i=1}^n riX_i$$

Where

$PQ$  =value of output

$rX$  = cost of raw materials and intermediate goods.

## Results and Discussion

### Key processes, Activities and Actors in Plantain Value Chain

The results of the analysis indicates that the key processes in Plantain Value Chain in Southwestern Nigeria are input supplies, Production, Assembling, Processing, Consumption and Export, while the key actors/players are input suppliers, producers, marketers (assemblers, wholesalers and retailers), exporters and consumers (Figure 1). Similar processes were also found by Ouma and Jagwe (2010) in traditional marketing channels for banana and plantain in Central Africa. They found that the Plantain Map in Central Africa consist a number of actors which also include input suppliers, producers, rural assemblers, two levels of wholesalers. The result is also in accordance with the findings of Grant *et al*, 2012. They found that the major functions in the maize value chain start with input supply, production, harvesting, postharvest handling, storage, marketing, processing and consumption. The processes in the Plantain Value Chain Map can be segmented further into three sectors namely:

- Upstream – Input supplies and production
- Midstream – Assemblers, Wholesalers, Processors and Exporters.
- Downstream - Retailers and Consumers.

A remarkable peculiarity of plantain value chain is the tremendous dominance of the Midstream sector. The midstream sector does not only influence the downstream sector through price regime, it has remarkable influence on the upstream sector through regime of demand and cartel activities. Value addition, volume of trade and geographical coverage indices are highest at the midstream sector. The major channels in the plantain sub-sector in the study area included sale of plantain at the farm gate and sales to Market- Arena Assemblers at the local market who in turn sell the produce to Insitu and Transit Wholesalers in the market.

### Key Players and their Functions

#### Input Suppliers

The input suppliers are responsible for procuring inputs from manufacturer's representatives and selling to farmers. Examples of such inputs are herbicides, pesticides, fertilizers, and plantain suckers, farm tools such as cutlasses and hoes. They also render advisory services to the farmers on the method of application of the various inputs. Most farmers (95%) in the study area source these inputs (Agrochemicals and tools) within their locality, while 5 percent source their input from urban metropolis such as Ibadan and Lagos. The Input Suppliers are also responsible for the provision of plantain suckers for some farmers (8%) while most farmers (92%) source suckers directly from fellow farmers. This agrees with the findings of Mmasa and Msuya, (2012) on Mapping of Sweet Potato Value Chain in Tanzania. They found that Input suppliers are not vertically integrated with producers and that farmers normally search seeds for planting from fellow farmers and not from recognized source/agent. The input suppliers play the least role in the chain. Inputs utilized are limited to basic tools (cutlass, files, hoes and sprayers) and limited quantities of Agrochemicals. Most farmers (65%) were not applying fertilizers of any kind. The communal exchange system of acquiring plantain suckers is another peculiarity of plantain value chain in the study area which has a reducing effect on the influence of input suppliers.

#### Producers

The producers are responsible for the production of plantain fruits. Their activities include establishment and management of the farm. Farmers in the study area are classified (based on scale of operation) into subsistence (13.46%), small scale commercial (68.08%), medium scale commercial (15.77%) and large scale commercial farmers (2.69%). This implies that majority of the farmers are small scale holders. This is similar to the findings of Raemaekers (2001) and TRIAS (2012), both studies confirmed that small-scale farmers were the main producers of banana in Africa. Farmers in the study area were intercropping plantain with a variety of crops. Major cropping systems identified were sole plantain (20%), Plantain and cocoa (40%), Plantain and Cocoyam (30%) and Plantain and Cassava (10%). The farmers in the study area were utilizing rudimentary implements in their production activities. Most of the producers (81.92%) obtained market and price information from their fellow farmers while the rest (18.08%) obtained price and market information from electronic mass media. It

was also observed that very few farmers (2%) export their commodity to other regional and international markets. Farmers are not benefiting from regional trade in the study area

### **Assemblers**

Many intermediaries were identified in the marketing process of plantain in south western Nigeria. It was discovered that there were two major types of assemblers in the plantain value chain: Farm-Gate Assemblers and Market-Arena assemblers. The Farm-Gate Assemblers collect and bulk Plantain from individual farmers. They handle 55% of total marketed plantain. This is similar to the findings of Ouma and Jagwe (2010) on Banana Value Chain in Central Africa. They found that Rural Assemblers play a major role of collecting and bulking banana from individual farmers and they handle 42% of total marketed cooking banana production in Central Africa. Selling at the Farm Gate prevent producers from bargaining for higher prices compared to when the commodity is taken to markets. The Farm gate assemblers buy at low prices which sometimes may not be commensurate with the efforts and input utilized in the production process. The Market-Arena Assemblers collate produce from the market and sell to wholesalers. The wholesalers on the other hand are of two types:

- In situ wholesalers
- Transit wholesaler.

The Insitu wholesalers resells his collections right in the market while the Transit wholesalers transports his commodity to metropolis such as Lagos, Ibadan, Abuja, Kano and Maiduguri because of attendant higher margin. From Transit wholesalers, Plantains are distributed to Consumer through the Retailers. The Farm-Gate Assemblers, Market-Arena Assembler and Insitu wholesalers in the study area collect and market on the average 2 tonnes of plantain per market day while the transit wholesalers collect and market on every five days 6-8 tonnes of plantain. The retailers sell in units to individual consumers. They ensure the commodity get to the consumer.

### **Processors**

Plantains in the study area are processed into different types of products such as plantain chips, plantain flour, plantain balls, and biscuits amongst others. The most popular plantain products in the study area are plantain flour and plantain chips. The processor buys directly from Assemblers and from the Producers. They operate on a small scale and rudimentary implements are being utilized in the processing business. Processed Plantain products are widely sold and accepted in the study area but little has been done on international standards and traceability.

### **Flow and Volume Movement in the Value chain**

The result of the analysis of plantain value chain mapping (Figure 1) indicated that farmers sells 55% of Plantain at Farm-gate to Farm-gate assemblers while the remaining were sold to Market-Arena assemblers (30%), Insitu-wholesalers (10%) and Transit-wholesalers (5%). Results also indicated that Farmers selling at the farm gate are receiving low price compared to farmers selling at the local market. Farm-gate assemblers sell to processors (5%), Insitu- wholesalers (10%), market-arena assemblers (30%) and Transit-wholesalers (10%). The market arena assemblers sell to in situ wholesalers (5%) and transit wholesalers (50%) and processors (5%). The in situ wholesalers sell to individual retailers (20%) who in turn sell to consumers within the locality. The transit wholesalers bulk the product for onward forwarding to urban areas such as Lagos and Ibadan, where they will be able to get higher prices. They sell 60% of the commodity to Retailers and 5% directly to consumers/ The Transit wholesalers facilitate the distribution of the commodity to retailers and consumers in the major metropolis. Processors on the other hand procure most of their raw materials from Farm-Gate assemblers (5%) and Market- Arena Assemblers (5%) and Insitu wholesalers (5%). They sell directly to wholesalers and Retailers. There is low level of export of the commodity in the study area (2%).

### **Value Added Along Plantain Value Chain**

Value added at the level of Producer is shown in Figure 2. Value added at Producer level is estimated at ₦33/kg. Labour cost constituted the major component of value added at producer's level and it represented 51.2%. Different values are also added by the different actors in the Plantain marketing chain. At farm-gate assembling level, value added accumulated to ₦18/kg, Market-Arena assemblers (₦14/kg), Wholesalers (₦36.5/kg) and Retailers (₦45/kg). Higher value added at Retail level was attributed to the fact that the Retail sells in units leading to higher value being added by the actor. Value added at the level of plantain chip processing was estimated at ₦107.3/kg and plantain flour was estimated at ₦114.6/kg with average value added of ₦111/kg at processing level.

### **Constraints along the node of Plantain Value Chain**

The major constraints encountered by Plantain farmers are shown in Table 2. The result of the analysis indicated that inadequate credit accessibility (81.5%), transportation (72.3%), storage (63.5%) and marketing (60%) were the major constraints militating against increased plantain production in south western Nigeria. In term of severity of constraints, credit accessibility was adjudged to be the most severe constraint (70%). This was followed by the road condition (61.2%) and market access (52.3%). Credit was a major constraint and most of

the farmers did not have access to flexible and affordable facilities during the production cycle. Most of the farmers source their credit from friends and relatives. Local banks are often reluctant to deal in Agricultural credit because of inherent risks and prospect of loss of investments. The problem of market access was critical during the peak season of production due to the large forces of supply that often leads to reduction in the price of the commodity. It was observed in the study area that cooperative and collective marketing were rarely practised. Land availability (90%) and corruption and pilfering (63.1%) were adjudged not to be severe in the area. Findings from this study are consistent with the findings of Ekunwe and Ajayi (2010, Kainga and Seiyabo (2012). They found that the major constraints faced by plantain farmers in Edo State and Bayelsa state were inadequate capital investment, transportation, labour, storage processing and finance.

#### **Marketing Constraints**

Table 3 gives the major marketing constraints encountered by the marketers. The results revealed that the major constraints were high transportation cost (87.5%), Absence of storage facilities (76%), and credit accessibility (75%). Moreover, other constraints limiting the marketing of Plantain were pilfering (30%), Manpower (35%), Training (26.7%). In term of the severity of the constraint, road condition was also adjudged the most severe constraints by the marketers (74.2%). This was followed by credit accessibility (28.3%) and pilfering (26.7%). The high transportation cost being the major factor limiting the marketing of plantain was attributable to poor condition of rural and sub-urban road networks in south western Nigeria. Storage being a constraint was attributed to the perishable nature of the commodity and low level of investment in marketing infrastructure.

#### **Processing Constraint**

The result of the analysis (table 4) revealed that the major constraints in plantain processing business were credit (82.9%), Training (53.7%), Manpower (39%). Other constraints were storage (34.1%), Transport (26%), Pilfering (2.4%). In term of severity of constraints storage facilities was the most severe, followed by credit facilities (24.4%). Result of this study is similar to the findings of Ekunwe and Atalor, (2007). They found that the major constraints of plantain processors were financial and labour constraints and marketing constraints

#### **Conclusion**

The study mapped Plantain Value Chain in Southwestern Nigeria to identify the actors, linkages, flow of product, value added and constraints at each node of the value chain. Results indicated that the key actors in Plantain Value chain were Input suppliers, Producers, Assemblers, Processors and Consumers. There is low level of export of the commodity in the study area and the dominance of the Midstream sector. Commodity was traded mostly in unprocessed form. Horizontal linkages were predominant in the value chain while the input suppliers played the least role in the Value Chain. The actors were involved in very low regional and international trade of the commodity. The result of the analysis indicated that Plantain was profitable at every stage of the value chain. Value added were higher at marketing level due to the number of intermediaries involved in the marketing.

#### **Recommendations**

Based on the result of the study, the following are recommended:

- Advocacy at actors levels to promote cooperative activities in order to enjoy the advantages of easy access to credit, collective marketing and economy of scale.
- There is the need to intensify advocacy to encourage the use of improved Planting Materials for better yield.
- Processing of the commodity to higher value product especially during the peak season to reduce the incidence of glut and post harvest losses.

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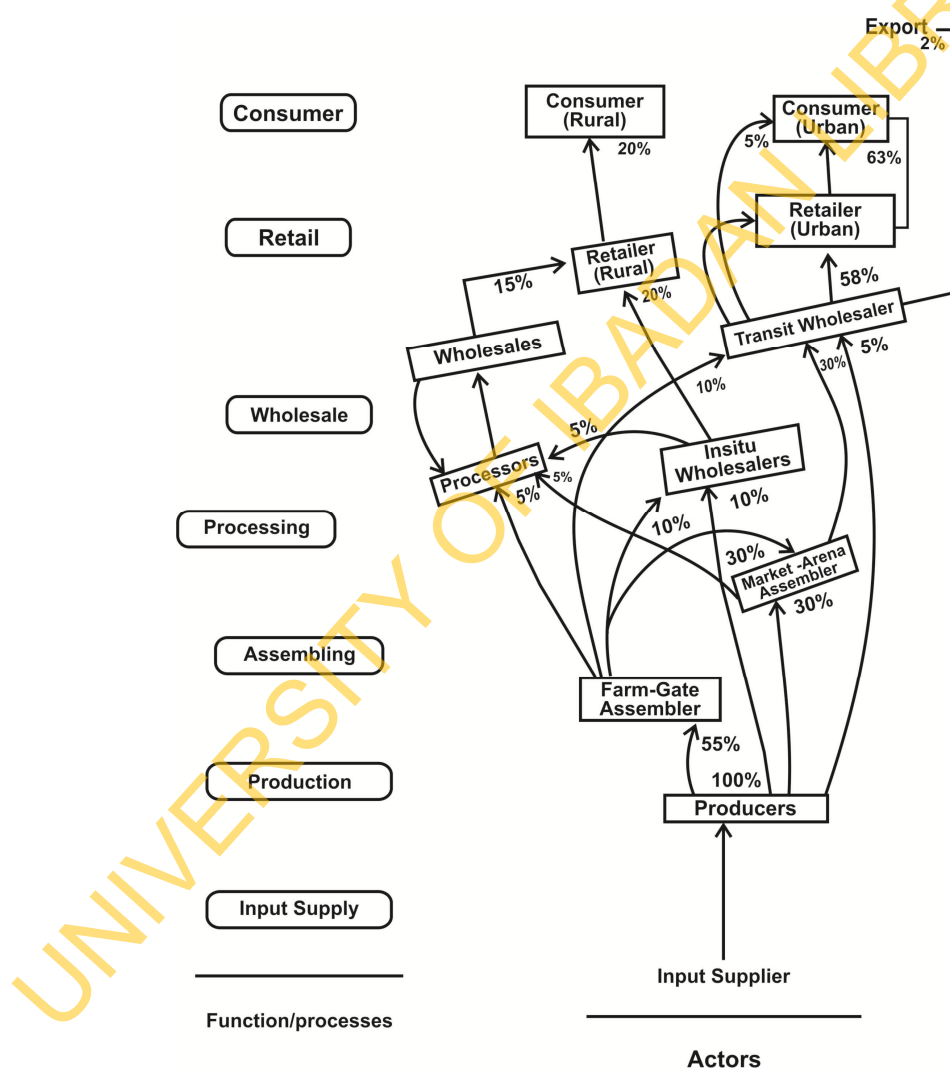
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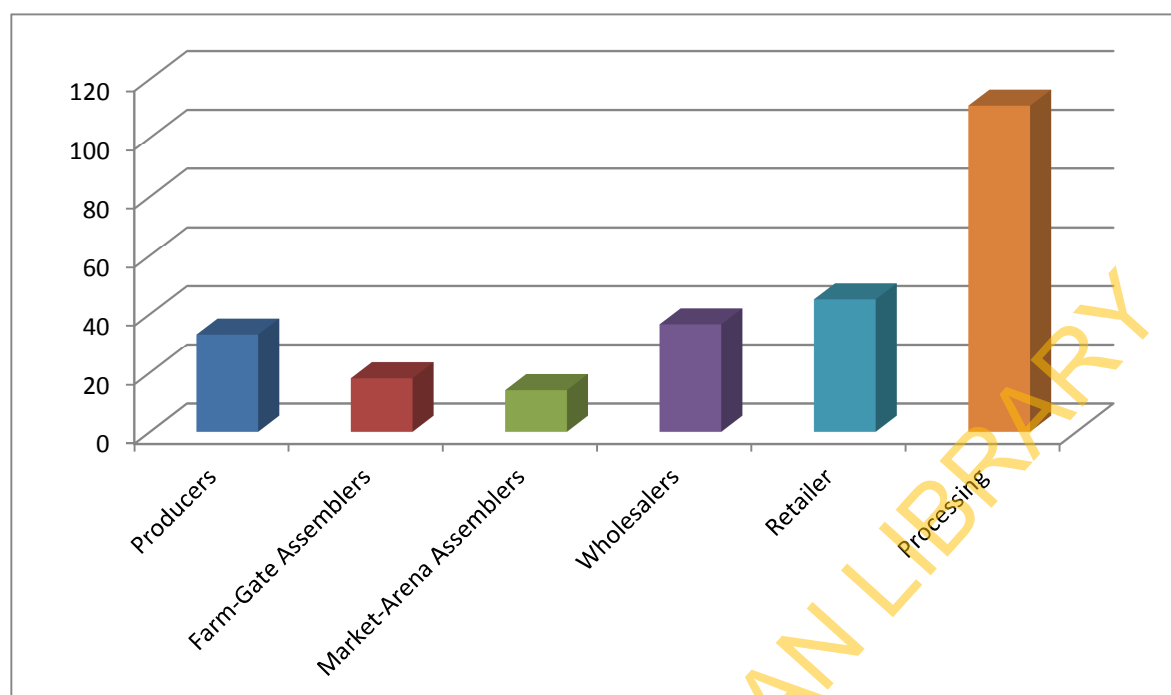
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**Fig. 1** Linkages, Flow and volume movement of plantain in South western Nigeria



**Figure 2: Value Added Along Plantain Value Chain.**

**Table 1: Key Players and their functions**

Variable	Percentage
<b>Source of inputs by farmers</b>	
Within locality	95
Outside the locality	5
<b>Source of planting materials</b>	
Input suppliers	8
Fellow farmers	92
<b>Fertilize usage</b>	
Use	35
Non use	65
<b>Classes of Farmers</b>	
Subsistence farmers	13.46
Small scale farmers	68.08
Medium scale farmers	15.77
Commercial farmers	2.69
<b>Cropping system of farmers</b>	
Sole cropping	20
Plantain + Cocoa	40
Plantain + Cocoyam	30
Plantain + Cassava	10
<b>Source of price information by the Farmers</b>	
Fellow farmers	81.92
Radio	18.08



**Table 2: Constraints in Plantain Production in South western Nigeria**

Constraints	Yes	No	Very severe	Severe	Not severe
Transport/Road Condition	188 (72.3)	72 (27.7)	159(61.2)	45 (17.3)	56(21.5)
Corruption/Pilfering	118 (45.4)	142 (54.6)	43 (16.5)	53 (20.4)	164 (63.1)
Storage	165(63.5)	95 (36.5)	54 (20.8)	88 (33.8)	118 (45.4)
Land accessibility	43 (16.5)	217 (83.5)	6 (2.3)	20 (7.7)	234 (90.0)
Credit accessibility	212 (81.5)	48 (18.5)	182 (70.0)	31 (11.9)	47(18.1)
Man power	127 (48.8)	133 (51.2)	29 (11.2)	58 (22.3)	173 (66.5)
Training	137 (52.7)	123 (47.3)	28 (10.8)	132 (50.8)	100 (38.5)
Marketing	156 (60.0)	104 (40.0)	136(52.3)	43 (16.5)	81(31.2)

**Table 3: Constraints to plantain marketing.**

Constraints	Yes	No	Very severe	Severe	Not severe
High transport cost	105(87.5)	15(12.5)	89(74.2)	28(23.3)	3(2.5)
Corruption/Pilfering	36(30)	84(70)	32(26.7)	30(25)	58(48.3)
Storage	76(63.3)	44(36.7)	5(4.2)	51(42.5)	64(53.3)
Land accessibility	14(11.7)	106(88.3)	3(2.5)	22(18.3)	95(79.2)
Credit accessibility	75(62.5)	45(37.5)	34(28.3)	24(20)	62(51.7)
Man power	42(35)	78(65)	25(20.8)	31(25.8)	64(53.3)
Training	32(26.7)	88(73.3)		46(38.3)	74(61.7)

**Table 4: Constraints in Plantain flour in all processors**

Constraints	Yes	No	Very severe	Severe	Not severe
Transport/Road Condition	21(26%)	61(74%)	4 (5%)	23(28%)	55(67%)
Corruption/Pilfering	2(2.4)	80(97.6)	0	0	82(100)
Storage	28(34.1)	54(65.9)	73(89)	9(11.0)	0
Land accessibility	2(2.4)	80(97.6)	0	17(20.7)	65(79.3)
Credit accessibility	68(82.9)	14(17.1)	20(24.4)	62(75.6)	82(100)
Man power	32(39)	50(61)	0	14(17.1)	68(82.9)
Training	44(53.7)	38(46.3)	0	13(15.9)	69(84.1)

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