VALUE CHAIN AND COMPETITIVENESS OF PLANTAIN IN SOUTHWESTERN NIGERIA

BY

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ABSTRACT

Nigeria ranks fifth in world plantain production but has low export volume. The low export may be a result of activities along its value chain. However there is little information on the number of employment generated, comparative advantage, competitiveness and effects of policies on plantain. Therefore, the competitiveness of plantain along the value chain in southwestern Nigeria was investigated.

A three stage sampling procedure was used. The ten high plantain producing Local Government Areas (LGA) were selected in southwestern Nigeria. In each LG, two plantain producing villages were randomly selected. Producers (260) and 100 processors were randomly selected based on probability proportionate to size of villages. One hundred and forty four marketers were also randomly selected in the geopolitical zone. Structured questionnaire was used to collect information on number of job generated, cropping systems, quantity of input, output and their prices on each stage (production, farm gate and market arena assembling, processing, in-situ and transit wholesaling and retailing) of the chain. Secondary data on port charges, import/export tariffs and exchange rates were sourced from Nigeria Port Authority and trade statistics. Data were analysed using descriptive statistics, policy analysis matrix, sensitivity and partial equilibrium analyses.

Major stages in plantain value chain were input supply, production, assembling, processing, wholesaling and retailing. Employment generated was 314 people/tonne with highest number (33.8%) in processing stages. Plantain/cocoa represented the highest cropping system (37.7%) while plantain/cassava (13.1%) was the least. Highest private and social profits of ₦514,547/ha and ₦1,593,611/ha were obtained in plantain/cocoyam at production stage respectively. Private Cost Ratio (PCR) ranged from 0.27 to 0.36 while Social Cost Benefit (SCB) ratio was 0.21 to 0.26. Profitability Coefficient (PC) of 0.20 to 0.32, Effective Protection Coefficient (EPC) of 0.26 to 0.37, and Subsidy Ratio to Producers (SRP) of -0.52 to - 0.62 were recorded at market price at the production stage.

Plantain chips and flour had private profit of ₦426,339 and ₦408,701 and social profit of ₦764,793 and ₦561,969/tonne respectively at the processing stage. Both plantain chips and flour respectively had PCR of 0.15 and 0.11 and SCB of 0.34 and 0.33. Profitability coefficient of 0.73 and 0.56, EPC of 0.60 and 0.76 and SRP of -0.18 and -0.29 were obtained for plantain flour and chips respectively. Wholesalers had highest private profit of ₦36,800/tonne while farm gate assemblers had highest social profit of ₦137,812/tonne at the marketing stage. The PC of 0.11 to 0.39, EPC of 0.12 to 0.41 and SRP of -0.24 to -0.66 indicated lack of protection at the marketing stage. Aggregated value chain of the cropping systems had PCR of 0.18 to 0.35 and SCB of 0.30 to 0.37. Private profit of the producers respectively increased by 24.5% and 49.3% with 20.0% and 40.0% increase in yield levels. Net social loss in production was ₦6,552/tonne while consumers gained ₦28,295/tonne in the chain.

Plantain/cocoyam production system had the highest private and social profits indicating that the system was profitable to participants and the southwestern economy.

Keywords: Plantain value chain, Social cost benefit, Competitiveness, Social and Private profit.

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DEDICATION

This thesis is dedicated to the Almighty God the most gracious, most compassionate for His infinite mercies that enable me to achieve this goal.

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CERTIFICATION

I certify that this thesis was carried out by Iyabo Bosede ADEOYE under my supervision in the Department of Agricultural Economics, University of Ibadan, Nigeria.

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ABBREVIATIONS AND ACRONYMS

AGDP	Agricultural Gross Domestic Products
AHP	Analytical Hierarchy Process
ATA	Agricultural Transformation Agenda
CBN	Central Bank of Nigeria
CIF	Cost Insurance Freight
DRC	Domestic Resource Cost
EPC	Effective Protection Coefficient
ERD	Economic Research Division
EMS	Export Market Shares
EU	European Union
ERD	Economic Research Division
EU	European Union
FAO	Food and Agriculture Organization
FMARD	Federal Ministry of Agriculture and Rural Development
FOB	Free on Board
Ha	Hectare
H-O	Heckscher-Ohlin
IFDC	International Fertilizer Development Corporation
IFPRI	International Food Policy Research Institute
INIBAP	International Network for the Improvement of Banana and Plantain.
IITA	International Institute of Tropical Agriculture
IPP	Import Parity Price
XPP	Export Parity Price
LG	Local Government
NPC	National Population Commission

NPCO	Nominal Protection Coefficient on Output
NPCI	Nominal Protection Coefficient on Input
NPAFS	National Programme for Agriculture and Food Security
PAM	Policy Analysis Matrix
PEM	Partial Equilibrium Models
PC	Profitability Coefficient
PCR	Private Cost Ratio
PIND	Partnership Initiatives in the Niger Delta
PSE	Producer Support Estimate
RCA	Revealed Comparative Advantage
SCBR	Social Cost Benefit Ratio
SRP	Subsidy Ratio to Producer
SW	Southwestern
THU	Tractor Hiring Unit
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
USDA	United State Department of Agriculture
VCA	Value Chain Analysis
VCD	Value Chain Development
VFS	Vegetable Farming System
WTO	World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

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). It is a major staple food in Africa, and its sustained production must be considered at the national and global agricultural policy levels (Lescot and Ganry, 2010). Presently, it is the fourth most important food crop in the world after rice, wheat and maize; it is a basic food product and goods of export and it is used as food, beverages, fermentable sugars, medicines, flavourings and cooked foods (Nkendah and Nzouessin, (2006), Nelson *et al.*, (2006); Phillip *et al*, (2009). Africa is the third largest producer of plantain and banana after Asia and Latin America (Olasantan, 2011). More than 70 million people in Africa depend on plantain for food and this major foods staple and cash crop is important in the rural and urban economy, social and cultural life in sub-Saharan Africa (IITA, 2009).

Nigeria is one of the major plantain producing and consuming countries in Africa, and the country is ranked among the 20 most important Plantain producing countries worldwide (FAO, 2011). In Nigeria, Plantain production was estimated at 2,800,000 metric tons in 2012 with an average consumption level of 190 kg/person/year (FAO, 2012). Plantain occupies a strategic position for rapid food production in Nigeria. It is ranked third among starchy staples in Nigeria (Akinyemi *et al*, 2010). Plantain production in Nigeria is becoming a significant economic activity. This is due to the crop contribution to food security, employment, diversification of income sources in rural and urban areas and contribution to the Gross National Product (Nkendah and Akyeampong, 2003). It also serves as a source of revenue for many people and as raw material for industries producing value-added products in many parts of Nigeria (Akinyemi *et al*, 2010). In some countries

like Cameroon, Plantain is ranked as the highest value commodity (FAO, 2006). Plantain contributes about 13.1 percent to the Agricultural Gross Domestic Product in Ghana. Plantain in some cases provides the sole source of income to rural population, thereby playing an important role in poverty alleviation (Frison and Sharrock, 1999). Moreover, plantains have a high carbohydrate content (31g/100g) and low fat content (0.4g/100g). It is a good source of vitamins and minerals, particularly iron (24mg/kg), potassium (9.5mg/kg), calcium (7.15mg/kg), vitamin A, Ascorbic acid, thiamine, riboflavin and niacin. The sodium content (351mg/kg) is low in dietary terms hence recommended for low sodium diets (Stover and Simmonds, 1987; Welford *et al*, 1988).

Plantain and its products are in high demand, and this is reflected by the relatively high price of plantain compared with other starch staple crops with the exception of yam in Nigeria (Baruwa *et al*, 2011). The consumption of plantain has risen tremendously in Nigeria in recent years because of the rapidly increasing urbanization and the great demand for easy and convenient foods by the non-farming urban populations (Akinyemi *et al*, 2010). Plantain consumption crosses multi-ethnic groups irrespective of locations and socio-economic status largely due to easiness of their preparation and consumption (Sharrock and Frison, 1998; INIBAP, 2002; Honfo *et al*., 2007). It is also one of the regular consumed foods staple in the country (Lusty *et al*., 2006) and contributes more than 25 and 10% of the daily intake of carbohydrates and calories, respectively for more than 70 million people.

In Nigeria, Plantain is produced in large quantities in Edo, Delta, Osun, Ogun, Ondo, Oyo and Ekiti states. Other producing states are Rivers State, Cross River, Imo, Anambra, Lagos, Kwara, Benue, Plateau, Kogi, Abia and Enugu. Plantain cultivation is not limited to big plantations, but is also grown in small orchards which sometimes go unnoticed (Wilson, 1983). 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 *et al*, 1991).

In Nigeria alone, about 49 percent of farming households produce Plantain as a main crop (Nweke, *et al*. 1988). CBN (2003) indicates that plantain is one of the major stable foods in Nigeria; it had the highest percentage increase in output over years 1999 to 2003. However, only eight African Countries were named among the top ten world

producers of plantain with Nigeria ranking as the fifth highest producer of the crop (FAO, 2004). The crop is grown on homestead and recently in small plantation for the commercial market (Bifarin, 2005).

World Plantain/banana trade accounts for about one third of the world's total fruit exports and globally, import volume of banana/plantain increased by more than 3.5 million tonnes (Olasantan, 2011). Plantain and its products have the potential to serve as a vehicle for poverty reduction and source of livelihood for a majority of smallholder farmers and traders (Akinyemi *et al*, 2010). This is because it is available when tuber crops like Cassava and Yam are difficult to harvest from the ground (Akinyemi *et al*, 2010). Plantain flour (a processed product from plantain) apart from being used as a substitute for garri especially for diabetic patients, also serve as a raw material used in the production of cakes, puff-puff, biscuit, bread and pan cakes (Foraminifera Market Research, 2013). Plantain flour is a cheap source of iron, protein and vitamin A and can be marketed through market women, food canteens, hotels and supermarkets (Faturoti *et al*, 2007). To exploit the various potentials of Plantain aforementioned, there is the need for the Value Chain development of the commodity. This will go a long way in promoting economic development, poverty reduction, and achievement of food and nutritional security.

Value chain is the keyword in recent agricultural development debates, often in conjunction with rural economic development and agribusiness promotion (Eastern and Central Africa Programme for Agricultural Policy Analysis (ECAPAPA), 2006). A value chain consists of all value-generating activities, sequential or otherwise, required to produce, deliver and dispose of a commodity (Schmitz, 2005). More specifically, it 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 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). It highlights the importance of private sector development for the purpose of fostering agricultural growth and aligning the agricultural sector development with urban and other trends in society (Federal Ministry of Agriculture and Rural Development (FMARD), 2001). An effective value chain analysis approach would help

in the identification of good policies and programmes to accelerate development (Gor *et al*, 2012). Value addition is a component of Value Chain and it is the process of increasing the economic value and consumer appeal of an agricultural commodity (Boland 2009). Value-addition in agriculture offers entrepreneurial farmers an opportunity to identify and pursue new crops and new markets (Dunlap, 2006). The former trend in which rural farmers disposed of their farms produce without processing seemed to drastically reduce the incomes realizable through such transactions (Dunlap, 2006).

Value Chain Development (VCD) plays an important role in poverty reduction as it is essential for the development of agricultural transformation and global competitiveness of farm produce (ECPAPA, 2006). It has almost become a magic formula for sustainable agricultural investments, trade, marketing, employment generation, wealth creation and food security (UNIDO, 2010). Value chain approach thus provides a framework to analyze the nature and determinants of competitiveness in which small farmers can participate (Rich *et al*, 2009). It also plays a key role in understanding the need and scope for systemic competitiveness (Huang *et al*, 2009) and it also analyses competitiveness in a global perspective (UNIDO, 2009). Competitiveness is a major factor in Value Chain Development (Porter, 2007). It is the ability to profitably gain and maintain market share in domestic, regional and international market (Fischer and Schornberg, (2007). To achieve economic growth through agriculture, there is the need to increase the competitiveness of the value chains which take key crops into domestic, regional and international market places (Amoa-Awua, 2012). There is the need for empirical analysis of Plantain value chain and competitiveness in South-western Nigeria. According to National Programme for Food Security (NPFAS, 2009), Southwestern Nigeria is one of the major producers of Plantain in Nigeria.

1.2 Statement of the Problems

Plantain is one of the most important horticultural and exportable crops in Nigeria (Babatola, 2004); the country is also one of the major producers of the commodity in the world (FAO, 2013). In spite of this great potential, Nigeria's role in world plantain economy is minor and does not project a promising outlook (Green House, 2012). Nigeria ranked first in Africa and fifth in the world producing 2,800,000 metric tonnes in 2012

(FAO, 2011). Despite her rank and prominence, Nigeria's participation in the commodity trade is low (Akinyemi *et al*, 2010). Export of horticultural commodities are faced with constrains such as inappropriate production economics and technologies, absence of quality control management, inappropriate/inadequate marketing services among others (Babatola, 2004). According to Adesina, (2012) and Daramola *et al* (2014), the country is not prominent in the export of agricultural commodities, her agricultural exports are negligible and represent about 0.2 percent of total exports. Her export share of agricultural produce declined rapidly and has been eclipsed by many countries such as Ghana, Cote d'Ivore, Cameroon amongst others. Potential annual revenue of 1.6 trillion Naira has been lost due to the inability of Nigeria to maintain the 1961 market share in agricultural exports (Agricultural Transformation Agenda (ATA), 2011).

Nigeria is expending a lot of foreign exchange on importation of food and agricultural products despite her vast agricultural potential. Nigeria's food import bill is exceptionally high and it is growing at an unsustainable rate of 11% per annum (Adesina, 2013). This constitutes huge loss and financial drain to the nation economic development (Punch, 2012). This has also deprived the nation thousands of jobs that could have been generated from the sector. Nigeria began to import some of those agricultural products it formerly exported and other food crops that it had been self-sufficient in (Daramola *et al*, 2014).

Most economic activity in plantain production is principally in primary production with limited value addition through processing (Ladapo, 2010, Daramola *et al*, 2014). Thus, postharvest losses of fruits and vegetables including plantain are extremely high in Nigeria (Olukunle *et al*, 2007). This is worsened by poor post-harvest handling and marketing strategies. There is non-maximization of the processing potentials of plantain (Ladapo, 2010). Storage and transport of produce from farm to other parts of the marketing chain remain a challenge. It is also known that 98 percent of agricultural production in high-income countries undergoes industrial processing; barely 38 percent is processed in developing countries (UNIDO, 2009).While primary processing could be done by smallholders, knowledge of the demand and market for plantain products is limited.

Plantain production in Nigeria is characterized by low yield, low usage of agricultural inputs, low mechanization and irrigation intensity. This is due to Nigeria's investment in agriculture that is exceptionally low averaging approximately 2% of government expenditure (Olomola, 2007). It is apparent that Nigeria, relative to most African countries, has a huge domestic market which can drive growth in agricultural and industrial production, including agro-based value addition. Poor infrastructure and high input costs (for example energy and credit) put Nigerian goods at a competitive disadvantage (ATA, 2011).

According to Adesina (2012), unemployment rate is spiralling in the country driven by the wave of 4 million young people entering the workforce every year. Plantain is one of the most important horticultural crops. It has been projected that Horticulture Value Chain is capable of generating 3.5 million jobs to the teeming youth if given the proper attention it desired (All Africa, 2013). There is dearth of information on the number of jobs that can be created in Plantain Value Chain. Consequently, Nigeria has huge horticultural potential that is laying waste (All Africa, 2013). In country such as Kenya, horticulture has been found to create 8 million jobs for the populace (ATA, 2011).

There is presently little or no research in the area of Plantain Value Chain that can lead to understanding of employability, Comparative advantage and Competitiveness of the commodity. Arising from the foregoing, there is dearth of information on responses of producers and consumers to distortions in policies of plantain sub sector in Nigeria. This has prevented the formulation of appropriate policies to reduce the effects. Also, there is little or no information on the effects of government policies on plantain production and value addition in the country to the author's knowledge. Understanding of the connections and network among the different participants along the value chain is also an issue. Arising from the foregoing, the following policy related questions are therefore relevant to this study:

1. What are the linkages/relationships that exist between participants (producers, processors and marketers) and activities in the Plantain value chain?
2. What are the Comparative advantage and Competitiveness along each stage of Plantain Value Chain and the entire commodity chain?

3. What are the effects of various Government Policies on Comparative advantage and Competitiveness along each stage of Plantain value chain and the whole commodity chain?
4. What are the effect of changes in policy indicators on comparative advantage and competitiveness on the whole commodity chain?
5. What are the extents of distortions in policies on Plantain Producers and Consumers' welfare?

1.3 Objectives of the Study

The broad objective of this study is to examine Plantain value chain and competitiveness in Southwestern Nigeria. Specifically, the objectives are to:

1. map the linkages between participants and activities in the Plantain value chain
2. examine Comparative advantage and Competitiveness along each stage of Plantain Value Chain and the whole commodity chain.
3. examine the effects of various Government policies on Comparative advantage and Competitiveness along each stage of Plantain value chain and the whole commodity chain.
4. determine the effect of changes in policy indicators on Comparative advantage and Competitiveness on each stage and the whole commodity chain.
5. compute extent of distortions in policies on Producers and Consumers' welfare.

1.4 Justification of the study

The study is imperatively justified due to the need to attain better understanding of functions and connections between participants in Plantain Value Chain. This is expected to reveal the form in which plantain is handled and transported in the value chain and the quantum of produce handled at each stage. The domineering participants and the level of value addition and employment creations shall be estimated as well. The study is expected to enrich the literature because previous research efforts on Competitiveness and Value chain in Nigeria dwelled on Rice, Maize, Cassava, Yam, Sweet potatoes. In addition, past studies on Plantain have been in the area of agronomy, production and marketing (Akinyemi *et al*, 2010, Ladapo, 2010). Some studies on Value Chain Analyses are available for grains like rice and maize (Ogbe *et al*, 2011, Liverpool *et al*, 2009,

Oguntade, 2011) and Cassava (Liverpool *et al*, 2009, PIND, 2011, Grant *et al*, 2009, USAID, 2008, IFDC, 2008, Ugochuckwu and Ezedinma, 2011), but value chains of Plantain seems limited/scanty in Southwestern Nigeria. Effects of government policies on individual aspects of the chain like production, processing and market potential of processed product have not been studied to the best of the author's knowledge.

The study shall reveal the status of comparative advantage and competitiveness Southwestern Nigeria has and the levels of upgrading and intervention required. This is necessary because it will show the extent to which the zone will be able to participate in domestic, regional and international trade; show the zone level of self-sufficiency in the production of the commodity and the extent to which the zone utilizes scarce resources in the production of the commodity. The nature of support, extent of government policies and incentives on the commodity along the value chain will be indicated and consequently level of protection the participants are receiving along the stages of the value chain.

Methodologically, Policy Analysis Matrix and Partial Equilibrium were employed in the analysis to determine the competitiveness, comparative advantage and effect of policies along the stages of the value chain. Effects of distortion in policies on consumers and producers welfare were also analyzed. Past empirical studies on Value Chain and Competitiveness (Liverpool *et al*, 2009, Ogbe *et al*, 2011, Oguntade, 2011) employed only Policy Analysis Matrix. Policy Analysis Matrix and Partial equilibrium are expected to yield better estimates because the extent and sources of distortions on producers and consumers welfare will be determined. The partial equilibrium model shall facilitate quantification of policy effects on producers and consumers welfare thereby leading to effective policy analysis.

Policy wise, the result of the study shall facilitate understanding of the road map that can guide policies and efforts needed to effect the re-engineering of the Nigerian Plantain sub sector. The kind of re-engineering efforts that will ensure competitiveness, efficient marketing, apt value addition and dynamic export procedures have become essential. Ultimately, policies to raise entrepreneurial and employment levels shall be suggested with enhanced incomes at private, corporate and government levels. Further, efficient policies that will offset market failures and lead to promotion of Plantain Value Chain shall be suggested.

1.5 Plan of the Study

The rest of the report comprises of four chapters. Chapter two discussed theoretical, conceptual framework, concept of value chain, overview of plantain production in Nigeria, in depth review of empirical and methodological review of literature. Theoretical/conceptual framework addressed the trade theory; different varieties of trade theory, concept of competitiveness. In the sub section on literature review, empirical and methodological reviews were carried out on Policy Analysis Matrix and linear programming. The study area, type of data, sampling procedure and size, analytical technique used were discussed in Chapter three. Chapter four gives a detailed presentation of the result and discussion of plantain value chain and competitiveness in southwestern Nigeria. Chapter four addressed socio economic characteristics of participants in plantain value chain, linkages between participants, estimate number of employment generated, identify constraints in the chain, analyzed competitiveness and comparative advantage on each stage and whole value chain, measure effects of policies on each stage and the whole value chain. Sensitivity analysis result was also presented in the chapter. Finally, chapter five is made up of the summary of major findings of the research, conclusion and recommendations.

Table 1.1a: Analysis of Objectives

Objectives	Meaning of objectives	Required Data	Analytical tool
Map linkages between participants and activities in plantain value chain.	This will give a better understanding of key processes, connections between participants and processes. To give an illustrative representation of the identified chain participants and the related product flows and volume and the number of employment created. Constraints faced by the participants were also analyzed.	Primary data on core processes in the value chain, types of participants involved in the processes, flow of product and volume of product along the stages of the value chain. Numbers of employment created on each stage of the value chain were also collected as well as constraints faced by the participants in the value chain.	Descriptive statistics, Functional analysis using tables, flow chart.
Examine comparative advantage and competitiveness along each stage of Plantain value chain and the whole commodity chain	This set out to analyze the comparative advantage and competitiveness of plantain production, processing and marketing in southwest zone of Nigeria.	Primary data on yields, input requirements, market prices for inputs and outputs, transportation costs. Secondary data on social price for input and output, port charges, storage costs, production subsidy, import/export tariffs and exchange rate.	**Policy Analysis Matrix (PAM)** **Competitiveness** was analyzed using: Private profitability, Private Cost Ratio, **Comparative advantage** analyzed using: Social Profitability. Domestic Resource Cost (DRC), Social cost benefit (SCB)
Examine the effects of the various Government policies on Comparative advantage and Competitiveness along each stage of Plantain value chain and the whole commodity chain.	This measure divergence between private and social valuation of output, input and profit. Effects of government policies such as taxes and subsidies on the production, processing and marketing of plantain were also determined.	Data on yields, input requirements, export parity price, private value of tradable inputs, private value of non-tradable input, social value of tradable input, social value of non-tradable input, and the market and social prices of inputs and outputs, world price.	**Policy Analysis Matrix** Nominal Protection Coefficient. Efficient protection coefficient (EPC), Subsidy Ratio to Producers (SRP) Profitability Coefficient (PC) Output transfer Input transfer ,Factor transfer (K) Net transfer Nominal Protection coefficient on output and input.

Table 1.1b: Analysis of Objectives

Objectives	Meaning of objectives	Required Data	Analytical tool
Determine the effect of changes in policy indicators on Comparative advantage and Competitiveness on each stage and the whole commodity chain.	This measure effects of changes in indicators such as yield, exchange rate and domestic price of price of plantain on comparative advantage, competitiveness and policy indicators on plantain value chain.	Primary data on yields, input requirements, market prices for inputs and outputs, transportation costs. Secondary data on social price for input and output, port charges, storage costs, production subsidy, import/export tariffs and exchange rate	**Policy Analysis Matrix** Private profitability, Private Cost Ratio, Social Profitability. Domestic Resource Cost (DRC), Social cost benefit (SCB) Nominal Protection Coefficient. Efficient protection coefficient (EPC), Subsidy Ratio to Producers (SRP) Profitability Coefficient (PC) Output transfer Input transfer ,Factor transfer (K) Net transfer Nominal Protection coefficient on output and input.
Compute the extent of distortions in policies on Producers and Consumers' welfare.	Estimate of the distortion in prices were computed to determine the welfare loss to the producers and consumers in plantain value chain.	Data on outputs, value of domestic production and consumption, Nominal Protection coefficient, Elasticity of demand and supply of plantain.	Partial Equilibrium Analysis

1.7 Definitions of Terms

Value Chain: This is the full range of activities and participants involved in moving agricultural products from input suppliers to farmers' fields, and ultimately, to consumers.

Competitiveness: Competitiveness pertains to the ability and performance of a firm, sub-sector or country to sell and supply goods and services in a given market, in relation to the ability and performance of other firms, sub-sectors or countries in the same market. It is also the ability of a farming system to profitably gain and maintain market share.

Comparative advantage: The ability of a firm or individual to produce goods and/or services at a lower opportunity cost than other firms or individuals. It is also the measure of efficiency of production in a domestic economy.

Value addition is a component of Value Chain and it is the process of increasing the economic value and consumer appeal of an agricultural commodity.

Value added is the difference between the value of the output and the value of the purchased inputs.

Tradeable inputs are goods that are tradeable in the world market. Examples are seeds, fertilizer, chemical, machinery and manure.

Non tradeable inputs are good that are not tradeable in the international market. Examples are land, labour, local capital and irrigation water.

Import parity price (IPP) is the value of a unit of product bought from a foreign country, valued at a geographic location of interest in the importing country.

Export parity price (XPP) – The value of a product sold at a specific location in a foreign country, but valued from a specific location in the exporting country.

Private prices are the market prices that the participants in a value chain are facing.

Social prices are prices that would result in the best allocation of resources and thus the highest generation of income. The social (efficiency) prices for tradable outputs and inputs are the comparable world prices.

Private budget are observed revenues and costs reflecting actual market prices received or paid by farmers, traders or processors in the agricultural system.

Social budget refers to observed revenues and costs reflecting social (efficiency) prices received or paid by farmers, merchants, or processors in the agricultural system.

Private profit: A measure of the competitiveness of the system at actual market prices.

Social profit: Measures comparative advantage and efficiency (or comparative advantage) in social prices.

Tariff

A tariff is a tax placed on imported goods or Customs duties on imports are called tariffs.

Subsidy

A sum of money granted by the state or a public body to help an industry or business keep the price of a commodity or service low.

Output Transfer: This is a measure of the implicit tax or subsidy on outputs.

Tradable input transfers: a measure of the implicit tax or subsidy on tradable inputs.

Factor Transfers: is the difference between the costs of all factors of production valued in actual market prices and the social costs of these factors.

Net transfer: This is the difference between the valuation of profits in private prices and in social prices.

CHAPTER TWO

2.0 Theoretical /Conceptual Framework and Literature Review

2.1 Theoretical Framework

There has been extensive theory building in the field of value chain and competitiveness reflected in many definitions and analytical approaches (Lazzarini *et al*. 2001). The theoretical underpinning Value Chain analyses and competitiveness are rooted in Trade theory. This is because the basic framework of trade theory lies in the principles of competitiveness and comparative advantage which is essential in value chain development of a commodity.

2.2 Trade Theory

Trade theory states that economic welfare is dependent on the production of goods and services that a country has comparative advantage in (Rangasamy, 2003). This indicates that competitiveness is secured when production is in line with a country's comparative advantage situation. According to (Rangasamy, 2003), trade theory advocates that domestic and international competitiveness is inter alia determined by factors endowments, increased savings and investments, innovations in products and production processes and intensity of entrepreneurial activity. Trade theory can be classified into two categories: the traditional trade theory and new trade theories (Bergoeing and Kehoe, 2003). Traditional trade theory incorporated the principles of perfect competition, homogeneous goods and constant returns to scale in production which include the trade theories of Smith, Ricardo, Hechscher and Ohlin and modifications or extensions of the Heckscher-Ohlin theory. The new theories of international trade on the other hand would include theories characterized by product differentials, imperfect competition and increasing returns to scale.

According to Ransagamy, (2003), Trade theories have inter alia attempted to explain three issues.

- The pattern of trade where the emphasis has been on explaining the basis of

trading relations.

- The sources of gain from trade where the emphasis has been on explaining how the gains from trade are distributed among trading patterns.
- The structure of production and returns to factors of production where the emphasis has been on explaining the implications of trade for the structure of production and returns to factors of production with each trading country.

Assumptions underlying conventional trade theories (Rangasamy, 2003) include:

- Trading relations are restricted to two countries each having a fixed stock of factors of production.
- Factors of production are perfectly mobile among industries within a country but completely immobile internationally.
- There are no transport costs in trade.
- All traded products are final products.
- Both factor and product markets are characterized by perfect competition with producers maximizing profits and factors returns at a level that ensures full employment of all factors.
- Technology is such that production is characterized by constant returns to scale.
- Consumers everywhere have identical homothetic utility functions.

2.2.1 Traditional Trade theories: This includes:

2.2.1.1 Mercantilism Trade Theory

Mercantilism is the first international trade theory and it emerged in England in the mid-16th century (Alan, *et al*, 2006). According to Wild *et al*, (2000), mercantilism trade theory states that nations should accumulate financial wealth, usually in the form of gold, by encouraging exports and discouraging imports. According to this theory other measures of countries' well-being, such as living standards or human development, are irrelevant. Mainly Great Britain, France, the Netherlands, Portugal and Spain used Mercantilism during the 1500s to the late 1700s (LaHaye, 2008). Mercantilist countries practised the so-called zero-sum game, which meant that world wealth was limited and that countries only could increase their share at expense of their neighbours (Ekelund and Tollison, 1981). Economic development was prevented when the mercantilist countries paid the colonies little for export and charged them high price for import. Mercantilists failed to

understand the notions of absolute advantage and comparative advantage and the benefits of trade (Spiegel, 1991)

2.2.1.2 Adam Smith's theory of Absolute Advantage: Adam Smith developed the trade theory of absolute advantage in 1776 (Marrewijk, 2007). According to the theory, a country that has an absolute advantage produces greater output of a good or service than other countries using the same amount of resources (Johnson, 2005). Smith argued that it was impossible for all nations to become rich simultaneously by following mercantilism because the export of one nation is another nation's import and instead stated that all nations would gain simultaneously if they practiced free trade and specialized in accordance with their absolute advantage (Encyclopedia of social sciences, 2009). Smith also stated that the wealth of nations depends upon the goods and services available to their citizens, rather than their gold reserves (Harrington, 2013).

2.2.1.3 Ricardian model of Comparative Advantage:

The most basic concept in the whole of international trade theory is the principle of comparative advantage, first introduced by David Ricardo in 1817 (Sullivan and Shreffin, 2003). Comparative advantage refers to the ability of a party to produce a particular good or service at a lower opportunity cost than another party. It is the ability to produce a product with the highest relative efficiency given all the other products that could be produced (BLS, 2008, Sullivan and Shreffin, 2003). According to the law of comparative advantage, a country must specialize in those products that it can produce relatively more efficiently than other countries (Krugman and Obstfeld, 2003). Ricardo's theory of comparative advantage is based on the labour theory of value (Salvatore, 2002). This implies that labour is the only production factor and that it is used in fixed proportions in the production of all products. The theory also assumes that labour is homogeneous (Salvatore, 2002). These unrealistic assumptions led to the incorporation of opportunity cost into the explanation of the theory of comparative advantage. If the Ricardian theory of comparative advantage is redefined in terms of opportunity cost, then a country will have a comparative advantage in the production of goods and services if such goods and services can be produced at a lower opportunity cost (Smit, 2010). Although the theory of

comparative cost advantage is based on a set of strict assumptions, this does not invalidate the general acceptance of the theory in explaining gains from trade (Krugman 1990). This is furthermore underscored by the fact that most of the principles of the World Trade Organisation (WTO) are based on the belief in the validity of the law of comparative advantage (Root, 2001).

The superiority of the theory of comparative advantage lies in the remarkable amount of useful information that it summarizes clearly and concisely. According to Salvatore (2002), it shows the conditions of production, the autarky point of production and consumption, the equilibrium relative commodity prices in the absence of trade, the comparative advantage of each nation, degree of specialization in production with trade, the volume of trade, the terms of trade, the gains from trade, and the share of these gains to each of the trading nations. It is this power of the theory that provides a convincing explanation why trade is a positive sum game (Krugman, 1998). The theory of comparative advantage, as discussed thus far, does not explain the location of these advantages (Smit, 2010). Whereas the Ricardian model of trade conveys the essential idea of comparative advantage, it does not explain the direction of trade. Economists thus needed an alternative model of comparative advantage to explain the direction of trade.

2.2.1.4 Heckscher-Ohlin (H-O) model: An important theory to explain the reasons, or causes, of comparative advantage differences between countries is the Heckscher-Ohlin (H-O) theory (Salvatore 2002). The Heckscher-Ohlin (HO hereafter) model was first conceived by two Swedish economists, Eli Heckscher (1919) and Bertil Ohlin. The Heckscher-Ohlin theory stresses that countries should produce and export goods that require resources (factors) that are abundant and import goods that require resources in short supply (Blaug, 1992). This theory differs from the theories of comparative advantage and absolute advantage since these theory focuses on the productivity of the production process for a particular good (Luella, 2012). On the contrary, the Heckscher-Ohlin theory states that a country should specialise in production and export using the factors that are most abundant, and thus the cheapest. The Heckscher-Ohlin theory is preferred to the Ricardo theory by many economists, because it makes fewer simplifying assumptions (Luella, 2012). H-O theory of international trade concludes that a nation will export the commodity whose production requires the intensive use of the nation's

relatively abundant and cheaper factor. A nation will import the commodity whose production requires the intensive use of the nation's relatively scarce and expensive factor.

2.2.1.5 Product Life Cycle Theory

Raymond Vernon developed the international product life cycle theory in the 1960s in response to the failure of the Heckscher-Ohlin model to explain the observed pattern of international trade (Wikipedia, 2014). The international product life cycle theory stresses that a company will begin to export its product and later take on foreign direct investment as the product moves through its life cycle (Hill, 2007). Eventually a country's export becomes its import. Although the model is developed around the U.S, it can be generalised and applied to any of the developed and innovative markets of the world. The product life cycle theory was developed during the 1960s and focused on the U.S since most innovations came from that market. This was an applicable theory at that time since the U.S dominated the world trade. Today, the U.S is no longer the only innovator of products in the world. Today companies design new products and modify them much quicker than before. Companies are forced to introduce the products in many different markets at the same time to gain cost benefits before its sales declines. The theory does not explain trade patterns of today.

2.2.2 New Trade Theory: The New Trade theory emphasises productivity rather than a country's resources. New trade theory is in line with the theory of comparative advantage but at odds with the factor endowments model (Aswathappa, 2010). New trade theory was established in the 1980s (Krugman, 1986; Grossman and Helpman, 1991). The theory attempt to address the shortcomings of standard trade theory. It deals with some of the realities of trade in a more complex and sophisticated manner by incorporating a fuller range of factors. Introduction of new models of monopolistic competition by industrial organizational theorists (Dixit and Stiglitz, 1977) allowed trade theorists (Krugman 1983; Ethier 1982) overcome the complexity of modeling oligopolistic rivalry in a general equilibrium framework. The main appeal for using monopolistic competition was to focus on economies of scale as the core in explaining trade rather than on imperfect competition (Krugman 1990).The difference between the traditional and the new trade theory is that at

the level of inter-industry trade, comparative advantage continues to be the dominant explanation of trade flows, whereas at the level of intra-industry trade, economies of scale become the dominant explanation of trade flows in differentiated products (Smit, 2010). The similarity is that in both the traditional and the new thinking about trade, advantage comes through specialization (Smit, 2010). However, in the former, specialization takes place because of country differences, while in the latter; the inherent advantage of specialization is based on increasing returns. What the new trade theory does not explain is where the actual location of production will be, as in the case of comparative advantage (H-O model). The most important insight of the new trade theory based on monopolistic competition is that under free trade there will be gains from trade (Krugman, 1992), which implies, as in the case of comparative advantage, that trade is a positive sum game (Krugman 1992). Monopolistic competition, however, is not a true reflection of the real world. Many of today's global industries are characterized by oligopolistic competition (Yoffie, 1995), where economies of scale at the level of the firm are sufficient to limit the number of competitors (Krugman 1992). The focus in the economic trade literature therefore changed from analyzing economies of scale as the core in explaining trade to imperfect competition as the core (Krugman 1990). The result was a set of trade models that assumed an oligopoly market structure (Krugman and Obstfeld, 2003).

A further criticism of the strategic trade policy argument is the partial equilibrium nature of the new trade models, and any attempt through government policies to favour some domestic firms over foreign firms may put the foreign firms at a competitive disadvantage (Krugman, 1990). Thus for strategic trade policy to be successful, the assumption should be that governments are smarter than markets; not only about the targeted industries, but also about how targeting will affect all the other industries in the country (Krugman, 1996). Strategic trade policy thus assumes that governments can spot winners before business or entrepreneurs can and that foreign governments will not react to counter this, which seems to be an unrealistic assumption. Although strategic trade policy supports interventionist policies that are desirable for domestic firms, at a country level this may lead to a counter-reaction by other countries and thus ignite a spiral of protectionist policies. Thus intervention may not be in the best interest of a country (Krugman 1992) and thus may imply a movement away from free trade to protectionism.

Theoretical and empirical justification in support of strategic trade theory is not sufficiently conclusive to reject the principle of comparative advantage in favour of strategic trade intervention. According to Siggel, (2006), any trade that results in welfare gains needs to be based on comparative advantage, irrespective of the nature of its sources.

The sources may be Ricardian productivity differences (or different technologies), or they may be differences in factor endowments that are reflected by factor cost differentials. But they may also include differences in the scale of production, for firms that share the same cost function. Thus the kind of sophisticated intervention suggested by strategic trade policy may eventually result in political rivalry between countries in which the negative consequences of such political rivalry outweigh the potential gains from free trade (Krugman and Obstfeld, 2003). Although the new trade theories of monopolistic and oligopolistic competition challenge the orthodoxy of free trade, they do not provide any explanation of where the actual location of production will take place. In contrast, comparative advantage not only explains the direction and gains of trade between countries, but also determines a country's relative location advantages. Porter (1990a, 1998b), however, questioned the ability of traditional trade theory to explain location advantages and therefore proposed a new theory to explain location advantages and thus the competitive advantage of nations.

2.2.2.1 Porters Competitive Advantage theory

Michael Porter proposed the theory in 1985 and the theory seeks to address some of the criticisms of comparative advantage. Competitive advantage is the strategic advantage one business entity has over its rival entities within its competitive industry (Porter, 1985). Porter emphasizes productivity growth as the focus of national strategies. Competitive advantage rests on the notion that cheap labour is ubiquitous and natural resources are not necessary for a good economy. The other theory, comparative advantage, can lead countries to specialize in exporting primary goods and raw materials that trap countries in low-wage economies due to terms of trade. Competitive advantage attempts to correct for this issue by stressing maximizing scale economies in goods and services that garner premium prices (Warf and Barney, 2007). The term competitive advantage is the ability

gained through attributes and resources to perform at a higher level than others in the same industry or market (Porter, 1980). Competitive advantage is a key determinant of superior performance and it will ensure survival and prominent placing in the market. Porter identified attributes of nation which determine (promote, impede) its competitive advantage referred to as Porter's Diamond (Figure 1) as follows (Porter, 1990a). The reason why a nation achieves international success in a particular industry is inherent in the Porter's Diamond model. Porter's Diamond model sets out to determine the various sources of competitiveness of individual firms which operate within the industry. The following according to Porter (1990a) are the main determinants of competitiveness:

Factor conditions: A country's factor endowments or supply of factors of production such as human resources, physical resources, knowledge resources, location, capital resources and infrastructure play a significant role in determining its national competitive advantage. Besides basic factors (e.g., natural resources, climate, etc.,) advanced factors (e.g., skilled labour, communications infrastructure, technology) are the crucial determinants of the capabilities and competitiveness of a nation. Advanced factors are declined by the efforts of the individuals, firms, institution and government in a country.

Demand conditions: The demand conditions in home market are important in stimulating domestic firms to undertake innovation and improve quality of products. When domestic buyers are sophisticated, a pressure in the market is created for the domestic firms to meet high standards of quality demanded.

Firm strategy, structure and rivalry constitute the fourth determinant of competitiveness. The way in which companies are created, set goals and are managed is important for success. But the presence of intense rivalry in the home base is also important; it creates pressure to innovate in order to upgrade competitiveness.

Role of Government can influence each of the above four determinants of competitiveness. Clearly government can influence the supply conditions of key production factors, demand conditions in the home market, and competition between firms. Government interventions can occur at local, regional, national or supranational level.

Element of Chance events are occurrences that are outside of control of a firm. They are important because they create discontinuities in which some gain competitive positions and some lose.

In this study, productivity, economies of scale, factor conditions, demand conditions and ability to garner adequate price are major determinants of competitiveness of the value chain. This is embedded in Porter competitive advantage theory.

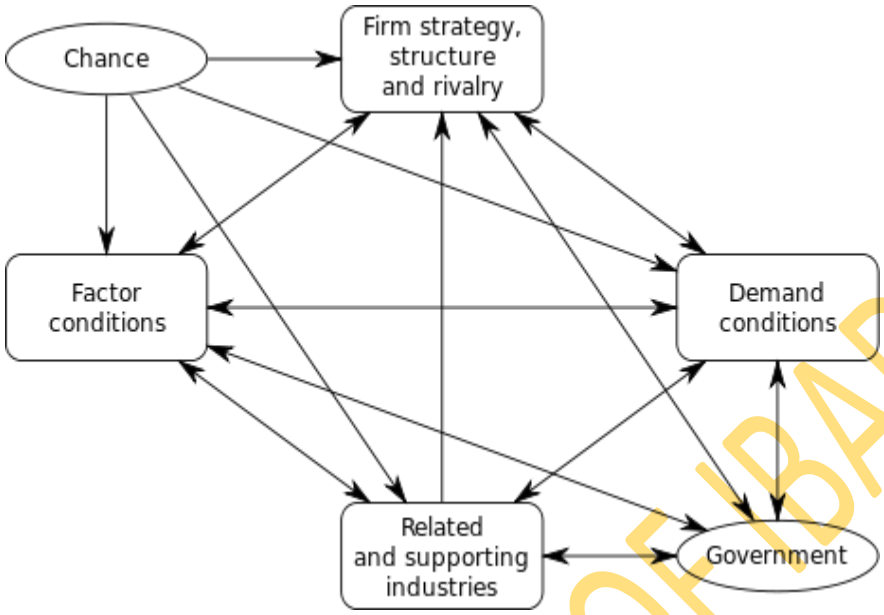

Figure 2.1: Main Determinants of competitiveness/sources of competitiveness of firms in an industry (Porters 1990a)

2.3 Concept of Value Chain

Value chain concept has been defined traditionally using the concept of the firm (Porter, 1998a). A firm refers to a collection of activities that are performed to design, produce, and market, deliver and support its product (Porter, 1998b).Value chains originate from the notion of a system as a set of interacting and interconnected activities within a commodity cycle (Porter, 1985).

The concept of Value chain is discussed from three distinct traditions: the French 'Filiere concept', Porters concept and Wallerstein's concept of Global commodity chain (Raikes *et al.* 2000). The Filiere 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). However, filiere analysis focused more on how public institutions affect local production systems. The early filiere analysis emphasized local economic multiplier effects of input-output relations between firms and focused on efficiency gains resulting from scale economies, transaction and transport costs amongst others (Kaplinksky and Morris, 2000). However a filiere tended to be viewed as having a static character, reflecting relations at a certain point in time. It does not indicate growing or shrinking flows either of commodity or knowledge, nor the rise and fall of actors (Kaplinksky and Morris, 2000). In general filiere analysis has been applied to the domestic value chain, thus stopping at national boundaries.

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 (Kapslinky and Morris, 2000). 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). Although he focused on the coordination of globally dispersed, but linked, production systems, he had shown that many chains are characterized by a dominant party who determine the overall character of the chain. Although Gereffi's contribution has enabled important advances to analytical and normative usage of the value chain concept, particularly because of its focus on the power relations (Kaplinksy and Morris, 2000).

2.4 The concept of value added

Value added refers to the creation of wealth, the contribution of the particular production process, or particular chain, to the growth of the economy (FAO, 2006). In macroeconomics, value added also refers to the contributions of the factors of production, such as land, labour and capital goods to raising value of a product and corresponds to the incomes received by the owners of these factors (Tallec and Bockel, 2005). Value added measures the increase in wealth for the nation as a whole, as represented by the sum of remuneration to labour, interest charges and taxes in addition to the net margin of the producers. Value added represents the worth that has been added to a product or a service at each stage of production or distribution. An economic agent can calculate the value added as a difference between the full value of the output and the value of the purchased inputs (McCormick and Schmitz, 2001). In this respect, value added is not merely an element of wealth, but it also shows the distribution of that wealth among the main participants of the national economy: households (the recipients of the return to labour), financial institutions (interest charges), government administration (taxes), and non-financial enterprises (FAO, 2006).

2.5 Concept of Competitiveness

Competitiveness is the fundamental determinant of the level of prosperity a country can sustain (Porter, 2005). The EU Commission (2003) defined Competitiveness as the ability

of an economy to provide its population with high and rising standards of living and a high level of employment for all those willing to work, on a sustainable basis. To be competitive, a firm must be able to undercut the prices or offer products of better quality (or with better service) than its competitors. Competitiveness remains an important measure of benchmarking economic performance (Dunning, 1995). Domestic competitiveness is measured in terms of private profitability, i.e. the ability of a producer to make a profit given prevailing tradable and non-tradable input costs and output prices. International competitiveness is measured in terms of social profitability, where social prices are derived from border prices or international reference prices.

2.6 Conceptual Framework

The main stages of plantain value chain are illustrated in figure 2 below. Some of the main activities that occur at each stage of the value chain are as follows.

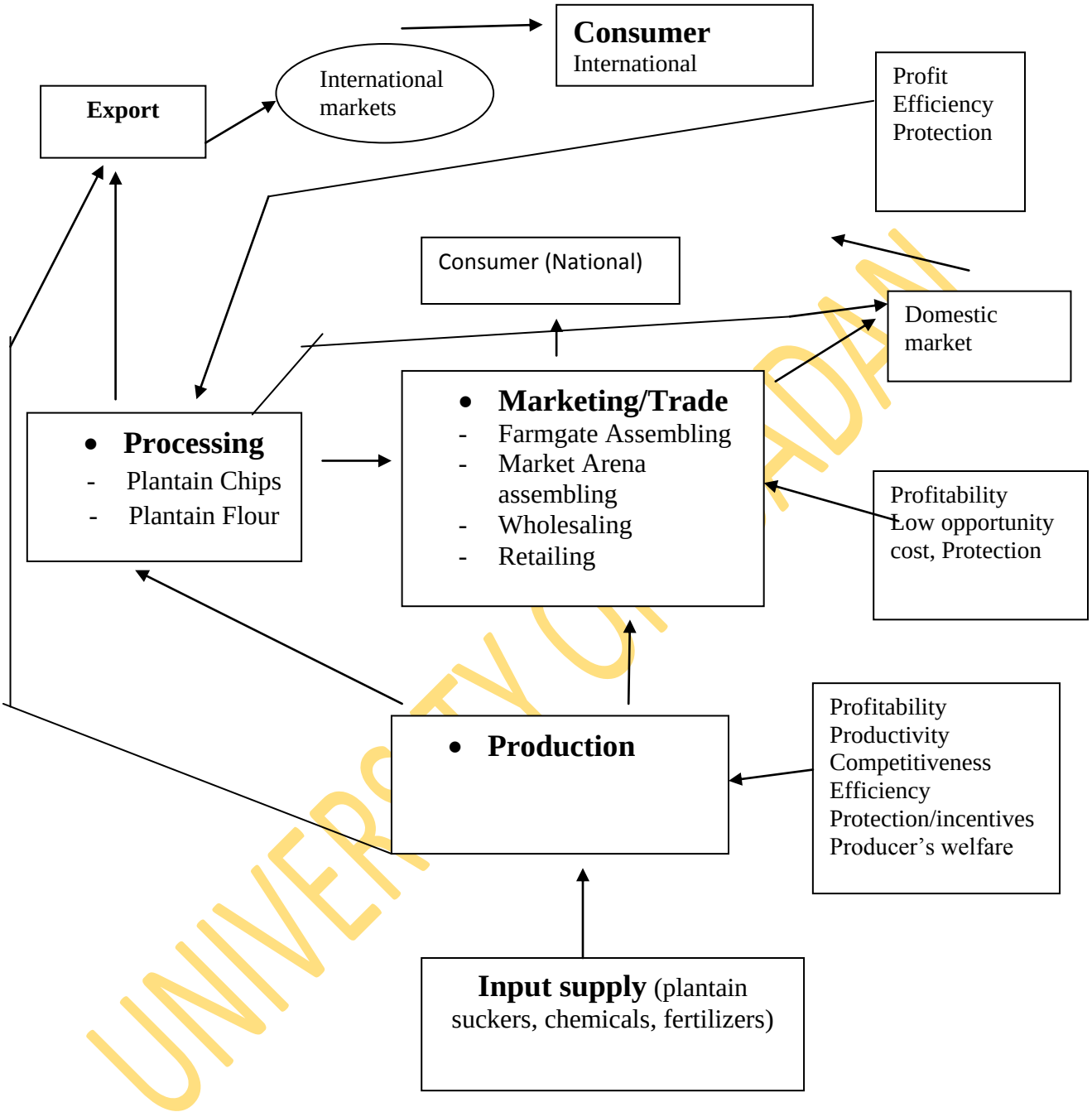

Figure 2.2: Conceptual Framework of Value chain and Competitiveness of Plantain (Adapted from USAID, 2007 and modified).

2.6.1 The stage in the framework of value chain is:

2.6.1.1 Input supply. This stage is concerned with the sourcing of materials required for production, processing, and trade. Inputs were sourced mainly locally. Input supply kick starts the process of Plantain production. Input supply is a crosscutting function that affects all participants, not just at the farm level. The efficiency of a country's input supply system therefore has a major bearing on the performance of the entire value chain (Olomola, 2007).

2.6.1.2 Farm production. This stage is concerned with primary production and ends with the sale of the commodity at the farm gate, local and urban market in the country. These transactions may occur literally at the farm gate or at some other point where the farmer hands over ownership of the product to the next value chain participant (Olomola, 2007). Four production systems were identified in the study are; these are sole plantain, plantain/cocoa, plantain/cocoyam and plantain/cassava production system.

2.6.1.3 Assembly. This stage involves the collection of Plantain produce from farmers and delivery to other participants in the chain. Participants involved are farm gate assemblers, market arena assemblers, wholesalers and retailers.

2.6.1.4 Processing. The processing stage involves the transformation of Plantain fruit into one or more finished traded goods such as Plantain Chips and Flour.

Profitability, efficiency and availability of incentives/support are major factors influencing competitiveness of the value chain of plantain in southwestern Nigeria.

2.7 Overview of Nigerian agricultural policy and programme

There have been several agricultural policies and programmes in the country such as the Farm Settlement Scheme, National Accelerated Food Production Programme, Agricultural Development Projects, Operation Feed the Nation, River Basin Development Authorities, Green Revolution, Directorate for Food Roads and Rural Infrastructure, Better Life Programme (BLP) For Rural Women, National Agricultural Land Development Authority, National Economic Empowerment and Development Strategy, Special Programme on Food Security and Root And Tuber Expansion Programme. Recently, the agricultural transformation agenda of the Federal Ministry of Agriculture and Rural Development was formed in 2011 (Agricultural Transformation Agenda, 2011). The vision in the transformation strategy is to achieve a hunger-free Nigeria through an agricultural sector

that drives income growth, accelerates achievement of food and nutritional security, generates employment and transforms Nigeria into a leading player in global food markets to grow wealth for millions of farmers. Expected initial impact from the transformation include provision of over 3.5 million jobs within five value chain rice, cassava, sorghum, cocoa and cotton, over 300 billion Naira (US$2 Billion) additional income in the hands of Nigerian farmers and food security by increasing production of key food staples by 20 Million metric tons. According to the agenda, the following measures will however be taken towards attaining success:

- There shall **e**nd the era of treating agriculture as a development project
- There shall be an end to big government crowding out the private sector.
- Agriculture will focus on as a business.
- The transformation of the agricultural sector will be utilized to create jobs, create wealth and ensure food security
- Value chains will be focused where Nigeria has comparative advantage.

2.8 Constraints to effectiveness of past agricultural policy:

According to Olomola, (2007), the constraints are:

2.8.1 Policy instability

One of the major constraints to agricultural policy effectiveness was that of policy instability. Over the years, the rate of turnover in agricultural policies had been high, with many policies formulated and scrapped in rapid succession. Again, this problem could be partly ascribed to political instability as every successive military government tended to jettison most of its predecessor's policies and programs in the erroneous belief that a new government could only justify its existence or make its mark by adopting entirely new policies and programs.

2.8.2 Inconsistency in policies

It had been observed that some agricultural policies and programs of Government inclined to be mutually antagonistic rather than being mutually complementary and reinforcing. One fundamental factor that made policy inconsistency so common was the failure of policy makers to adopt a systems approach to policy formulation. In a systems approach, the entire spectrum of agricultural and rural development problems would be viewed globally and consistent, mutually reinforcing policies would be addressed to them. But as

each problem was viewed in isolation of others and policy was addressed to each problem in isolation, the probability of inconsistency among policies could not but be high.

2.8.3 Narrow base of policy formulation

The base of the agricultural policy formulation process in Nigeria had, in the past, been rather narrow as the level of involvement of the people and their institutions in the formulation of policies that affected their lives was minimal. In the circumstance, these policies tended to lack grassroots support and the popular mobilization required for their success.

2.9 Elements of Nigeria's Agricultural Polices influencing Competitiveness

2.9.1 Trade Policies

Nigeria's trade policies in the post-independence era according to Akande and Ogundele, (2009) were those of inward looking, domestic oriented and import substitution strategies. The oil boom of 1973–1975 created corresponding increases in imports. The Government undertook the importation and sale of cheap foreign products thereby flooding the local markets with high quality imported foods at prices which were substantially lower than the unit costs of producing their local substitutes. As a result, these domestically produced substitutes were rendered uncompetitive with the cheaper imports and their production declined drastically. It was later discovered that outward orientation is a desirable option for economic growth and development, thus trade liberalization became the policy stance from 1986. Also, Akande and Ogundele (2009) reported that the particular period was marked by two important policy developments. These are the flexible exchange rate mechanism and the adoption of a comprehensive tariff system on agricultural related products. This was to discourage the importation of these commodities and induce domestic production. In order to increase domestic production of fruits and fruit juices, a ban was imposed on consumer pack fruit juice products in later part of year 2002 (Perez and Pollack, 2005).

2.9.2 Fertilizer Policies

The primary objective of the policy is to facilitate farmers' timely access to adequate quantity and quality of fertilizers at competitive but affordable prices (USAID, 2009). Fertilizer policy in Nigeria has been oscillatory, characterized by subsidy removal today and its return tomorrow (Akande and Ogundele, 2009). Crop production is fertilizer

intensive due to the fertility nature of the soil. Only about 120,000 tonnes of fertilizer was available in 2001 as against the 300,000 tonnes in 2000 (CBN report, 2002). The inconsistent policy on fertilizer could have an adverse effect on the production and expansion of area cultivated to fruits and other crops. A decrease in the cost of fertilizer and other inputs would encourage more areas to be put into production. Government policy on input supply and distribution focused on instruments for ensuring the adequate and orderly supply of modern inputs like fertilizers, agro-chemicals, seed and seedlings, machinery and equipment, and so on (Manyong, *et al*, 2005). The key policy instruments adopted were as follows:

(i) Centralization of fertilizer procurement and distribution. All fertilizer procurement and distribution activities in Nigeria were effectively taken over by the federal government

(ii) Also, the federal government established a superphosphate fertilizer plant in the country to reduce the country's dependence on foreign sources of fertilizer supply.

2.9.3 Agricultural Mechanization Policy

Mechanized agriculture has been the major ambition of many Nigerian governments (Akande and Ogundele, 2009). This will facilitate large scale farming. The need for a coherent agricultural mechanization policy became very pressing in the early 1970s in view of an increasing shortage of agricultural labour that necessitated the substitution of some appropriate forms of mechanical power for human labour. In an attempt to achieve the objectives of an agricultural mechanization policy, the following policy instruments were adopted:

i) The operation of Tractor Hire Units (THUs) by states.
ii) Liberalized import policy in respect of tractors and agricultural equipment.
iii) Massive assistance program to farmers on land clearing through cost subsidies.

Availability of tractor would mean a great reduction in the human drudgery associated with land clearing.

2.10 Methodological and Empirical Review of Literature

2.10.1. Policy Analysis Matrix (PAM)

Muringai *et al* (2014) investigated Zimbabwe's competitiveness and comparative advantage in fertilizer production using gross margins, Competitive Advantage Ratios (CAR) and Domestic Resource Cost (DRC) Ratios. Secondary data were used in the analysis. Competitive Advantage Ratio (CAR) and Domestic Resource Cost ratio (DRC) was used to assess the country's competitiveness and comparative advantage in fertilizer production. Protection coefficients indicators such as the Nominal protection coefficient (NPC), Effective protection coefficient (EPC) were utilized to measure the level of incentives received in fertilizer production. Sensitivity analysis was used to assess the impact of changes in exchange rate on the country's comparative advantage in producing the various fertilizers. Result revealed that Zimbabwe had competitive and comparative advantage in producing compound and phosphate fertilizer.

Mortazavi *et al*, (2014) measured the relation between comparative advantage indices of wheat and support policies using econometrics approach. Data for wheat production and the current trend that supports producers in Iran for the period 1991 to 2005 compiled from published sources such as the Ministry of Agricultural and the Customs Institution of Iran were utilized. Time series data on support prices were also collected from published data of the rural cooperation organization. Cost and physical Comparative advantage indices were employed in the analysis. Physical indices such as Efficiency Advantage Index, Scale Advantage Index and Aggregated Advantage index were used. Cost comparative indices such as Net Social Profit, DRC and Social Cost Benefit (SCB) ratio were also employed. Stationary test and an econometrics model (Vector Error Correction Model (VECM) were applied to analyze the relation between guaranteed price policy and producer support estimate index. Results showed that as producer support is increased, comparative advantage decreased and the use of cheaper price inputs led to less competitiveness. The guaranteed price policy led to an improvement in scale advantage index, but had no positive effect on the efficiency advantage index.

Elzaki *et al*, (2014) examined the Comparative Advantage of Crops Production in the Agricultural Farming Systems in Sudan. The study is based on both primary and

supportive secondary data sources. The study applied the linear programming associated with Policy Analysis Matrix to determine competitiveness and policy effects on crops production in the farming systems. The PAM results showed that the farmers grow the food crop only to maintain self-sufficiency level.

Hassanpour *et al*, (2013) investigated Policies Effects and Comparative Advantage of Rainbow Trout Farming in KB Province, Iran. Data for the study was obtained through the documentary and management studies of fisheries in 2012. The study employed the DRC, Nominal Protection Coefficient on Output (NPCO) and input (NPCI) and Effective Protection Coefficient (EPC) to measure comparative advantage, protection on output, input and value added. The amount of NPCO indicated that there is a direct subsidy on the producer while the NPCI indicated indirect taxes on tradable inputs. EPC index showed that the government's policies support production process.

Longwe-Ngwira *et al*, (2012) assessed the Competitiveness of Groundnut Production in Malawi using policy analysis matrix. Primary data on groundnut yields, inputs and the market prices for inputs and output per hectare of land and secondary data on transportation costs, port charges, storage costs, import/export tariffs and exchange rate were also used in the study. Indicators of incentives such as the NPCO, NPCI, EPC, Subsidy Ratio to Producers (SRP), Producers Subsidy Estimate (PSE) were utilized to measure effects of policy on competitiveness of groundnut production. The result indicated that investments in improved technology resulted in higher profits than traditional technology.

Meliko et *al*, (2012) evaluated the efficiency of the small scale farmers for the production year 2006/2007 in Limpopo province using policy analysis matrix. Primary data were collected from a sample of random selected farmers in 25 irrigation schemes. PAM was used to measure competitiveness, comparative advantage and effects of policies on the evaluated farming systems. Result showed that all production systems were being taxed indicating little motivation from policies for small scale farmers.

Rehman *et al*, (2011) examined Comparative Advantage and Policy Analysis of Wheat in District Khan of Khyber Pakhtunkhwa. Primary data were collected using stratified random sampling technique. Secondary data on input and output prices, information on agricultural and macroeconomic policies and other relevant variables were

collected from agricultural price commission and Pakistan research council. The DRC and SCB were used to measure efficiency in production while levels of incentives were measured using EPC, NPC and the SRP. The result indicated that wheat production is nationally profitable for import substitution but is not profitable for export promotion. The Domestic Resource Cost (DRC) ratio and Social Benefit Cost (SBC) ratio analysis also confirm the same results. Nominal Protection Coefficient (NPC) and Effective Protection Coefficient (EPC) show that wheat production is encouraged by the policy incentives both for export promotion and import substitution strategies.

Ogbe *et al* (2011) assessed the competitiveness of Nigerian rice and maize production ecologies using the policy analysis matrix (PAM). The study made use of secondary data collected in three of Nigeria's agro–ecological zones: the lowland, upland and irrigated ecologies in 2006. Level of incentives received in the production ecologies were measured using NPC, EPC and SRP. Sensitivity analysis was carried to test whether the result would be affected or altered by changes in world price, farm gate price, output and exchange rate valuation. Results of the PAM revealed that outputs from the production ecologies are taxed; however the production ecologies are subsidized on the use of tradable inputs.

Ugochuckwu and Ezedinma, (2011) examined Rice Production Systems in South-eastern Nigeria using Policy Analysis Matrix Approach. Primary data were collected using multi stage sampling technique. Three indicators of economic efficiency under the policy analysis matrix were used to assess the three (upland, lowland and double) rice production systems. The indicators of economic efficiency include the Nominal Protection Co- efficient (NPC), Effective Protection Coefficient (EPC) and Domestic Resource cost (DRC).The result shows that upland; lowland and double rice cropping systems in south-eastern Nigeria were profitable based on the policy analysis matrix (PAM) model, and rice production under various systems and technologies was socially profitable and financially competitive.

Oguntade (2011) assessed Protection and Comparative Advantage in Rice Processing in Nigeria. The main analytical framework used was the Policy Analysis Matrix (PAM). The study made use of primary data collected from Rice processors in Ebonyi state, Nigeria. Data from other secondary sources were also used. The main

analytical framework used was the Policy Analysis Matrix (PAM). The policy distortions were measured through Nominal Protection Coefficient (NPC) and Effective Protection Coefficient (EPC). Private Profitability Coefficient (PPC) was used to measure the comparative advantage a processor has in producing value-added rice while the Domestic Resource Cost ratio (DRC) was selected as the measure of the comparative advantage Nigeria has in producing the commodity. The results show that the total value addition in the processing of paddy rice into basic milled rice was 20% of the output value while the total value addition in the processing of basic milled rice into value-added rice was about 17% of the output.

Islam and Kirschke, (2010) analyzed policy incentive in terms of protection and efficiency of production in the rice sector of Bangladesh by using policy analysis matrix (PAM) for the period of 2003 to 2005. They utilized secondary data from different published and unpublished sources such as the World Bank. From policy analysis matrix, protection coefficients such as NPCO, NPCI, EPC and PC and competiveness coefficients such as DRC, SCB were used to measure the level of protection and comparative advantage in the rice sector of Bangladesh. The results of the policy transfer and protection coefficients (NPCO, NPCI, EPC and PC criteria) shows that rice production in Bangladesh was subsidized for inputs (NPCI<1) and taxed for the product/output (NPCO<1).The net effect of output taxation and input subsidy resulted in a net taxation on value added (EPC<1) for policy goal of self-sufficiency. The sensitivity analysis shows the sensitiveness of rice production competitiveness towards technological improvement, climate change and change in international and national price of input and output under import parity condition.

Habibullah (2010) analyzed competitiveness, comparative advantage and policy effects on wheat production in two selected villages of district Dehbala, Nangarhar Province, Afghanistan. Primary data were utilized and supported with secondary data on prices of inputs and outputs market, world prices, and other macroeconomic variables which were obtained from different national and international secondary sources. The data was analyzed using the Policy Analysis Matrix (PAM). The extent of comparative advantage and policy distortions of wheat production was estimated from measures of comparative advantage (Domestic Resource Cost (DRC) and Social Benefit-Cost Ratios

SBC) and indicators of policy incentives (Nominal Protection Coefficient (NPC) and Effective Protection Coefficient (EPC), Producer Subsidy Equivalent (PSE) and Subsidy Ratio to Producer (SRP). The result revealed that wheat farmers had no comparative advantage in the study area and the result of disadvantage was proved by SBC ratios.

Liverpool *et al* (2009) examined the Competitiveness of Agricultural Commodity Chains in Nigeria using the Policy Analysis Matrix (PAM). They utilized primary data on farm level production budget as well as other processing and affiliated costs related to the production and marketing of commodities. Policy Analysis Matrix (PAM) framework was employed to assess private profitability, national economic growth, and the divergence between the private and social profit in the production and marketing of three agricultural Commodities in Nigeria (cassava, maize, and rice). PAM was also used to analyze the direct and indirect effects (negative or positive) of various government policies along with the agricultural production environment on farmers' profitability. They found that Nigerian cassava growers do not have comparative advantage in the production of cassava chips and maize for export.

Yercan and Isikli (2009) evaluated competitiveness of horticultural crops (tomato, melons, watermelons, tangerines, sweet peppers, grapes and straw berries) that can be produced and exported from Turkey. The study utilized secondary data from regional directory of the agricultural ministry, Research Institute of Agricultural Economics. Private and social profit were used in the determination of value added at private and social value while level of comparative advantage and protection received in the sub sector were measured using Domestic Resource Cost (DRC), Effective Protection Coefficient (EPC) and Nominal Protection Coefficients (NPC). The results showed that the Turkish horticultural sector had competitive advantage. The study discovered that the two main factors underlying competitiveness are price competitiveness and product quality.

Arsanti *et al*, (2008) evaluated Vegetable Farming Systems for Competitiveness in Upland Areas of Java and Sumatra, Indonesia using primary data. The Private Cost Ratio (PCR) was used to measure competitiveness while Domestic Resource Cost (DRC) were used to measure comparative advantage. The results showed that Vegetable Farming System (VFS) in upland areas of Indonesia is profitable, especially for potato in

Pangalengan and in Berastagi, cabbage, tomato, broccoli, chilli, leek and carrot, but not for potato in Kejajar. Most of vegetable products have also comparative and competitive advantages, except potato in Kejajar.

Winter-Nelson and Aggrey-Fynn, (2008) applied Policy Analysis Matrix (PAM) to identify opportunities to enhance agriculture's contribution to economic growth and poverty alleviation in Ghana. Primary data from surveys of households were utilized. The PAM method was applied to study the social and private profitability of six maize production systems and six rice production systems. The results indicated that all twelve systems contributed to national economic growth and private income generation among farmers, at least under the high cereals prices that prevailed in 2007. Maize systems show a higher rate of return (lower cost/benefit ratio) than rice systems.

Esmaeili (2008) analyzed the Competitiveness of Shrimp Farming in Southern Iran. Primary data collected from field survey using two stages random sampling technique was utilized. Profitability and protection indices such as private and social profit, NPCO, NPCI, DRC, SCB, EPC, SRP and PSE were utilized. It was concluded that shrimp social price and production profit were less than market prices.

Azzouzi *et al* (2006) measured the effect of incentive policy on performance and international competitiveness of fruits, vegetables, and olive oil in Morocco using secondary data obtained from the country Ministry of agriculture. The Nominal Protection Coefficients (NPC), Domestic Resource Cost (DRC) ratios and the Effective Protection Coefficients (EPC) were used to evaluate the effects of the local incentive policy on international competitiveness of the products. The results showed that the NPC ratios, which were all less than one, indicate that the four products are relatively taxed. The DRC ratios for the four products were also less than one, indicating a comparative advantage and an efficient allocation of domestic resources.

Javed *et al*, (2006) assessed the comparative advantage of cotton production in Pakistan and determined the effect of the current set of policies on the comparative advantage. The Domestic Resource Cost (DRC), Nominal Protection Coefficient (NPC) and Effective Protection Coefficient (EPC) were used for the analysis of secondary data collected in the harvesting years, 1998-2003. The analysis was carried out in the context of Policy Analysis Matrix (PAM). Overall results of the study depict that Pakistan under

WTO regime had comparative advantage in producing seed cotton as major export crop. Mohanty *et al* (2003) used a modified Policy Analysis Matrix (PAM) approach to assess the efficiency of cotton produced under set of complex policies including price supports and various input subsidies and credit in five major producing states in India. Secondary data from ministry of agriculture and cooperation in India was utilized. Protection coefficients such as Nominal protection coefficient on output and input, Effective protection coefficient, subsidy ratio to producers as well as Producers subsidy estimate were evaluated. The results indicated that cotton is not efficiently produced in the second largest cotton producing state in the country and without government interventions, acreage will move away from cotton to more profitable crops such as sugarcane and groundnut in the states.

Wiendiyati *et al*, (2002) examined the impact of Tariff policy and inter island transport costs on the profitability of soybean production in Ngada Regency, NTT. Primary data on budgets were gathered through in-depth interviews with soybean farmer. Sample farmers were drawn using purposive sampling. Secondary data on the world prices of exported and imported commodities were obtained from the Center for Agro-Socio-Economic Research (CASER), the Food and Agriculture Office of Ngada Regency, the Indonesia National Central Bureau of Statistics, and various academic research reports. Private and social profits were calculated as well as policy distortions indicators such as the NPCO, NPCI, DRC, SCB, SRP and PSE. Results showed that soybeans are both privately and socially profitable. They also found that farmers have a strong economic incentive to produce soybeans which has a significant competitive advantage over the alternative, red beans.

Shahabuddin *et al* (2002) examined the comparative advantage of rice production in Bangladesh. Secondary data on input coefficients, financial prices of crops and production inputs, economics prices of crops and productions input were utilized in the study. Comparative advantage in Bangladesh agriculture was analyzed using Net economic profitability and the domestic resource cost ratio. The profitability estimates and estimated domestic cost ratio suggest that Bangladesh has a comparative advantage in rice production except for the upland crop and the deep water rice.

Bogale *et al* (2002) examined the competitiveness of smallholder farmers in food crop production in Alemaya, Hitosa, Teff and Merhabete. Policy Analysis Matrix indicators such as Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC) and Domestic Resource Cost (DRC) were employed to determine the incentives generated under a set of existing agricultural policy. The PAM indicator showed that domestic production of food crops enjoyed comparative advantage even in regions where productivity was highly constrained by land degradation and policy disincentives.

Gorton and Davidova (2001) examined the competitiveness of crop and livestock production in Central and East European Countries. They utilized the DRC methodology. Data were obtained from empirical work conducted by the authors and other studies that have estimated domestic resource cost (DRC) ratios for agriculture in various CEECs. The results showed that countries' crop production is more internationally competitive than livestock production.

Joubert and Van Schalkwyk, (2000) utilized the Policy Analysis Matrix (PAM) to determine the definable impact of policies on the Southern African Valencia industry. Secondary data from Agriconcept, Combud publications and Citrus Production Guidelines were utilized. Private cost coefficient, DRC coefficient, NPC on tradable outputs and inputs, EPC, Profitability Coefficient (PC) and the Subsidy Ratio to Producer (SRP) were employed to measure financial and economic profitability as well as level of protection received in the Valencia industry. The result indicated that the Valencia industry was highly competitive and had comparative advantage in normal years. Taxation in the form of tariffs on production inputs was the main controllable contributor towards the sensitivity of the industry.

Fang and Beghin, (1999) assessed the comparative advantage and protection of China's major agricultural crops using a modified Policy Analysis Matrix (PAM) with secondary data collected from 1996 to 1998 data. Nominal protection coefficient on output, Nominal protection coefficient on input, Effective protection coefficient, Effective protection coefficient, Domestic resource cost, social cost benefit cost were used to compare relative efficiency and comparative advantage between agricultural commodities. The study considered the following commodities: early indica rice, late indica rice, japonica rice, south wheat, north wheat, south corn, north corn, sorghum, soybean,

rapeseed, cotton, tobacco, sugarcane, and a subset of fruits and vegetables. The results indicated that China had comparative advantage in labour-intensive crops, and a disadvantage in land-intensive crops. Land-intensive grain and oilseed crops are less socially profitable than fruits and vegetables. Within the grain sector, high quality rice and high quality north wheat have more comparative advantage than early indica rice and south wheat, respectively.

Gorton *et al* (2000) examined the competitiveness of agricultural production in Bulgaria and Czech Republic by using the Revealed Comparative Advantage (RCA) and Domestic Resource Cost (DRC) and Effective protection rates. Secondary data collected from Czech Institute of Agricultural Economics and FAO administered farm accounting survey in Bulgaria augmented with price and yield information from Bulgaria Ministry of Agriculture. The results showed that Czech and Bulgaria cereal producers were competitive at world market prices as well as at the EU prices.

2.10.2 Gross Margin Analysis and Value Chain Mapping

Ugonna *et al*, (2013) examined the value chain analysis of Irish potato as an industrial raw material in Nigeria. The study made use of secondary and primary data and analyzed using descriptive statistics. The study showed that the constraints limiting production, processing and marketing of Irish potato include inadequate supply of good quality seeds, inadequate storage facilities, poor diseases, and pests' management which affects yield and value addition to potato crop.

Ouma and Jagwe, (2010) analyzed Banana Value Chains in Central Africa using primary data collected during banana market survey and post-harvest transformation survey. Value chain mappings and gross margin analysis were employed to assess margin along the chain, constraints and opportunities for existing value chains for bananas in Central Africa. The results showed weak linkages within the banana value chains with poor integration of value chain participants and minimal involvement with regional markets and high-value domestic chains such as supermarkets.

2.10.3 Policy Analysis Matrix and Programming

Abedi *et al*, (2011) analyzed Comparative Advantages of Corn in Optimal Cultivation Pattern. The study investigated comparative advantages of corn in comparison with other competitor crops. Linear Programming in combination with DRC approach

was employed in determining comparative advantage in corn cultivation using secondary data. Results showed that corn has comparative advantages in all regions of Kermanshah province while in optimal cultivation pattern of 37.5 percentages of regions in existence of rotation and 50 percentages of regions in lack of rotation, corn acreage has been increased.

Reig-Martínez *et al*, (2008) evaluated profitability of rice cultivation in wetland of eastern Spain. The study combined policy analysis matrix with data envelopment analysis techniques to model the analysis of profitability from farming under observed conventional and profit-efficient farming conditions. The study utilized primary data collected from comprehensive survey on Variable inputs such labour (working days), capital, fertilizers, seeds, herbicides and fungicides, The results revealed that there was lack of profitability under conventional farming conditions while farmers are shown to make positive profits at private and social prices when data reflecting efficiency adjustments are used in the analysis.

2.10.4 Policy Analysis Matrix and Partial Equilibrium Analysis

Ahmed *et al* (2012) examined effect of price policies on the most important Egyptian Cereal crops. Secondary data collected from different sources during the period (2005-2009) were utilized. The data were analyzed using Policy Analysis Matrix and Partial Equilibrium Methods. The results indicated that, there was a protection in wheat prices in 2005 and2006 with respect to producer, while there was a policy of imposing taxes on wheat producers during (2007-2009).

A number of studies have been carried out on value chain and competitiveness of agricultural commodities. For example Adegbite *et al* (2014) examined competitiveness of Pineapple production in Osun state. Results revealed that pineapple production techniques were privately and socially profitable. Nominal Protection on Input and Output and the Effective Protection Coefficients for the two production systems indicated presence of tax and the producers were not protected by policy.

Mkpuma *et al*, (2013) analyzed competitiveness of rice processing and marketing in Ebonyi State to determine the impact of policies on domestic rice in Ebonyi State. Findings revealed that Nominal protection coefficient for output and inputs were 1.52 and 0.92 respectively for processors, 1.5 and 1.4 for marketers. Domestic resource cost coefficient was 1.41 and 0.53 respectively for processors and marketers. The EPC values

of 10.33 and 0.17 respectively for processors and marketers showed that rice processors were protected while marketers were not protected in the area.

Ahmed *et al* (2012) analyzed effect of price policies on the most important Egyptian cereal crops with respect to protection of domestic prices in order to guarantee continuity of production that achieve comparative advantage. Results indicated that, there was protection in wheat and rice prices while there was a policy of imposing taxes on wheat and rice producers during 2007-2009. Both wheat and rice were characterized with comparative advantage in their domestic production. The results of (PEM) for wheat showed that, the net economic loss as a result of importing wheat reached maximum in 2009, by 93.04 million bounds, while reached minimum in 2006 by 4.89 million pounds. Also, the results of (PEM) for rice showed that, the net economic loss as a result of exporting rice reached maximum in 2009, by 1.395 billion bounds, while it reached minimum in 2006 by 0.12 million pounds.

Ogbe *et al*, (2011) in their study on competitiveness of Nigerian rice and maize production ecologies found that outputs from the production ecologies were taxed while the tradeable inputs were subsidized. They also found that the ecologies show a strong competitiveness at the farm level. In the same vein, a study by Oguntade (2011) on protection and comparative advantage in rice processing in Nigeria revealed that total value addition in the processing of paddy rice into basic milled rice was 20% of the output value while the total value addition in the processing of basic milled rice into value-added rice was about 17% of the output.

Ugochuckwu and Ezedinma (2011) examined rice production systems in south-eastern Nigeria. The result showed that upland; lowland and double rice cropping systems in southeastern Nigeria were profitable and rice production under various systems and technologies is socially profitable and financially competitive.

Rehman *et al*, (2011) analyzed comparative Advantage and policy Analysis of Wheat in District D.I.Khan of Khyber Pakhtunkhwa. Nominal Protection Coefficient (NPC) and Effective Protection Coefficient (EPC) showed that wheat production was encouraged by the policy incentives both for export promotion and import substitution strategies. Result further showed that the current sets of agricultural macro policies are

consistent with competitiveness of wheat production for import substitution, but are not consistent with production for export Promotion.

Odendo *et al*, (2011) analyzed the production-consumption continuum of mushroom value chains in Kenya. Result revealed that men played a bigger role in deciding entry into mushroom cultivation and purchase of spawn, women had greater role in harvesting and post-harvest activities. About 20 percent of mushroom growers processed mushrooms and the major products were cakes (38 percent) and flour (31 percent). Marketing of mushrooms was dominated by the producers themselves. Logit model showed that households that entered mushroom industry were: headed by male full-time farmers, composed of larger number of female adults and had access to extension services.

Quddus and Mustafa (2011) examined the relative efficiency of major crops (wheat, rice, sugarcane, and cotton) in Pakistan and their comparative advantage in international trade as measured by economic profitability and the domestic resource cost (DRC) ratio. Economic profitability analysis demonstrates that Punjab has a comparative advantage in the domestic production of wheat for self-sufficiency but not for export purposes. In basmati production, Punjab has a comparative advantage, and increasing Basmati production for export is a viable economic proposition. The nominal protection coefficient (NPC), effective protection coefficient (EPC), and DRC for Irri rice are more than 1: the given input-output relationship and export prices do not give Punjab a comparative advantage in production of Irri for export. Sugarcane growers did not receive economic prices during 2001/02 and 2002/03 in an importing scenario, while in 2003/04, the NPC was 1.02, indicating positive support to sugarcane growers. The NPCs estimated under an exporting situation range from 1.33 to 1.99, indicating that the prices received by growers are higher than the export parity/economic prices. This is also an indication that sugarcane cultivation for exporting sugar is not feasible in terms of economic value. The NPCs for cotton under an importing scenario were less than 1 while under an exporting scenario were either close to or greater than 1, implying an expansion in cotton production as imports have been more expensive than domestic production.

Empirical studies on the use of linear programming in the determination of competitiveness include those of Abedi *et al* (2011). They investigated comparative

advantages of corn in comparison with other competitor crops. Results showed that corn has comparative advantages in all regions of Kermanshah province while in optimal cultivation pattern of 37.5 percentages of regions in existence of rotation and 50 percentages of regions in lack of rotation, corn acreage has been increased. Factors such as supporting policies and rotation might also have effects on comparative advantages and optimal cultivating pattern. Similarly, Tanko *et al* (2011) analyzed competitiveness of mono crop and mixed crop enterprises in farming system of small holder farmers in Niger state, Nigeria. Results indicated that resources were not optimally allocated and after optimization, gross margins could be increased. Cereal-legume cropping patterns showed dominance in both the existing and optimum plans.

Ouma and Jagwe (2010)) examined opportunities and constraints in Banana value chains in central Africa. Results showed weak linkages within the banana value chains with poor integration of value chain participants, minimal involvement with regional markets and high-value domestic chains such as supermarkets. They also found that Transaction costs comprising transport, handling and storage comprised a high proportion of cost items in the value chain. Kumar and Kapoorb (2010) examined value chain analysis and market chain of coconut in Orissa in order to examine flow of product from farmers through different intermediaries to the consumers. The study observed a high ratio of vendors versus farmers and aggregators versus vendors in the channel.

Winter-Nelson and Emmanuel Aggrey-Fynn (2008) examined Opportunities in Ghana's Agriculture. Results indicated that all the twelve systems evaluated contributed to national economic growth and private income generation among farmers. Maize systems showed a higher rate of return than rice systems. Results further suggested adoption of input technologies that could make maize profitable under a very wide range of prices.

Obih *et al* (2008) analysed the protection and welfare effects of ban and tariff policies on rice importation in Nigeria for the periods of 1987-2005 using the partial equilibrium model. Result revealed that tariff appeared to be more effective in raising domestic prices than discouraging importation because of the price capping effect of imported rice brands. Ban provided higher but insignificant

amount of protection than tariff, its inefficiency costs on rice production and consumption were significantly higher.

According to the study of Akande and Ogundele (2009) on the effects of trade and market liberation on incentive structure in yam production in Nigeria, they discovered that yam production was profitable to producers and the economy. Findings further revealed that Nigeria had comparative advantage in yam production in the three production systems examined. The incentive structure showed that yam producers were fairly protected as economic agents under the existing macroeconomic and sectoral policy regimes.

Neptune and Andrew (2007) assessed the competitiveness and comparative advantage of cocoa production in Trinidad and Tobago. The analyses were conducted over three cocoa production systems – small farm traditional, large farm traditional and large farm intensive cultivation. Results indicated that all production systems were profitable, internationally competitive and have comparative advantage. The results suggested that the low levels of profitability per hectare for the small farms may underlie the declining area and output.

Mashinini *et al*, (2006) analyzed the welfare effects of the regulation of the maize market in Swaziland. The study established that lack of market competitiveness was the cause of market distortions in the maize marketing system of Swaziland. Williams (1993) examined impact of livestock pricing policies on meat and milk output in selected sub-Saharan African countries. The empirical results indicated that in comparison with real border prices, a certain degree of success was achieved in stabilizing real domestic producer prices in the study countries. However, consumers still appeared to gain as much as producers in three of the study countries, with negative consequences for foreign exchange earnings and government revenues. The analysis revealed the importance of domestic inflation and exchange rates as key variables for livestock pricing policies and highlights the need to address the macro- economic imbalances that caused exchange-rate distortions and high domestic inflation at the same time that direct price distortions were being tackled.

Javed *et al*, (2006) assessed the comparative advantage of cotton production in Pakistan and determined how far the current set of policies is consistent with the comparative advantage. The Domestic Resource Cost (DRC) analysis for Punjab

concluded that farmers in Punjab had comparative advantage in producing seed cotton for the study period. The value of Nominal Protection Coefficient showed that the seed cotton farmers in Punjab were taxed. This was further confirmed by the values of Effective Protection Coefficient. The analysis showed that Sindh had more comparative advantage than Punjab.

Zhong *et al*, (2002) stated that the comparative advantage in main grain crop varied significantly across China. It was reported that there existed great potential to improve resource allocation and increase grain production through restructuring of the grain sector. The study also indicated that China is able to compete in the world market as a whole and has comparative advantage in producing some crops at some of its provinces.

Akgungor *et al* (2001) evaluated the competitiveness of Turkish Fruit and Vegetable processing sector through the Revealed Comparative Advantage and Comparative Export Performance Indices. They found that Grapes and Citrus processing industry were more competitive compared with the other competitor countries, such as Spain, Greece and Portugal.

Ferto and Hubbard (2001) examined the competitiveness of Hungarian agriculture and food processing in relation to that of EU based on four indices of Revealed Comparative Advantage for the period 1992-98. The results revealed that the indices were less satisfactory as cardinal measures but are useful to identify whether or not Hungary has a comparative advantage in a particular product group.

Camara (2000) examined using Policy Analysis Matrix framework the magnitude of the impact of agricultural policies, location and technologies on the private and social profitability of cassava production and post-production processing in Nigeria, Cote di'voire and Ghana. The result showed that cassava/maize systems had a competitive advantage over their competitors in Cote di'voire. Further, farmers operating at the market located near the port city benefited from a small implicit price support whereas farmers operating in the market located far away from the port city were subject to a small implicit tax. The result also indicated that Ivorian and Ghanaian cassava/maize farmers benefited from growing IITA's improved variety and adopting mechanized processing methods.

Bagchi and Hossain (2000) evaluated the comparative advantage in rice production for India. The detailed data on costs and returns available from reports of the costs of

cultivation of principal crops was used. The results showed that adoption of high yielding varieties, farm mechanization, increased use of fertilizers and chemicals led to increase in productivity. The increased use of tradable inputs also resulted in reallocation of resources.

2.10.6 Lessons learnt from Literature reviewed

A number of lessons were learnt from theoretical, methodological and empirical review of literature. From theoretical point of view, it was learnt that competitiveness would be sustained when production is in line with country comparative advantage situation. Comparative advantage is the dominant factor determining trade flows in differentiated products. The major determinants of competitiveness from theoretical point of view are factor conditions, demand conditions and role of government.

From methodological point of view, studies by Yercan and Iskili, (2009); Van Schalkwyk, *et al*, (1997); Javed *et al*, (2006); Fang and Beghin, (2000);, Mohanty *et al*, (2003); Hassanpour *et al*, (2013);, Habibullah, (2010) and Mortazavi *et al*, (2014) among others were reviewed. Policy Analysis Matrix was employed using indices such as Private and Social profits. Competitiveness and Comparative Advantage indices, and Protection Coefficients such as PCR, DRC, SCB, NPCO, NPCI, EPC, SRP, PSE, and PC were used to measure competitiveness, comparative advantage and level of protection received along the commodity value chain. Secondary data were mostly utilized by the reviewed work (Yercan and Iskili, 2009; Van Schalkwyk, *et al* 1997; Javed *et al*, 2006; Fang and Beghin, 2000; Mohanty *et al*, 2003) while Habibullahi, (2010), Arsanti *et al*, (2008) combined both primary data with secondary data for their studies. Empirical review placed emphasis on private and social profitability and protection coefficients such as Nominal Protection Coefficients on output and input, Effective Protection Coefficient, Domestic Resource Cost ratio, Social Cost Benefit ratio, Subsidy Ratio to Producers and Producers Subsidy Estimates.

2.10.6 Shortcomings in literature Reviewed

Most studies engaged only Policy Analysis Matrix for their analysis. Only few reviewed work carried out sensitivity analysis. Sensitivity analysis is a method that could be used to strengthen the result of the Policy Analysis Matrix (PAM) since PAM is a static model because it is based on current market situation. Most reviewed work focused on a segment

of the chain, thereby leading to insufficient information on the performance of the commodity chain.

2.10.7: Literature gap

This study differs from the reviewed literatures because it focused on Plantain. Most of the work from Nigeria and the world at large focused on rice, maize, yam and potato. The study was also different from the reviewed studies because it utilized Policy Analysis Matrix in combination with Partial Equilibrium Analysis while most reviewed work focused only on one of the analytical tool. Better results were expected because of the ability to indicate the source and volume of protection/tax accruing to the participants in the value chain. Sensitivity analysis was also carried out to estimate the effect on the competitiveness and comparative advantages with changes in indicators such as yield, exchange rate, price of tradeable input amongst others. The study also analyzed the level of employment generated along the stages of the value chain which was not the case in reviewed work. Also, the study differs from the reviewed literature because it examined the flow and volume of product in plantain value chain in order to identify the core processes, the participants, opportunities and constraints along the stages of the value chain. Most of the reviewed work focussed on a segment of the chain such as production (Ogbe *et al*, (2011), Akande and Ogundele, 2009). This present study analyzed the competitiveness of the whole plantain chain and not focussing on a segment of the chain.

2.10.8: Reasons for using Policy Analysis Matrix and Partial Equilibrium Analysis: The PAM according to Monke and Pearson (1989) provides a complete and consistent coverage to all policy influences on costs and returns of agricultural production. It allows varying levels of disaggregation and it makes the analysis of policy induced transfers straightforward. The PAM also makes it possible to identify the net effect of a set of complex and contradictory policies and to sort out the individual effects of those policies. Partial equilibrium technique will indicate the volume of support and taxes accruing to the producers and consumers in a commodity value chain.

CHAPTER THREE

3.0 Research Methodology

3.1: Study area

The study was carried out in Southwestern, Nigeria. The study was concentrated in the major plantain producing states in the region comprising of Oyo, Osun, Ondo, Ekiti and Ogun state. The zone was chosen because it is 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 Southwestern is one of the six geopolitical zones in Nigeria. 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 west and 6^{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 mean annual rainfall is 1480mm with a mean monthly temperature range of $18^{o}C$ – $24^{o}C$ during the rainy season and $30^{o}C$ – $35^{o}C$ during the dry season. 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, plantain and yam (NPC, 2006).

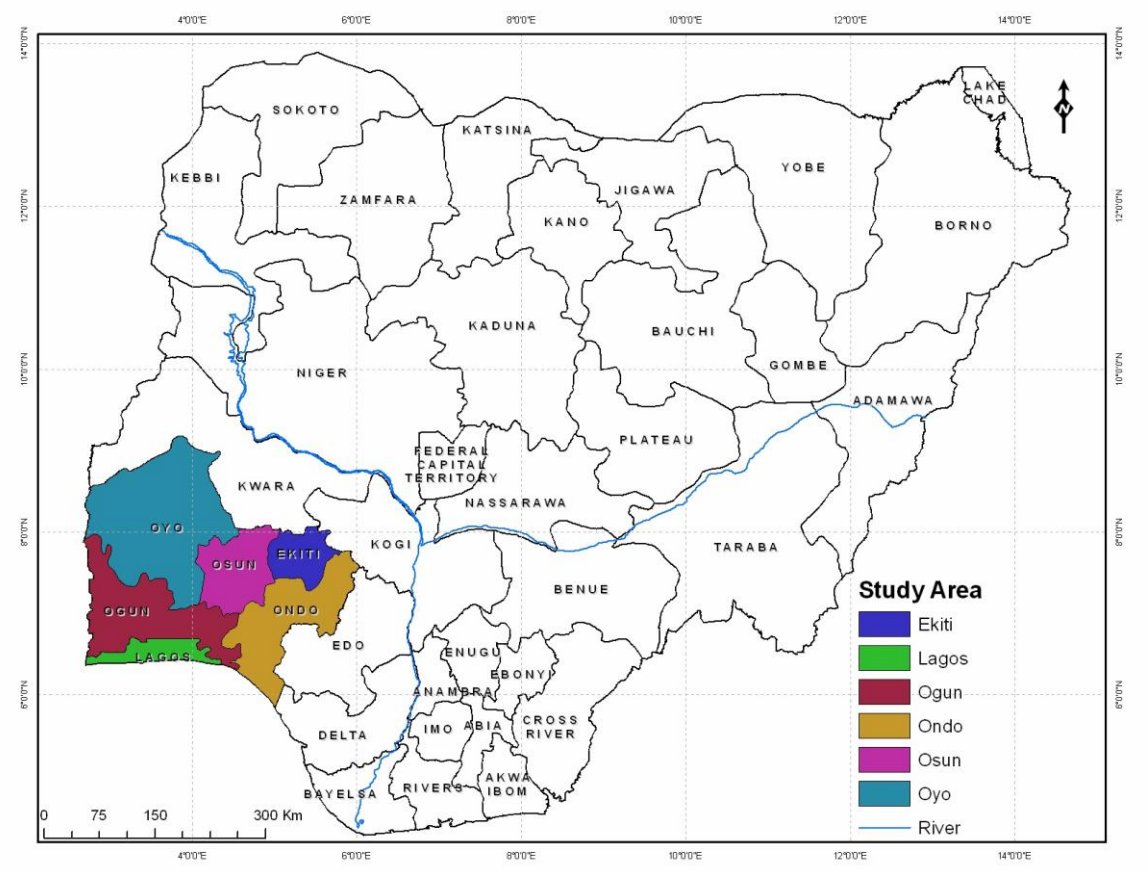

Figure 3.1: Map of Southwestern Nigeria showing the study area

3.2: Sources and types of data: Primary and Secondary data were utilized for this study. Primary data were obtained through the use of well-structured questionnaire. Primary data were collected from participants in the value chain including producers, assemblers, marketers and processors. The primary data collected include: information on key processes, key participants and functions, number of employment along the stages of the value chain, cropping systems, quantity of input, output and their prices, transportation cost, storage cost, as well as constraint along the stages of the value chain. Secondary data include world reference price for the commodity, production subsidy, port charges, import and export tariffs and exchange rates. The secondary data were sourced from Nigeria Port Authority and trade Statistics.

3.3 Sampling procedure and Sampling size: A reconnaissance survey was conducted to identify the major area of production, marketing and processing of plantain in Southwestern (SW) Nigeria. Thereafter, the study employed three stage sampling technique in the selection of producers and processors. For the producers, 10 high plantain production local government areas were selected from the zone based on the information collected from Agricultural Development Project office. This was followed by selection of two villages randomly from each of the local government. In the last stage of producers sampling, farmers were randomly selected from the villages based on probability proportionate to size of each village based on the information received from association of producers in the locality to give a total number of 260 producers from the zone. For processors, four local government areas notable for processing were selected in the zone. In the second stage of the processors sampling, four communities were purposively selected in the four local governments and in the final stage 50 processors of plantain chip and flour were randomly selected from the communities in the SW zone. A total number of 144 marketers were randomly selected from plantain markets in the zone. The surveyed markets were selected because they were largely reputed plantain marketing centres. The volume of trade and geographical spread of patrons stood them out as markets of reference for plantain in the region.

Table 3.1: Producers sampling procedure

Producers	Local Government Areas selected	Villages per Local Government	Number of farmers
Osun	Irewole	Molarere,	10
		Odeyinka,	15
	Ayedaade	Akanle,	12
		Sanga,	15
Ondo	Idanre L G	Ododе	15
		Atosin	12
	Ondo East	Lagba	11
		Fagbo	15
Ekiti	Ekiti South West	Ilawe	15
		Ogotun	10
	Ekiti West Local Government	Aramoko	14
		Ile-Ona	14
Ogun	Ijebu east	Igbodu	12
		Ojelana	14
	Odogbolu	Jimijero	12
		Idena	14
Oyo	Oluyole	Alaaru	12
		Ashipa	15
	Iddo	Akufo	13
		Bakantare	10

Source: Field Survey, 2013

Table 3.2: Marketers and Processors Sampling

State	**Name of market**	**Number of respondents**
Osun	Total	50
Ondo	Owena	50
Oyo	Oje	44
Processors (flour)		
State	**Local government**	**Number of respondents**
Osun	Irewole	25
Ondo	Akure south LG	25
Chips		
State	**Local government**	**Number of respondents**
Ogun	Ijebu east and odogbolu	25
Oyo	Ibadan North and SW	25

Source: Field Survey, 2013

3.4: Analytical Procedure

3.4.1 Socioeconomic Characteristics of participants along the stages of the Value Chain

This was analyzed using descriptive statistics such as frequency, percentage and tables.

3.4.2 Mapping of linkages between participants and activities in the Plantain value chain. (Objective 1)

This was analyzed using functional analysis. The core processes, participants involved, flow and quantity of product at each stage of the value chain were determined. A flow chart was used to represent the activities in the value chain. Constraints along the stages of Plantain Value Chain were analyzed using descriptive statistics.

3.4.3 Comparative Advantage and Competitiveness of each stage and whole Plantain Value Chain were analyzed using Policy Analysis Matrix Approach (objective 2).

The Policy Analysis Matrix (PAM) was used to analyze the Competitiveness and Comparative advantage of plantain along the stages of the value chain (Objective 2). The PAM is a computational framework developed by Monke and Pearson, (1989) and augmented by Masters and Winter–Nelson (1995) for measuring input use efficiency in production, comparative advantage and degree of government interventions (Nelson and Panggabean, 1991). PAM provides a complete and consistent coverage to all policy influences on costs and returns of agricultural production. The strength of PAM is that it allows varying levels of disaggregation and it makes the analysis of policy induced transfers straightforward. The PAM also makes it possible to identify the net effect of a set of complex policies and to sort out the individual effects of those policies. Three principal practical issues can be investigated through the PAM approach: 1) the impact of policy on competitiveness and farm-level profits, 2) the influence of investment policy on economic efficiency and comparative advantage, and 3) measuring transfer effects of policies (Pearson *et al*, 2003). A policy analysis matrix (PAM) is a budget-based method for quantitative economic policy analysis, which allows for the evaluation of public investment projects and government policies in the agricultural sector (Monke and Pearson 1989; Pearson *et al*, 2003). The basic format of PAM is presented on Table 3.

Table 3.3: The Policy Analysis Matrix Framework

Item	Revenue	Costs		Net profit
		Tradeable inputs	Domestic factors	
Private prices	$A = \sum P_X^P Q_X$	$B = \sum P_I^P Q_I$	$C = \sum P_J^P Q_J$	D = *A*-*B*-*C*
Social prices	$E = \sum P_X^S Q_X$	$F = \sum P_I^S Q_I$	$G = \sum P_J^S Q_J$	H = *E* – *F* - *G*
Divergences	$I = \sum P_X^P Q_X - \sum P_X^S$	$J = \sum P_I^P Q_I - \sum I$	$K = \sum P_J^P Q_J - \sum P_J^S Q_J$	*L* = *D* – *H*

Source: Monke and Pearson, 1989; Masters, 1995)

$A =$ Revenues in private prices $B =$ Cost of tradable inputs at private price $C =$ Cost of domestic factors at private price $D =$ Private profits $E =$ Revenue in social prices $F =$ Cost of tradable input at social prices $G =$ Costs of domestic factor in social prices $H =$ Social profits $I =$ Output transfers $J =$ Tradeable input transfers $K =$ Factor transfer $L =$ Net policy transfers Subscript x = plantain fruits and products Subscript i = tradeable input Subscript j = non tradeable domestic factor input $P_X^P =$ Private Price of plantain fruits and products $Q_X =$ Quantity of plantain fruits and products $P_I^P =$ Private Price of tradeable inputs $Q_I =$ Quantities of tradeable inputs $P_J^P =$ Private Price of non tradeable inputs $Q_J =$ Quantity of domestic non tradeable inputs $P_X^S =$ Social price of plantain fruits and products $P_I^S =$ Social price of tradeable input $P_J^S =$ Social price of domestic non tradeable inputs

3.4.4. Competitiveness

This was analyzed from PAM framework using Private profitability and Private Cost Ratio.

3.4.4.1 Private Profitability

The private profitability demonstrates the competitiveness of the agricultural system given current technologies, prices of input and output and policy (Monke and Pearson, 1989). The term private refers to observed revenues and costs reflecting actual market prices received or paid by farmers, merchants, or processors in the agricultural system. The private, or actual, market prices thus incorporate the underlying economic costs and valuations plus the effects of all policies and market failures (Monke and Pearson, 1989). Private profit is calculated on the first row of the matrix and it is the difference between observed revenues and costs valued at market prices (private values) received by the producers, marketers and processors.

$$PP = \sum P_X^P Q_X - \sum P_i^P Q_i - \sum P_j^P Q_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Where:

$PP =$ Private profit

Subscript x = plantain fruits and products

Subscript i = tradeable input

Subscript j = non tradeable domestic factor input

P_X^P = Private Price of plantain fruits and products

Q_X = Quantity of plantain fruits and products

P_I^P = Private Price of tradeable inputs

Q_I = Quantities of tradeable inputs

P_J^P = Private Price of non tradeable inputs

Q_J = Quantity of domestic non tradeable inputs

Private Profit < 0 = the enterprise is not competitive

Private profit > 0 = the enterprise is competitive.

3.4.4.2 Private Cost Ratio (PCR): The Private Cost Ratio (PCR) is an indicator of competitiveness. The PCR is a ratio of the private opportunity costs of domestic factors of production (labour, capital, manure, and sometimes land) relative to the value added in domestic prices (revenues less tradable input costs, both measured in actual market prices). A PCR less than one indicates positive private profit and shows that the production system is competitive for resources given the actual prices in the product and factor markets. The lower the PCR, the greater is the degree of competitiveness (Rasmikayati and Nurasiyah, 2004).

$$PCR = \frac{\sum P_J^P Q_J}{\sum P_X^P Q_X - \sum P_i^P Q_i} = \frac{C}{A-B} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:

$A =$ Revenues in private prices

$B =$ Cost of tradable inputs at private price

$C =$ Cost of domestic factors at private price

Subscript x = plantain fruits and products

Subscript i = tradeable input

Subscript j = non tradeable domestic factor input

$P_X^P =$ Private Price of plantain fruits and products

$Q_X =$ Quantity of plantain fruits and products

$P_I^P =$ Private Price of tradeable inputs

$Q_I =$ Quantities of tradeable inputs

$P_J^P =$ Private Price of non tradeable inputs

$Q_J =$ Quantity of domestic non tradeable inputs

Thus PCR<1 indicates that entrepreneurs are earning profits while PCR>1 implies entrepreneurs are making losses.

PCR = 1 indicates the breakeven point.

3.4.5 Comparative Advantage was analyzed using:

3.4.5.1 **Social Profitability**

The Social profitability is a measure of comparative advantage and efficiency because outputs and inputs are valued in prices that reflect scarcity values (Pearson *et al*, 2003).The term social refers to observed revenues and costs reflecting social (efficiency) prices received or paid by farmers, merchants, or processors in the agricultural system. Social prices are prices that would result in the best allocation of resources and thus the highest generation of income. The social (efficiency) prices for tradable outputs and inputs are the comparable world prices. Import prices for commodities that are partly imported (importable) or export prices for commodities that are partly exported (exportable). The Social (efficiency) prices for domestic factors of production (land, labour, and capital) are estimated also by application of the social opportunity cost principle. Because domestic factors are not tradable internationally and thus do not have world prices. Social profits are observed in the absence of government policies /market failures. Theoretically, social prices are those that would exist in a perfect market situation.

$$SP = \sum P_X^S Q_X - \sum P_i^S Q_i - \sum P_j^S Q_j \quad \text{..... (3)}$$

SP = Social Profits

P_X^S = Social price of plantain fruits and products

P_I^S = Social price of tradeable input

P_J^S = Social price of domestic non tradeable inputs

Q_X = Quantity of plantain fruits and products

Q_I = Quantities of tradeable inputs

Q_J = Quantity of domestic non-tradeable inputs

+ A positive social profit indicates that the system uses scarce resources efficiently.

- Negative Social profits indicate that the sector cannot sustain its current output without assistance from the government.

3.4.5.2 **Domestic Resource Cost (DRC) ratio:**

The domestic resource cost (DRC) is a measure of relative efficiency of domestic production by comparing the opportunity cost of domestic production to the value

generated by the product (Tsakok, 1990). The lower the DRC, the greater is the degree of economic efficiency (Elly *et al*, 2004). The measure is calculated as the ratio of the cost of domestic resources and non-traded inputs of producing the commodity to the net foreign exchange earned or saved by producing the good domestically. In the PAM context:

$$DRC = \frac{\sum P_J^S Q_J}{\sum P_X^S Q_X - \sum P_i^S Q_i} = \frac{G}{E-F} \quad \ldots\ldots\ldots\ldots \quad (4)$$

P_X^S = Social price of plantain fruits and products

P_I^S = Social price of tradeable input

P_J^S = Social price of domestic non tradeable inputs

Q_X = Quantity of plantain fruits and products

Q_I = Quantities of tradeable inputs

Q_J = Quantity of domestic non tradeable inputs

G = costs of domestic factor in social prices.

E = measures Revenue in social prices

F = cost of tradable input in social prices

DRC = 1 implies that the economy neither gains nor saves foreign exchange through domestic production.

DRC<1 Value of domestic resources used in production is less than value of the foreign exchange earned or saved.

DRC>1 Value of domestic resources used in production is greater than value of foreign exchange earned or saved.

3.4.5.3 Social Cost Benefit (SCB) Ratio:

A good alternative for the DRC is the social cost-benefit ratio (SCB), which accounts for all cost and avoids classification errors in the calculation of DRC (Masters and Winter-Nelson 1995). SCB is a measure of the ratio of the sum of tradable inputs costs and domestic factors cost to gross revenue, all valued at reference prices (Masters, 1995).

$$SCB = \frac{\sum P_i^S Q_i + \sum P_j^S Q_j}{\sum P_X^S Q_X} = \frac{F+G}{E} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

P_X^S = Social price of plantain fruits and products

P_I^S = Social price of tradeable input

P_J^S = Social price of domestic non tradeable inputs

Q_X = Quantity of plantain fruits and products

Q_I = Quantities of tradeable inputs

Q_J = Quantity of domestic non tradeable inputs

G = Costs of domestic factor in social prices

E = Measures Revenue in social prices

F = Cost of tradable input in social prices

SCBR ratio > 1 indicates that the selected system does not have comparative advantages.

SCBR ratio < 1 indicates that the selected system have comparative advantage.

3.5.0: Effects of government Policies on each stages and whole Plantain Value Chain (Objective 3).

In order to achieve this, divergences between private and social value of output, input and profit were estimated using the PAM framework. Protection coefficients were also estimated to determine the effects of government policies on each stages and the entire value chain.

3.5.1: Divergences and impact of government policies

The measurement of divergence and transfer effects of policies is carried out in the third (bottom) row of the PAM matrix. Divergences arise from either distorting policies or market failures. Either source of divergence causes observed market prices to differ from their counterpart efficiency prices. One source of divergence is the existence of a market failure. A market fails if it does not generate competitive prices that reflect social opportunity costs and lead to an efficient allocation of products or factors. Three basic types of market failures create divergences. The first is monopoly (seller control over market prices) or monopsony (buyer control over market prices). The second are negative externalities (costs for which the imposer cannot be charged) or positive externalities

(benefits for which the provider cannot receive compensation). The third are factor market imperfections (inadequate development of institutions to provide competitive services and full information). The second source of divergence is distorting government policy. A tariff on imports, for example, could be imposed to raise farmer incomes (equity objective) and increase domestic production (security objective), but it would create efficiency losses if the replaced imports were cheaper than the costs of domestic resources used to produce the additional product.

In order to estimate divergence (output transfer (I), input transfer (J), domestic factor transfer (K) and net policy effect (L)), I, J, K and L were calculated.

3.5.2: Output Transfer (I): Output transfers (I), a measure of the implicit tax or subsidy on outputs. Output Transfers is defined as the difference between the actual market price of a commodity produced by an agricultural system (A) and the efficiency valuation for that commodity, E.

$$I = \sum P_X^P Q_X - \sum P_X^S Q_X = A - E \quad \text{..... (6)}$$

Where:

I = output transfer

P_X^P = Private Price of plantain fruits and products

P_X^S = Social price of plantain fruits and products

Q_X = Quantity of plantain fruits and products

A= Revenue in private prices

E= Revenue in social prices

If the value of I (output transfer) is positive, then private revenues exceed social revenues. This indicates that the government is subsidizing output prices. If I is negative, social revenues are greater than private revenues. This means that the government is taxing instead of subsidizing the producers.

3.5.3: Tradable-Input Transfers

Tradable input transfers (J), a measure of the implicit tax or subsidy on tradable inputs. The tradable-input transfers, J, are defined as the difference between the total costs of the tradable inputs valued in private prices, B, and the total costs of the same inputs measured in social prices, F.

$$J = \sum P_I^P Q_I - \sum P_I^S Q_I = \quad B - F \quad \text{..... (7)}$$

Where:

J = Tradeable input transfer

P_I^P = Private Price of tradeable inputs

P_I^S = Social price of tradeable input

Q_I = Quantities of tradeable inputs

B= cost of tradeable input at private price

F= cost of tradeable input at social price

If J is negative, the private costs of tradable inputs are lower than the social costs. This indicates that the government is subsidizing the cost of inputs. Positive J indicates that government is taxing the producers.

3.5.4: Factor Transfers: Factor transfers, K, are defined as the difference between the costs of all factors of production (unskilled and skilled labour and capital) valued in actual market prices, C, and the social costs of these factors, G.

$$K = \sum P_j^P Q_j - \sum P_j^S Q_j = \quad C - G \text{..... (8)}$$

P_J^P = Private Price of non tradeable inputs

P_J^S = Social price of domestic non tradeable inputs

Q_J = Quantity of domestic non tradeable inputs

C= cost of domestic factor at private price

G = cost of domestic factor at social price

When any factor of production is subsidized, the private cost will be less than the social costs and K will have a negative value. On the other hand, if government taxes domestic factors, K will have a positive value.

3.5.5: Net Transfers

The net transfer is the difference between the valuation of profits in private (actual market) prices and in efficiency (social) prices, or (D-H). The L will have a positive value if the overall effect of all policies or market failures on input and output prices is in favour of the producers. L will have a negative value if the policies and market failure are working to the detriment of the producers.

$$L = D - H \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

L = Net transfer

D= Private profit

H= Social profit

3.6 Measures of Protection Coefficient

Protection Coefficients are Ratios, which are free of currency or commodity distinctions (Pearson *et al*, 2003). The most common protection coefficients in PAM are the Nominal Protection Coefficient on Output and Input, Effective Protection coefficient (EPC), Profitability coefficient (PC) and Subsidy Ratio to Producers (SRP), Producers Subsidy Estimate (PSE).

3.6.1 Nominal Protection Coefficient (NPC)

The NPC is a measure of the extent to which domestic price policy protects domestic producers or consumers from the direct input or output of foreign markets (Tsakok, 1990). NPC can also be defined as the ratio between the observed market price paid to producers of a given product and the good's underlying social opportunity cost (Pearson *et al*, 2003). NPC is a common measure of trade protection and it shows how much domestic prices differ from social prices for output and input. The ratio formed to measure output transfers is called the Nominal Protection Coefficient on Output (NPCO) while the ratio formed to measure tradable input transfers is called the Nominal Protection Coefficient on Inputs (NPCI). If NPCO exceeds one, the domestic price is higher than the import (or export) price and thus the system is receiving protection. If NPCO is less than one, the domestic price is lower than the comparable world price and the system is disprotected by policy. In the absence of policy transfers the domestic and world prices would not differ and the NPCO would equal one (Pearson *et al*, 2003). If NPCI exceeds one, the domestic input cost is higher than the input cost at world prices and the system is taxed by policy. If NPCI is less than one, the domestic price is lower than the comparable world price and the system is subsidized by policy. In the absence of policy transfers the domestic and world prices of tradable inputs would not differ and the NPCI would equal one.

$$NPC = \frac{P^d}{P^w} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

NPC_o = Nominal Protection Coefficient on plantain

$$NPC_O = \frac{\sum P_X^P Q_X}{\sum P_X^S Q_X} = \frac{A}{E} \quad \text{..... (11)}$$

$$NPC_I = \frac{\sum P_i^P Q_i}{\sum P_i^S Q_i} = \frac{B}{F} \quad \text{..... (12)}$$

NPC_i = Nominal Protection Coefficient on input for plantain

$A =$ Revenues in private prices

$B =$ Cost of tradable inputs at private price

$E =$ Revenue in social prices

$F =$ Cost of tradable input at social prices

$P_X^P =$ Private Price of plantain fruits and products

$Q_X =$ Quantity of plantain fruits and products

$P_I^P =$ Private Price of tradeable inputs

$Q_I =$ Quantities of tradeable inputs

$P^d =$ Domestic price of plantain and products

$P^w =$ World reference price of plantain

3.6.2 Effective Protection Coefficient (EPC)

The EPC is the ratio of value added at domestic prices (A - B) to value added at world reference prices (E- F). The purpose of the EPC is to show the joint effect of policy transfers affecting both tradable outputs and tradable inputs, in contrast to the nominal protection coefficient, which measures only output transfers (Masters, 2003).

$$EPC = \frac{\sum P_X^P Q_X - \sum P_i^P Q_i}{\sum P_X^S Q_X - \sum P_i^S Q_i} = \frac{VAD}{VAB} = \frac{A-B}{E-F} \quad \text{..... (13)}$$

$A =$ Revenues in private prices

$B =$ Cost of tradable inputs at private price

E = Revenue in social prices

F = Cost of tradable input at social prices

P_X^P = Private Price of plantain fruits and products

Q_X = Quantity of plantain fruits and products

P_I^P = Private Price of tradeable inputs

Q_I = Quantities of tradeable inputs

P_X^S = Social price of plantain fruits and products

P_I^S = Social price of tradeable input

VAB = Value added at Border Price;

VAD = Value added at Domestic price;

A value of EPC greater than one indicates a net subsidy to value added (Beghin and Fang, 2002).

EPC<1 represents a net disincentive. EPC=1 implies either no intervention or impact of various distortions in both the input and product markets results in a neutral effect on value-added.

3.6.3 Profitability Coefficient

The profitability coefficient measures the incentive effects of all policies and serves as a proxy for the net policy transfer (Monke and Pearson, 1989). The Profitability Coefficient (PC = D/H) is a comparison of private profits (D) with social profits (H). The PC shows the impact of all divergences on private profits. If the PC is less than one, policies (and market failures) transfer income away from the production system (or impose a net tax), whereas if the PC exceeds one, policies (and market failures) transfer income toward the system (or provide a net subsidy). The index is calculated as a ratio of private profit to social profit.

$$PC = \frac{\sum P_x^P Q_x - \sum P_i^P Q_i - \sum P_j^P Q_j}{\sum P_x^S Q_x - \sum P_i^S Q_i - \sum P_j^S Q_j} = \frac{A-B-C}{E-F-G} = \frac{D}{H} \quad \text{.....(14)}$$

PC = Profitability coefficient of plantain;

P_x^P = Private Price of plantain fruits and products

Q_X = Quantity of plantain fruits and products

P_i^P = Private Price of tradeable inputs

Q_i = Quantities of tradeable inputs

P_j^P = Private Price of non tradeable inputs

Q_j = Quantity of domestic non tradeable inputs

P_x^S = Social price of plantain fruits and products

P_i^S = Social price of tradeable input

P_j^S = Social price of domestic non tradeable inputs

3.6.4: Subsidy Ratio to Producers

A final incentive indicator is the subsidy ratio to producers (SRP), the net policy transfer as a proportion of total social revenues. The SRP shows the proportion of revenues in world prices that would be required if a single subsidy or tax were substituted for the entire set of commodity and macroeconomic policies (Monke and Pearson 1989). The producer subsidy ratio (SRP) is formulated as a proportion of the net policy transfer to total social revenues. It includes policy effects on all inputs and factors and enables comparison of the extent to which all policy subsidizes agricultural systems (Mucavele, 2000).

$$SRP = \frac{L}{E} = \frac{(D-H)}{E} \quad \text{..... (15)}$$

- The positive value of SRP indicates the overall transfer from society to producer while
- Negative value of SRP means overall transfer from producer to society and taxpayers

3.6.5 Producer Subsidy equivalent (PSE) is a more complete measure of protection from trade as it accounts for factors affecting input and output prices. It measures the impact of policies on profits of as share of revenue. The PSE measures the net

contribution of policies to farm revenues. The PSE is the level of producer subsidy that would be necessary to replace the array of actual farm policies employed in the country in order to leave farm income unchanged (Mucavele, 2000). The PSE is extracted from the PAM as (L) divided by A.

$$PSE = \frac{L}{A} \quad \text{..... (16)}$$

The negative value of PSE indicates overall transfer from producer to consumer and taxpayers while the positive value means the overall transfer from consumer to producer.

3.7 Component of Policy Analysis (PAM) and Data Requirement

3.7.1 Input /Output Technical Coefficient and the Financial/Market Prices

Input technical coefficient are the physical quantities of input that are used in the production, processing and marketing of plantain. Output technical coefficients are output produced from the production, processing and marketing process. Data on input and output coefficient used in production are compiled on per hectare basis while that of processing and marketing are compiled on per tonne basis.

3.7.2 Input Categories

This is classified into two viz:

3.7.2.1 Tradable/purchased input

Tradeable inputs are goods that are tradeable in the world market (Elzaki *et al*, 2014). This includes the tradable portion of all intermediate inputs other than labour and capital. Examples are seeds, fertilizer, chemical, machinery and manure. Tradable goods have border prices and an international price for them. This can be identified and measured at the border price. If the final price has to be expressed at different levels, for example, at the farm-gate, the local cost of handling, transport and marketing must be deducted from border price.

3.7.2.2 Non-tradable inputs

Non tradeable inputs are good that are not tradeable in the international market (Elzaki *et al*, 2014). Non-tradable goods have no readily available border prices by which social value can be measured. Examples are land, labour, local capital and irrigation water. Non-

tradable goods can be broken down into tradable and primary factors of production. Primary factors refer basically to labour and land, the essential domestic resources.

3.7.3 Input/output Domestic Prices

These are the farm gate prices and the prices paid by farmers, processors and traders to purchase their inputs and the prices received by selling their outputs. These prices are used to calculate actual revenue received by the farmers at private prices (private budget).

3.7.3.1 Input/output World prices

These are estimated on the basis of whether the commodity is exportable (export parity prices) or importable (import parity prices).

3.7.3.2 Import parity price (IPP) is the value of a unit of product bought from a foreign country, valued at a geographic location of interest in the importing country.

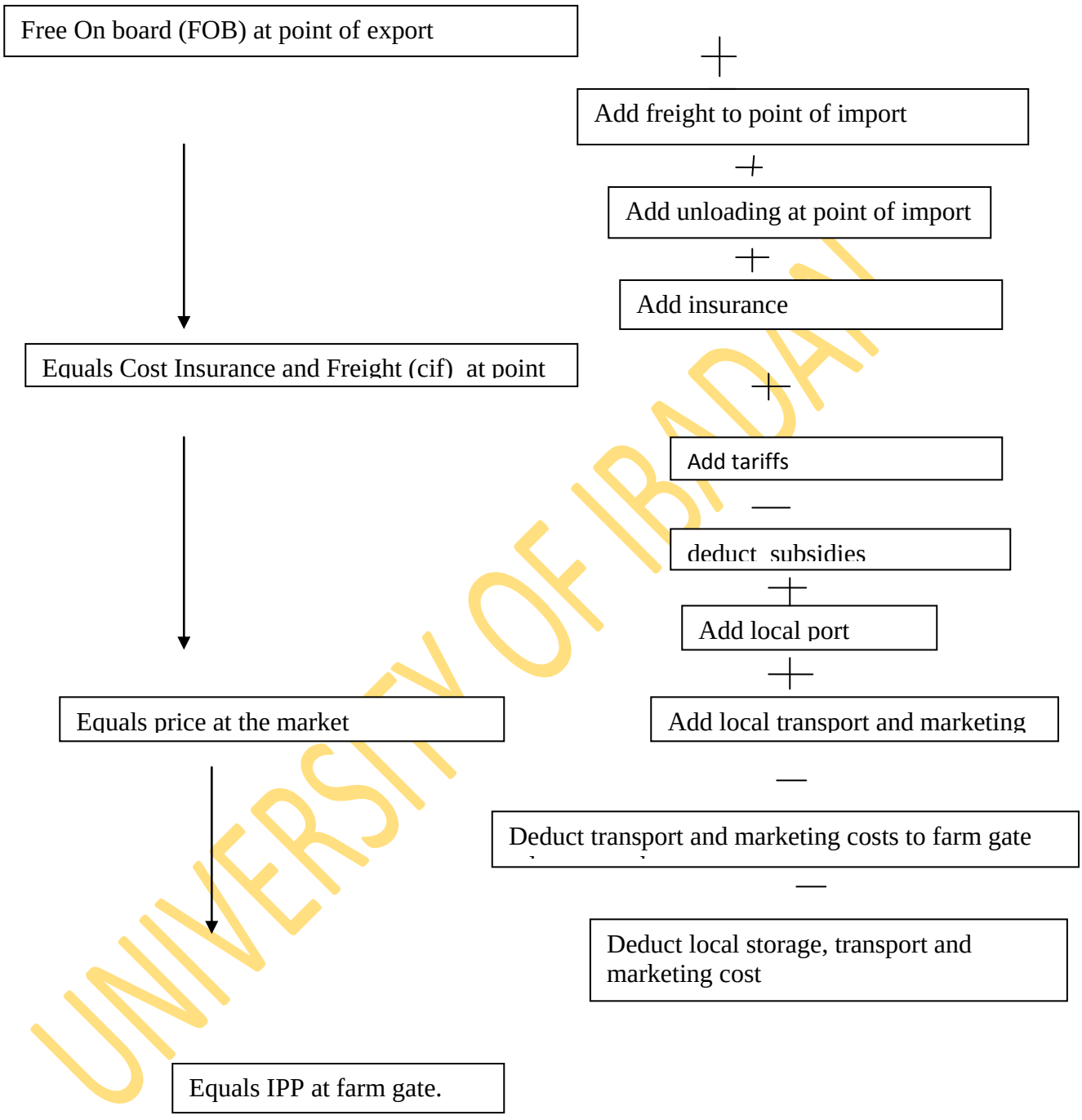

Figure 3.2: Estimation of import parity price

3.7.4: Export parity price (XPP) – The value of a product sold at a specific location in a foreign country, but valued from a specific location in the exporting country (USAID, 2008). According to USAID, (2008), Import and export parity prices are used to assess the incentives to trade as well as the incentives to produce where local producers are in competition with producers and suppliers from outside the country or across the border.

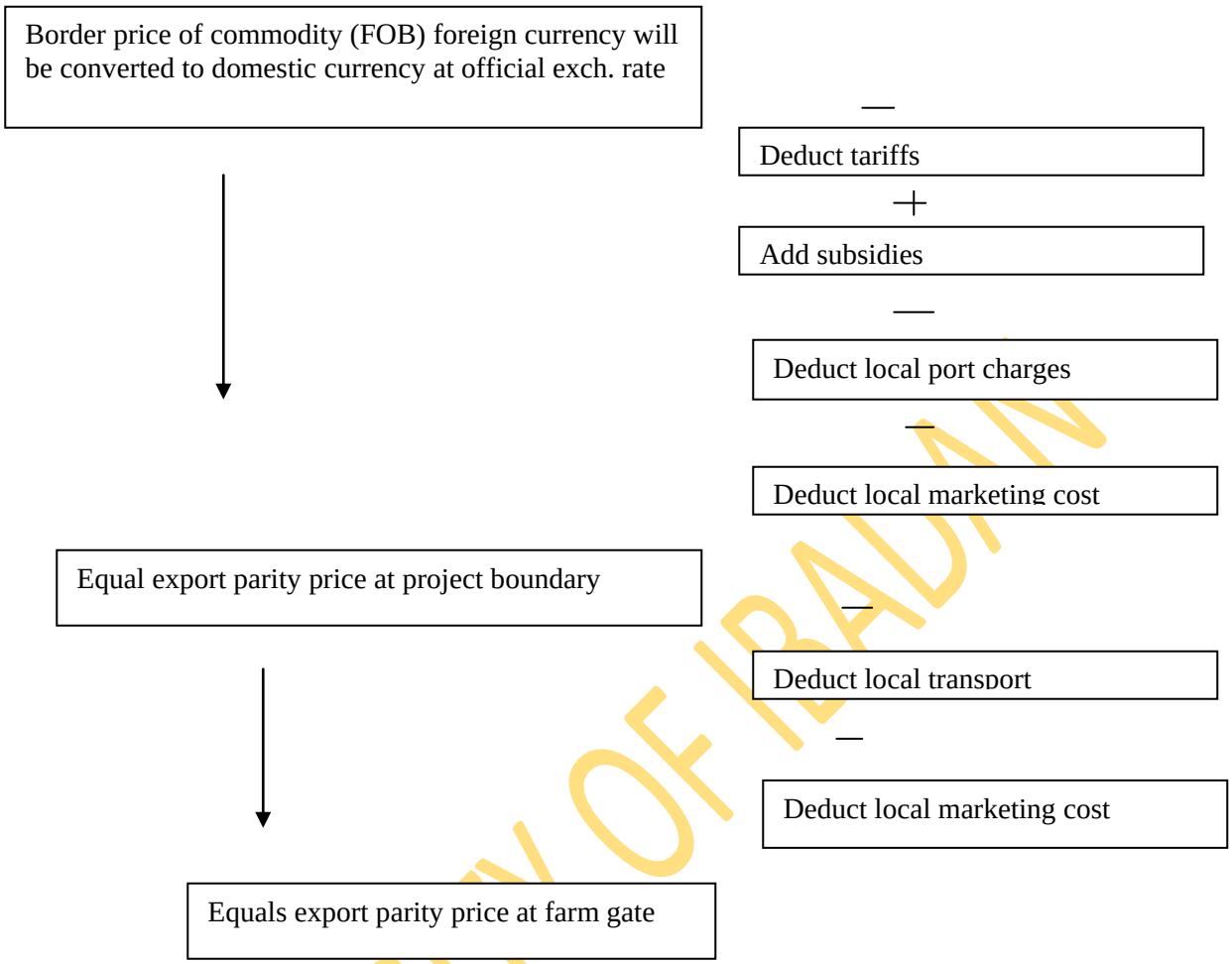

Figure 3.3: Estimation of export parity price

3.7.5: Private and Social Prices for Labour

The prevailing wage rate was used for the private price of labour. The social price of labour was different from the actual wage rates. In theory, it should be equal to the Value of Marginal product of labour (VMPL). In this study, approach recommended in Yao (1993) was used. Labour is divided into peak-season and off-peak season components. The wage rate in the peak-season is regarded as the opportunity cost of labour for that period. The opportunity cost of labour during the off-peak season is only half of the prevailing wage rate. Thus, the social price of labour was calculated according to the following formula.

$$SP_L = \frac{W_p + 0.5W_o}{2} \quad \text{..... (17)}$$

Where

SP_L = social price of labour.

W_p = are the prevailing wage rates in the peak season

W_o = are the prevailing wage rates in the off-peak seasons,

3.8.6: The Private and Social Prices for land

The social price of land is the opportunity cost of land measured in foreign exchange. Measuring the opportunity cost of land is probably the most difficult task in constructing a PAM. Following Gulati and Kelley (2000), the social valuation of land is calculated as the ratio of net returns to land to the average of the nominal protection coefficient of competing crops output (NPCOs).The net return of Banana production was taken as the opportunity cost of land for the crop under study. Net return in this case is defined as the profit (revenue - cost of materials - cost of labour and other charges) per hectare of land.

3.9 Effect of changes in policy indicators on Comparative advantage and Competitiveness along the stages and entire plantain value chain: Sensitivity analysis was carried out by simulating changes in variables such as yield, exchange rate, Free on Board (FOB) and the effects on Comparativeness and Competitiveness were estimated.

3.9.1 Sensitivity analysis

PAM is a static model, and cannot capture the potential changes in policy parameters and productivity (Akter, 2003). Due to the static nature of the Policy Analysis Matrix, sensitivity analysis was carried out to determine earning capacity of the investment with changes in factors such as yield, exchange rate and domestic price among others. Sensitivity analysis provides a way of assessing the impact of changes in the main parameters on both private and social profitability (Monke and Pearson 1989). The sensitivity analysis illustrates the reaction in the policy indicators such as NPC, DRC, EPC and SRP with changes in the aforementioned factors. Following Nguyen and Heidhues, (2000) and Mane-Kapaj, et *al (*2010), Mohanty *et al*, (2003), Liverpool *et al*, (2009), the sensitivity analysis was carried out at the farm level, marketing and processing and the entire value chain. Indicators that were varied include yield, domestic price, FOB, Exchange rate. The effects on Private and social profitability and all policy indicators were evaluated.

3.9.2 Extent of distortions in policies on Producers and Consumers welfare analyzed using Partial Equilibrium Analysis.

Partial Equilibrium Analysis: The model was used to calculate net social gain (loss) in production and consumption and welfare gain (loss) of producers and consumers as a result of distortion in policies. In partial equilibrium analysis, supply and demand elasticities and price data are used to calculate the financial implications of a change in commodity price, the welfare transfers between producers and consumers and the net gains and losses in economic efficiency (Mashinini, *et al* 2006). The partial equilibrium analysis indicates the volume of support or taxes imposed on the product and the consumer (Ahmed, 2012). Following Tsakok's (1990) and Mashinini *et al*, (2006) approach, the quantification of changes relating to policy is considered to be complementary in measuring coefficients of protection and comparative advantage which all contribute to effective policy analysis and design.

3.9.3 Equations in the model:

3.9.3.1 Value of domestic production at domestic price: This is a function of domestic price for plantain and quantity of plantain fruit produced.

$V' = P^d x D^p$ ……(18)

Where:

V' = Value of domestic production at domestic price

P^d = Domestic price of plantain

D^p = Domestic quantity of plantain produced.

3.9.3.2 Value of domestic consumption: This is a function of the domestic price of plantain and total supply of the commodity.

$W' = P^d x TS$ ……(19)

Where:

W' = Value of domestic consumption at domestic price

P^d = Domestic price of plantain

TS = Total supply of plantain

3.9.3.3 Net social losses in production are a function of domestic production of plantain and the impact of the distortion in prices. This represents net social loss in production to the society on the whole. It also indicates how much the producer as a whole is losing in monetary terms from implementing a distorting policy.

$NeSL_p = 0.5 x e_s x t \wedge 2 x V'$ …….. (20)

Where:

$NeSL_p$ = Net social loss in production

e_s = Elasticity of supply of plantain

t = Impact of distortion

V' = Value of domestic production at domestic price

3.9.3.4: Net social losses in consumption are a function of domestic consumption of plantain and the impact of the distortion in prices. This represents net social gain (loss) in consumption to the society on the whole. If domestic prices move

toward border equivalent prices (i.e. a shift toward free trade), then NSL_p and NSL_c are benefits (gains) to society. If as in the case of the imposition of export or import duty, the trend is away from free trade, then the values reflect costs (losses) to society.

$NeSL_c = 0.5 x n_d x t \wedge 2 x W'$ ……………………………………………………(21)

Where:

$NeSL_c =$ Net social losses in consumption

$n_d =$ Elasticity of demand

$t =$ Impact of distortion

$W' =$ Value of domestic consumption at domestic price

With the presence of tax net social loss in consumption will be negative but when there are subsidies net social loss in consumption will be positive.

3.9.3.5: Welfare gains of producers are the differences between distortion in prices, domestic production of plantain and the Net social losses in production. This measures the welfare changes or the extent of monetary gains and losses of producers. They give an indication of the redistribution of income between producers caused by the instituted price policies.

$G_p = tV' - NeSL_p$ ………………………………………………..(22)

Where:

$G_p =$ Welfare gain (loss) of producers

$t =$ Impact of distortion

$NeSL_p =$ Net social loss in production

$V' =$ Value of domestic production at domestic price

3.11.6: Welfare gains of consumers are the differences between impact of distortion in prices, domestic consumption of plantain and Net social losses in consumption. This measures the welfare changes or the extent of monetary gains and losses of consumers. They give an indication of the redistribution of income between consumers caused by the instituted price policies.

$G_c = tW' + NeSL_c$ .....(23)

Where:

G_c = Welfare gain (loss) of consumers

t = Impact of distortion

$NeSL_c$ = Net social losses in consumption

W' = Value of domestic consumption at domestic price

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the empirical findings of the study. This involves the socioeconomic characteristics of respondents, examining linkages between participants and activities in plantain value chain which comprises of the key processes, key participants and their functions, flow and volume of product on each stage, number of job generated and constraints faced by the participants along the stages of the value chain. Comparative advantage and competitiveness, policies effects, effects of distortion in policies on producers and consumer's welfare in plantain value chain were also discussed in the chapter.

4.1 Socioeconomic Characteristics of Respondents

This section presents empirical findings on socioeconomic characteristics of the respondents in the study area. This comprises sex, marital status, age, household size, years of education, years of experience among other characteristics.

4.1.1 Sex of participants in Plantain Value Chain

The result (Table 4.1a) indicated that majority of Plantain producers in southwestern Nigeria were male (82.7 percent) while females producers represented 17.3 percent. This indicates the dominance of men in plantain production. This agrees with the findings of Ekunwe and Ajayi, (2010), Kainga and Seiyabo (2012), that more male were involved in Plantain farming in Edo and Bayelsa state, Nigeria. Results also indicated that majority of the marketers were female (82.6 percent) while male constituted 17.4 percent implying that plantain marketing is controlled by women. This finding is consistent with the findings of Adewumi *et al*, 2009, Adetunji and Adesiyan, (2008), Oladejo and Sanusi, (2008) and Aina *et al*, (2012). They established that majority of plantain marketers in their respective study area were female. Similarly, majority of the processors of plantain in the study area were also female (82 percent) while male constituted 18 percent. This agrees with the findings of Tijani *et al*, 2009 who found that women were involved in the

processing and marketing of plantain. Overall result of the sex distribution of participants along the stages of plantain value chain indicated the dominance of men in production while women controlled the marketing and processing of plantain.

4.1.2 Marital Status of participants

The results (Table 4.1a) revealed that majority of the producers were married (86.5 percent), single (6.9 percent), divorced (3.1 percent), and widowed (3.5 percent) respectively. This implies that the respondents will have to be responsible since they have family obligations to fulfil. The result is consistent with the findings of Ekunwe and Ajayi, (2010). They found that majority of plantain producers were married. The result also indicated that majority of the marketers (88.2%) and Processors (90%) were married in the study area. This substantiates the findings of Folayan and Bifarin, (2011), Olabode *et al*, (2010).They found that married individuals are majorly involved in plantain marketing and processing in their respective study areas. This implies that they will use the returns from the operations in taking care of their families.

4.1.3 Age of participants in Plantain Value Chain

The age distribution of respondents reveals that most of the farmers were in the age range of 41-50 years (26.5%). The average age of farmers in southwest zone was 49.34± 13.83. This implies that producers in the study areas were approaching their non-active age which may affect productivity and strength in searching for improved methods of production and other necessary information negatively. This is consistent with the findings of Tijani *et al* (2009) and Ladapo and Oladele, (2011) and Dzomeku *et al*, (2011). They also found that most of the farmers were approaching their old age. Most of the marketers were within 41-50 years (36.1%). The mean age of the marketers was 43.3 ±10.06. This implies that the marketers were young and still within their active age. This agrees with the findings of Oladejo and Sanusi, (2008) and Adetunji and Adesiyan, (2008) that active working age group were involved in plantain marketing in the study area. Most of the processors of plantain chips and flour in the study area fall in the age range of 31-40 years (44%) with mean age of 37.36 ±8.71 respectively. This thus indicates that the processors were in their active age and this may improve their ability to search for information on improved method of processing the commodity. This is similar to the

findings of Ekunwe and Atalor (2007). They found that active working age group were involved in Roasted plantain and Chip processing in the study area. Overall deduction on age range along plantain value chain indicates that most producers were approaching their old age which may affect their productivity and strength in searching for improved methods of production and other necessary information while majority of the marketers and processors were still within their active age (Table 4.1a).

4.1.4 Household size of participants

Most of the producers had 6-10 members in their household (46.15%) with mean of 6.1±2.7. This indicates that the producers have quite a number of individuals in their household and they could help in the farming activities. This is in agreement to the findings of Ekunwe and Ajayi (2010). They found that the mean number in the household of farmers in Edo state was 7. Majority of the marketers (57.34%) and processors (56%) also had 6-10 members in their household. The mean number of individual in marketers household was 6.2 while mean number of 5.99 was estimated for the processors in the study area. Thus the producers, marketers and processors have individuals in their various household that may assist them in their production activities (Table 4.1a).

4.1.5 Years of Education

Education has been identified as one of the key assets in any profession because it will propel the participants to adopt new innovations and technologies that are vital to enhancing productivity (Oni *et al*, 2009). The producers had mean years of education of 5.90±4.27. This year of education implied that producers in the study area had low level of education and this may affect their understanding of improved method and innovations in production. This is similar to the findings of Kainga and Seiyabo, (2012) and Fakayode *et al*, (2011). They also found average years of education among farmers in Bayelsa and Rivers state to be between 5.4 to 6.2 years. Among the marketers, the mean years of education obtained was 4.4±4.61 indicating low level of formal education. This agrees with the findings of Adetunji and Adesiyan, (2008). They found that a large percentage of the marketers had low level of formal education. Most of the processors also had mean years of education of 5.92± 4.8. This is line with the findings of Ekunwe and Atalor (2007). They found that mean years of education among roasted plantain and

plantain chip processors was 6.8 and 6.4 years respectively. Thus, the participants in plantain Value Chain have low level of education (Table 4.1b).

4.1.6 Years of Experience

The average years of experience of the producers stood at 14.4 with a larger proportion of the respondents falling between years of experience of 11-20 years (48.8 percent). This indicates that the producers had been in the business of plantain production for a number of years. This is similar to the findings of Tijani *et al* (2009), Fakayode *et al*, (2011) and Dzomeku *et al*, (2011) that farmers involved in plantain production have appreciable years of experience in the production of the commodity. Most of the marketers had between 11-20 years of experience in marketing plantain in the study area (53.5%) with mean marketing experience of 12.86±9.0. This implies that the marketer had been in the business of marketing plantain for quite a number of years. Processors of plantain flour and chips had 8.3±5.85 mean year of experience in the processing of plantain flour and chips. This agrees with the findings of Ekunwe and Atalor, (2007) that the processors had mean years of experience of 6 in the processing business (Table 4.1b).

4.1.7 Primary Occupation of participants

The different types of occupations of Plantain producers, marketers and processors were presented in the table 4.1b. The results show that the main occupation of the majority of producers was farming (78.5%) whereas that of marketers was distribution and marketing the commodity (45.8%) and the processors were mainly involved in the processing of the commodity (74%). Other producers had occupation in fishing (8.8%) and trading (6.5%). This implies that the participants were involved in the different stages of the value chain contributing to their major source of livelihood and income generation.

4.1.8 Scale of Operation and farm size

The results in the table 4.1c show the scale of plantain production, marketing and processing in southwestern Nigeria. Following Neptune and Andrew (2007) on farm size distribution, the majority of producers (68.5%) are small-scaled farmers with 1-5ha of cultivated area. Large-scale production is practiced by only a few (5%) plantain farmers. This implies that plantain production in the study area is on small scale and may limit the extent of commercialization. This is in consistence with a similar study by Fakayode *et al*,

(2011), Ekunwe and Ajayi, (2010), which also confirmed that small-scaled farmers as the main producers of Plantain in Nigeria and Africa generally.

4.1.9 Price and Market Information

Result (Table 4.1c) indicated that Producers in the zone obtained price and market information from their fellow farmers and producers groups (84.6%) while only 15.4 per cent sourced price information from radio broadcast. Similarly, the processors seek price information from their fellow processors (97%).

4.1.10 System of Cropping

The result of the analysis (Table 4.1c) indicated that most of the producers were practising intercropping system in the production of plantain (73.5%) while 26.5% practised sole cropping of plantain. Producers in the study area are intercropping plantain with cocoyam (22.7%), Cassava (13.1%) and Cocoa (37.7%). This implies that plantain is mainly produced in intercropping system in the study area. Producers intercrop to increase returns from the production and reduce weed infestation. On the other hand, it is an age long belief that plantain can be used to nurse cocoa while also contributing to the income of the farm family. The result of the analysis of the system of cropping agrees with the findings of Baruwa *et al* (2011) and Ekunwe and Ajayi, (2010) that 61.0% of farmers practised intercropping in the production of plantain. Oni *et al*, (2009) affirmed that crop mix and rotation when properly adopted, promote productivity among crop farmers in the dry and moist savannah agro-ecological zones of Nigeria.

4.1.11 Membership in social group

Result (Table 4.1d) revealed that 44.6% of the producers are in cooperative societies, informal work (such as age group members) and exchange group constituted 20.4 percent, saving and credit group 8.5 percent, religious group 6.5% and town union constituted 21.2 percent respectively. This implies that most of the producers (55.4 percent) are not member of cooperative societies. This may prevent them from having access to credit and benefit from the social groups. This may in turn prevents them from procuring necessary input that will be utilized in plantain production and may have serious implication on food security and economic growth of the nation. On the other hand, 30.8 percent of marketers

belong to cooperative society while 62.2 percent of processors are members of cooperative society.

4.1.12 Source of land

Results indicated (Table 4.1d) that 54.2 percent of producers rented land used in plantain production, followed by those that owned their land (30.4%) while those that purchased their land constituted 15.4 percent. This infers that most land used in plantain production was obtained through rent. This is comparable to the findings of Ekunwe and Ajayi, (2010) that most producers rented land used for production purposes. On the other hand, most of the marketers rent stall in which they display their commodity.

4.1.13 Access and source of Credit

Access to credit facilities will contribute positively to household production efficiency (Akinseinde, 2006). The result of the analysis (Table 4.1d) indicated that most of the producers (76.9%), marketers (93.75%), and processors (67%) do not have access to credit in the study area. The most prevalent source of credit to producers (53.8%), marketers (77.8%) and processors (67.0%) was through personal source. This credit situation in the study area may affect the efficiency of the participants in the value chain.

Table 4.1a: Socioeconomic Characteristics of Participants along the Stages of Plantain Value Chain

	Producers		Processors		Marketers	
Variables	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Sex						
Male	215	82.7	18	18	25	17.4
Female	45	17.3	82	82	119	82.6
Total	260	100			144	100
Marital Status						
Single	18	6.9	4	4	9	6.3
Married	225	86.5	90	90	127	88.2
Divorced/Separated	8	3.1	6	6	6	4.2
Widowed	9	3.5	-	-	2	1.3
Total	260	100	-	-	144	100
Age (Years)						
20 or less	-	-	3	3	-	-
21-30	26	10.0	14	14	13	9.0
31-40	52	20.0	44	44	47	32.6
41-50	69	26.5	35	35	52	36.1
51-60	55	21.2	4	4	25	17.4
61-70	44	16.9	-	-	7	4.9
>70 Years	14	5.4	-	--	-	-
Total	260	100				
Mean of age		**49.3**		37.36		**43.3**
Standard Deviation of age		**13.8**		8.71		**10.06**
Maximum Age		**85**		53		**68**
Minimum Age		**22**		14		**25**
Household size						
1-5	103	39.62	42	42	61	42.36
6-10	120	46.15	56	56	83	57.64
11-15	36	13.85	2	2		
16-20	1	0.38				
Total	260	100	-	-	144	100
Mean household size		**6.1**		5.99		6.2
Standard Deviation		**2.7**		2.09		2.31
Maximum		**15**		15		12
Minimum No. of household size		**1**		1		1

Source: Field Survey, 2013

Table 4.1b: Socioeconomic Characteristics of Participants along the Stages of Plantain Value Chain

Variables	Producers		Processors		Marketers	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Years of Education						
0	64	24.6	31	31	69	47.9
1-6	98	37.7	36	36	38	26.4
7-12	86	33.1	24	24	37	25.7
13-18	12	4.6	9	9	8	5.6
19-24				-		
Total	260	100		100		
Mean years of education		**5.90**		5.92		4.4
Standard deviation		**4.27**		4.8		4.6
Max		**13**		14		11
Min		**0**		0		0
Years of farming Experience						
1-10	70	26.9	76	76	44	30.6
11-20	127	48.8	18	18	77	53.5
21-30	34	13.1	6	6	20	13.9
31-40	23	8.8	-	-	1	0.7
41-50 Years	5	1.9	-	-	2	1.4
>50	1	0.4				
Total	260	100	100	100		
Mean		**14.29**		8.3		12.86
Standard deviation		**12.47**		5.85		9.0
Max		**70**		25		45
Min		**1**		1		1
Primary occupation						
Farming	204	78.5	16	16	55	45.8
Fishing	23	8.8	-	-	48	40.0
Trading	17	6.5	6	6	12	10
Public service	8	3.1	4	4	5	4.2
Private Business	8	3.1	-	-	40	100
Processing			74	74	-	-
Total	260	100	100	100	144	100

Source: Field Survey, 2013

Table 4.1c: Socioeconomic Characteristics of Participants along the Stages of Plantain Value Chain.

Variables	Producers		Processors		Marketers	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Scale of Operation					-	-
Subsistence	37	14.2				
Small scale commercial production	178	68.5	97	97	-	-
Medium scale commercial production	32	12.3	3	3	-	-
Large scale commercial	13	5.0	-	-	-	-
Total	260	100	100	100	-	-
Price and Market Information						
Radio	40	15.4	3	3	3	2.1
Producers group	220	84.6	97	97	141	97.9
News paper		-	-	-	-	-
Total		100	-	-	-	-
System of Cropping						
Mono cropping	69	26.5	-	-	-	-
Intercropping	191	73.5	-	-	-	-
Total	260	100	-	-	-	-
Farm Size						
Less than 1 ha	39	15.0	-	--	-	-
1-5 ha	177	68.0	-	-	-	-
6-10 ha	29	11.2	-	-	-	-
11-15 ha	15	5.8			-	-
Total	260	100	-	-	-	-
Mean		**3.70**	-	-	-	-
Standard deviation		**3.46**	-	-	-	-

Source: Field Survey, 2013

Table 4.1d: Socioeconomic Characteristics of Participants along the Stages of Plantain Value Chain.

Variables	Producers		Processors		Marketers	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Membership in Social groups						
Cooperative societies						
Yes						
No	116	44.6	51	62.2	40	
	144	55.4	31	37.8	104	
Informal work exchange group			-	-	-	
Yes	53	20.4				
No	206	79.2				
Savings and credit group			-	-	-	
Yes	22	8.5				
No	238	91.5				
Religious group			-	-	-	
Yes	17	6.5				
No	243	93.5				
Town union			-	-	-	
Yes	55	21.2				
No	205	78.8				
Occupational groups			-	-	-	
Yes						
No	20	7.7				
	240	92.3				

Source: Field Survey, 2013

Table 4.1e: Socioeconomic Characteristics of Participants along the Stages of Plantain Value Chain.

	Producers		Processors		Marketers	
Variables	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Source of land						
Owned	79	30.4				
Purchased	40	15.4				
Rented	141	54.2				
	260	**100**				
Access to Credit						
Yes	60	23.1	33	33	9	6.25
No	200	76.9	67	67	135	93.75
Source of credit						
Personal savings	140	53.8	67	67	112	77.8
Friends/Relatives	63	24.3	6	6		
Cooperatives	57	21.9	17	17	20	13.9
Banks	-	-	4	4		
Local Money lender	-	-	2	2	12	8.3
Government	-	-	4	4		
Total	260	100		100	144	100

Source: Field Survey, 2013

4.2 Linkages between Participants and Activities in the Plantain Value chain

This section discussed the key processes, activities, key participants and their functions, flow and volume of product at each stage of the chain, level of employment generated as well as constraints faced by the participants in plantain value chain.

4.2.1 Key processes, Activities and Participants in Plantain Value Chain

The results of the analysis indicated that the key processes and activities in Plantain Value Chain in South western Nigeria were input supplies, Production, Farm-Gate Assembling, Market-Arena assembling, Processing, wholesaling, Retailing, Consumption and Export, while the key participants were input suppliers, producers, farm-gate assemblers, market-arena assemblers, processors, wholesalers, consumers, exporters (very low) (Figure 4.1). Similar processes were also found by Martinez *et al* (2014) and Ouma and Jagwe (2010) in traditional marketing channels for banana and plantain in Peru and Central Africa. The study found out that the Plantain chain in Peru and Central Africa consist a number of participants which also include input suppliers, producers, rural collectors, 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 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 and supply 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.

4.2.2 Key Participants and their Functions

4.2.2.1: Producers

The producers are responsible for the production of Plantain fruits. Their activities include establishment and management of the farm till harvest period. Farmers in the study area are classified (based on scale of operation) into subsistence (13.46%), small scale (68.08%), medium scale (15.77%) and large scale 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 small-scale farmers as the main producers of banana in Africa. Subsistence farmers are cultivating less that 1 hectare of farm land while the small scale farmers are cultivating between 1-5 hectare of farm land. Farmers in the study area were intercropping their plantain with a variety of crops. Major cropping systems identified were Sole plantain (26.5%), Plantain and cocoa (37.7%), Plantain and Cocoyam (22.7%) and Plantain and Cassava (13.1%). 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 radio. It was also observed that very few farmers (2%) export their commodity to regional and international markets.

4.2.2.2: Assemblers

There are many intermediaries in the marketing process of Plantain in Southwestern Nigeria. It was discovered that there were two major types of assemblers in the plantain value chain viz: Farm-Gate Assemblers and Market-Arena Assemblers. The Farm-Gate Assemblers collect and bulk plantain from individual farmers. This is similar to the findings of Ouma and Jagwe (2010) on Banana Value Chain in Central Africa. They also found that rural assemblers play a major role of collecting and bulking banana from individual farmers and they handle 42% of total marketed banana in Central Africa. Findings from this study revealed that selling at the farm gate prevent producers from bargaining for higher prices compared to when the commodity was taken to markets. The Farm-Gate collectors' buy at low prices from the farmers and this 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 in-situ 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 in- situ wholesalers collects and market on the average two 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.

4.2.2.3 : 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 processors 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.

4.2.3 Flow and Volume analysis in Plantain value chain

The result of the analysis of value chain mapping (Figure 4.1) indicated that the Producers sell 55% of their produce at farm gate directly to Farm-Gate Assemblers. The remaining proportions were sold to Market Arena Assemblers (30%), Insitu-wholesalers (10%) and Transits-Wholesalers (5%). The Market-Arena Assemblers and Insitu wholesalers operate in the local market while the Transit-Wholesalers commute between local and urban market. Result indicated that Farmers selling at the Farm Gate were receiving low price compared to Farmers selling at the local market. Result of the analysis also indicated that 7% of Farmers in the Zone were also involved in collation/assembling of produce from other producers for sale at local and urban market in the zone. Further analysis indicated that out of the 55% of Plantain sold to Farm-Gate Assemblers, 5% were sold to Processors, 10% for Insitu-wholesalers, 30% for Market-Arena Assemblers and 10% for Transit Wholesalers. As a result, the Market- Arena Assemblers grossed 60% out of which 32% were sold to Insitu wholesales, 20% to transit wholesalers and the remaining

8% to processors. The 52% of produce with the Insitu wholesales were also sold in the following proportions: 10% rural Retails, 37% to transit wholesalers and 5% to processors. The transit wholesalers accumulated 72% of produce, rural retailers (10%) while the processors had 18% of produce. The 72% of produce with the transit wholesalers was in turn sold to urban retailers (48%) and the remaining 22% sold directly to consumers, 2% went to export. The 10% with the rural retailers and 18% of the produce with the processors were processed and sold to consumers through the retailers. The result of the flow and volume mapping of plantain showed that the chain was lengthy and a large number of participants were involved in the various activities. The produce were mainly (82%) exchanged in an unprocessed form with little value addition (18%). Result also indicated that the structure of the flow in the chain was unorganized and this had effect on the efficiency of the chain.

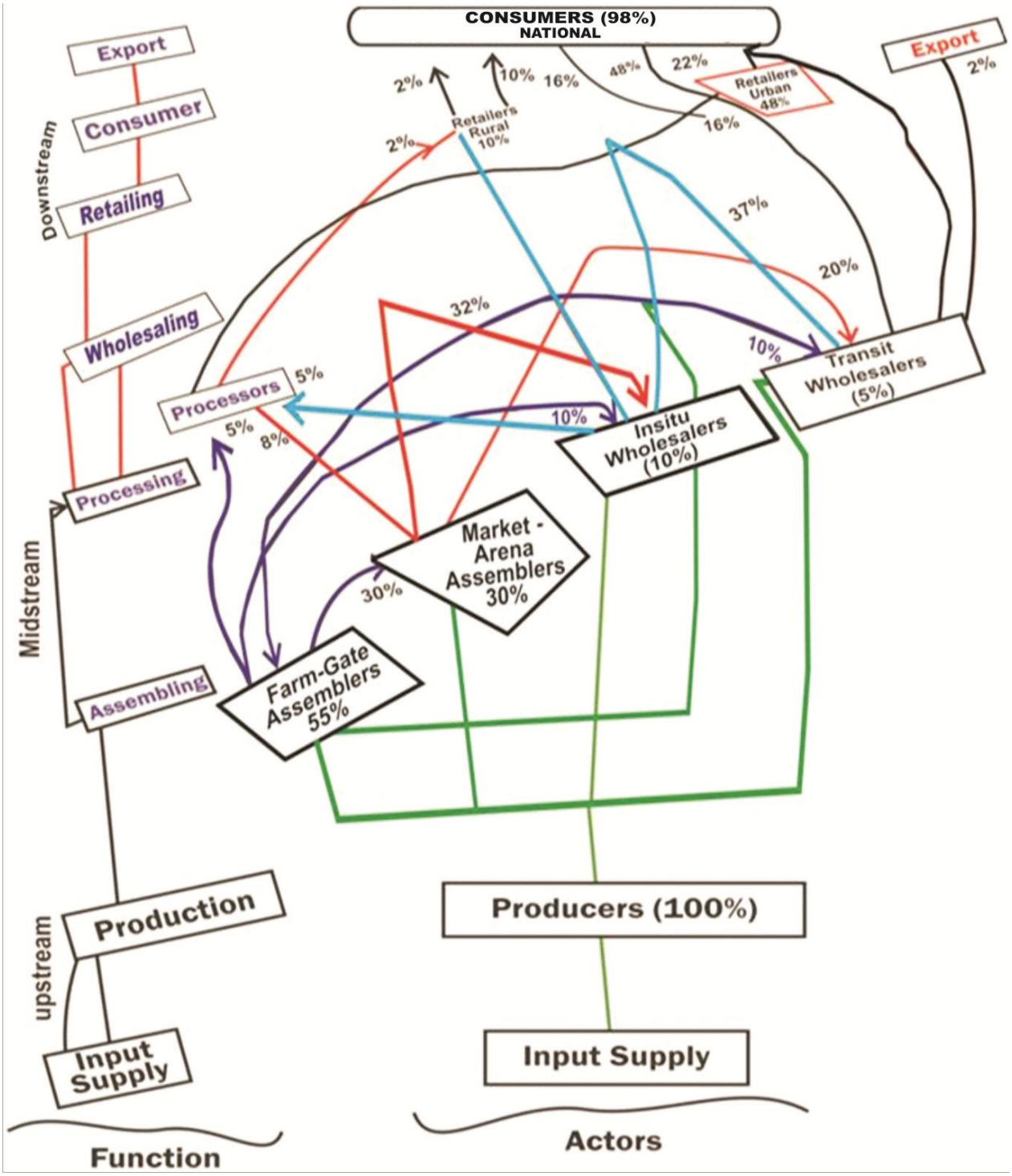

Fig 4.1: Flow and volume analysis in plantain value chain

4.2.4 Level of employment along the stages of Plantain Value Chain

Analyzing level of employment along the chain is essential in determining opportunity for employment generation. This is because unemployment rate is spiralling in the country (ATA, 2011) and there is urgent need for avenue to reduce such menace in the country. Analyzing level of employment gave an indication of the number of job at each stage of the chain.

The result of the analysis (Table 4.2) indicated that an average of 12 persons was required per tonne in the production of plantain fruit. They were employed for activities such as land clearing, planting, weeding, fertilizer application, agrochemical application and harvesting. This implies that plantain production is capable of generating large volume of employment; the fact that 12 persons were employed to produce 1 tonne of plantain implies that an average of 123 people would be required per hectare of plantain. In Farm-Gate Assembling, an average of 48 persons were employed per year to collate and market 1 tonne of plantain while Market-Arena Assemblers engaged an average of 52 persons to market 1 tonne of plantain per year. The Wholesalers employed more hands to the tune of 64 persons per tonne of plantain marketed yearly. They were employed in gathering of plantain from Producers, Farm-Gate Assembler, Market-Arena Assemblers and loading of plantain into trucks. Furthermore, averages of 32 persons were employed per tonne by the Retailers (during the peak season) in the marketing of 1 tonne of plantain and therefore to market plantain produced on a hectare a total number of 329 retailers would be required during the peak season of production. The labours engaged were mainly for hawking of plantain and loading at the purchasing point. For Processors, an average of 106 persons was employed per year to process a tonne of plantain. They were employed for activities such as peeling of plantain, slicing, frying and packaging of the product as well as marketing of the chips and flour. This is a reflection of the level of diversification and complex nature of Plantain Value chain. Overall result indicated that Plantain processing was capable of generating higher levels of employment per tonne of Plantain. The result of the analysis however indicated that only 18% of the produce was processed. This was an indication that higher employment could be generated if more of the produce is processed.

Table 4.2: Employment along the stages of Plantain Value Chain

Participants	Number of employment/tonne*	Number of employment/ha	Percentage
Producers	12	123	3.82
Farm-gate assemblers	48	493	15.28
Market-arena assemblers	52	534	16.56
Wholesalers	64	657	20.38
Retailers	32	329	10.19
Processors	106	1,088	33.76
Total	**314**	3,224	100

Source: Field Survey, 2013.

***** Number of job created at every stage was estimated and collated.

4.2.5: Constraints along the stages of Plantain Value Chain

Constraints analysis was carried out to identify the challenges and the magnitude of the identified constraints on each stage of plantain value chain.

4.2.5.1: Plantain production

The major constraints encountered by Plantain farmers are shown in Table 4.3. The result of the analysis indicated that inadequate credit accessibility (81.5%), transportation (72.3%), inadequate storage facilities (63.5%) and marketing (60%) were the major constraint militating against increased plantain production in south western Nigeria. Other constraints are training on Plantain production (52.7%) and inadequate man power (48.8%). The least constraints in plantain production were land accessibility (16.5%) and Pilfering (45.4%). 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 since most of the farmers do not have access to use during the production cycle. Most of the farmers source their credit from friends and relatives. Bank not giving enough credit may be attributable to risky nature of agricultural production since most of the banks are not willing to invest in such operation. The problem of market access was critical during the peak season of production due to the large forces of supply that will lead to the reduction in the price of the commodity. Collective marketing would have helped farmers to realize more benefits from their production and this would have helped the farmers to access better markets for their product. Land availability (90%) and corruption and pilfering (63.1%) were adjudged not to be severe in the area. Land availability that was reported not to be constraint may be attributed to the location of the farm that are in rural areas and this make land available for the intending farmers. Findings from this study are consistent with the findings of Ekunwe and Ajayi (2010, Kainga And Seiyabo (2012) .They also 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.

Table 4.3: 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 in production	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)

Source: Field Survey, 2013
*Figures in parenthesis are percentages

4.2.5.2: Marketing Constraints

The results (Table 4.4) revealed that the major constraints are high transportation cost (87.5%), storage facilities (63.3%), and credit accessibility (62.5%). Moreover, other constraints limiting the marketing of Plantain are pilfering (30%), Manpower (35%), Training in marketing (26.7%). In term of the severity of the constraint, high transport cost 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 the high cost of transporting the commodities from one part of the farm to the different market locations in the south western Nigeria. Storage facilities being a constraint were attributed to the perishable nature of the commodity.

Table 4.4: Constraint in 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)
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)

Source: Field Survey, 2013
*Figures in parenthesis are percentages

4.2.5.3: Plantain Processing

The result of the analysis Table 4.5 revealed that the major constraints in plantain processing business are credit (82.9%), Training on processing (53.7%), Manpower (39%). Other constraints are inadequate storage facilities (34.1%), Transport condition (26%), Pilfering (2.4%). In term of severity of constraints inadequate storage facilities for the fruit used in processing was the most severe constraints in plantain processing (89%) 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 are financial, labour constraints and marketing constraints.

Table 4.5: Constraints in Plantain Processing

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 in processing	44(53.7)	38(46.3)	0	13(15.9)	69(84.1)

Source: Field Survey, 2013
*Figures in parenthesis are percentages

4.3 Comparative advantage and Competitiveness along each stage of the chain and the whole plantain value chain.

Comparative advantage and competitiveness analysis was carried out at each stage of plantain value chain and the whole chain. This is necessary to determine the effect of policies on comparative advantage and competitiveness on each stage and the whole plantain value chain system. Efficiency of every stage is important and also business success will depend on the performance of the whole chain (Vermeulen *et al*, 2008).

4.3.1 Competitiveness of Plantain at each stage of Plantain Value Chain and the whole chain

This was carried out for the four identified production systems (Sole plantain, plantain/cocoa, plantain/cocoyam and plantain/cassava); participants involved in marketing (Farmgate Assemblers, market-arena assemblers, wholesalers and retailers) and processing (flour and chips). In order to carry out the comparative advantage and competitiveness analysis, private and social budget involved in production, processing and marketing were first estimated. This is crucial in the analysis of comparative advantage and competitive analysis.

4.3.1.1: Private and Social Budget of Plantain Production System

Private and social budgetary analysis of four production system were analysed to determine the profitability of each of the production system at private and social value. The prominent production systems practiced by producers in the study area were Sole plantain (26.5%), Plantain/Cocoa (37.7%), Plantain/Cocoyam (22.7%) and Plantain/Cassava (13.1%).

4.3.1.2: Private and Social Budget of Sole Plantain Production System

The total cost incurred in producing sole plantain (detailed budget table 4.6a, summary of budget, table 4.6b) was estimated at ₦243,617/ha and ₦387,105/ha at private and social value. In cost sharing, input cost such as cost of plantain suckers, fertilizer, pesticides, herbicides, bags, basket constituted 38.1% and 23.8% in private and social value, factor cost constituted 6.7% and 50.1% at private and social value while labour cost constituted 55.2% and 26.1% at private and social value respectively. This implies that costs of labour (55.2%) constituted the highest percentage of cost at private value followed by inputs cost (38.1%) while the least was obtained with factor cost (6.7%). At social price, factor cost

(50.1%) constituted the highest percentage of cost in Sole Plantain production system. The high percentage of factor cost at social value was due to land cost. The cost was estimated using the opportunity cost approach in which land value was estimated based on the net return from competing crop (Gullati and Kelly, 2000). The average yield of Plantain in the production system in south-western Nigeria was estimated at 10.266 tonnes/ha. Net profit of ₦348,352.16/ha and ₦1,533,489.88/ha was obtained at private and social value in the sole Plantain production system.

Table 4.6a: Detailed Private and Social Budget per hectare for Sole Plantain Production System in Southwestern Nigeria.

Items	Unit	Qty	Market Price ₦	Social price ₦	Private Value ₦	Social value ₦
Non Tradeables						
Fixed factors (Depreciation on tools)						
Cutlass	No	4	425.5	520	1,702	2,076.4
Hoe	No	4	375.5	132	1,502	527.99
File	No	4	200	32	800	128
Spade	No	1	193.8	240	193.8	240
Sprayer	No	2	1,146.4	1,728	2,292.80	3,462.1
Wheel barrow	No	2	825.84	464	1,651.68	924.94
land rent	Ha		5429		5,429	184,126
Transportation cost	N			2,656.2	2,656.20	2,656.2
Sub total					**16,227**	**194,141.63**
Labour						
land clearing	MD	23	1,100	825	25,300	18,975
Digging plantain holes	No	1,111	24	18	26,664	19,998
Planting plantain	MD	7	1,100	825	7,700	5,775
Weeding	MD	39	1,100	825	42,900	32,175
Fertilizer Application	MD	7	1,100	825	7,700	5,775
Chemical Application	MD	11	1,100	825	12,100	9,075
Harvesting	M/D	11	1,100	825	12,100	9,075
Sub total					**134,464**	**100,848**
Tradeables						
Suckers	N0	1171	61	61	71,431	71,431
Fertilizer	Kg	126	118	136	14,868	17,136
Pesticides	Litre	1	1173	369	1,1173	369
Herbicides	Litre	3.4	902	233	3,066.80	792.2
Bags	No	7	76	76	532	532
Baskets	No	7	265	265	1,855	1,855
Subtotal					**92,926**	**92,115**
Grand total cost					**243,617**	**387,105**
Output						
Yield of plantain	Kg	10,266	50.26	179.68	515,969.16	1,844,594.88
Suckers	No	1520	50		76,000	76,000
Total revenue					591,969.16	1,920,594.88
Net profit					**348,352.16**	**1,533,489.88**

Source: Field Survey, 2013

Table 4.6b: Summary of budget in sole plantain production system (ha)

Item	Private price ₦	Social Price ₦
Factors	16,227 (6.7%)*	194,141.63 (50.1%)
Labour	134,464 (55.2%)	100,848 (26.1%)
Input cost	92,926 (38.1%)	92,115 (23.8%)
Total cost	243,617	387,105
Revenue	515,969.16	1,835,125.2
Revenue from suckers	76,000	76,000
Revenue (other crop)	-	-
Total Revenue	591,969.16	1,920,594.88
Profit/Ha	348,352.16	1,533,489.88

Source: Field Survey, 2013.

*Figures in parentheses are percentages.

4.3.1.3: Private and Social Budget of Plantain/Cocoa Production System

In plantain/Cocoa production system (detailed budget table 4.7a, summary of budget, table 4.7b), result indicated that average total cost incurred in the production was estimated at ₦288,819/ha and ₦427,903/ha at private and social value. At private value, labour constituted 49.6% and 25.1% at private and social value. Factor cost constituted 6.3% and 45.8% at private and social value while input constituted 44.1% and 29.1% at private and social value. Higher percentage of cost was obtained for labour at private value (49.6%) compared to the social value (25.1%). Higher cost obtained in Plantain/Cocoa production system compared to the sole plantain production system was due to the cost involved in procurement of cocoa seedlings that were intercropped with the plantain and the weeding cost. Average total revenue of ₦591,969.16/ha and ₦1,920,594.88/ha were obtained at private and social value in the production system while profit/ha of ₦303,150.16 and ₦1,492,691.88 were obtained at private and social value in Plantain/cocoa production systems.

Table 4.7a: Detailed Private and Social Budget per hectare for Plantain/Cocoa Production System in Southwestern Nigeria.

Items	Unit	Qty	Market Price ₦	Social price ₦	Private Value ₦	Social value ₦
Non Tradeables						
Fixed factors (Depreciation on tools)						
Cutlass	No	4	425.5	520	1,702	2,076.4
Hoe	No	4	375.5	132	1,502	527.99
File	No	4	200	32	800	128
Spade	No	1	193.8	240	193.8	240
Sprayer	No	2	1,146.4	1,728	2,292.80	3,462.1
Wheel barrow	No	2	825.84	464	1,651.68	924.94
land rent	Ha		5429		5,429	184,126
Transportation cost	N			4,604.2	4,604.2	4,604.2
Sub total					**18,175**	**196,090**
Labour						
land clearing	MD	23	1,100	825	25,300	18,975
Digging plantain holes	No	1,111	24	18	26,664	19,998
Planting plantain	MD	7	1,100	825	7,700	5,775
planting cocoa	MD	8	1,100	825	8,800	6,600
Weeding	MD	39	1,100	825	42,900	32,175
Fertilizer Application	MD	7	1,100	825	7,700	5,775
Chemical Application	MD	11	1,100	825	12,100	9,075
Harvesting plantain	M/D	11	1,100	825	12,100	9,075
Sub total					**143,264**	**107,448**
Tradeables						
Suckers	N0	1171	61	61	71,431	71,431
Cocoa seedlings		1111	25	20	27,775	27,775
Fertilizer	Kg	150	118	136	17,700	20,400
Pesticides	Litre	4.28	1173	369	5,020.40	1,579.32
Herbicides	Litre	3.4	902	233	3,066.80	792.2
Bags	No	7	76	76	532	532
Baskets	No	7	265	265	1,855	1,855
Subtotal					**127,380**	**124,365**
Grand total cost					**288,819**	**427,903**
Output						
Yield of plantain	Kg	10,266	50.26	179.68	515,969.16	1,844,594.88
Suckers	No	1520	50		76,000	76,000
Total revenue					**591,969.16**	**1,920,594.88**
Net profit					**303,150.16**	**1,492,691.88**

Source: Field Survey, 2013

Note: MD= Mandays

Table 4.7b: Summary of budget at private and social price in plantain/cocoa production system/hectare

Item	**Private price ₦**	**Social Price ₦**
Factors	18,175 (6.3%)*	196,090 (45.8%)
Labour	143,264 (49.6%)	107,448 (25.1%)
Input	127,380 (44.1%)	124,365 (29.1%)
Total cost	288,819	427,903
Revenue	515,969.16	1,844,594.88
Revenue from suckers	76,000	76,000
Revenue (other crop)	-	-
Total Revenue	591,969.16	1,920,594.88
Profit/Ha	303,150.16	1,492,691.88

Source: Field survey, 2013.
*Figure in parentheses are percentages.

4.3.1.4 Private and Social Budget of Plantain/Cocoyam Production system/hectare

For plantain/cocoyam production system (detailed budget table 4.8a, summary of budget, table 4.8b), the estimated average total cost of production at private and social value were ₦363,422/ha and ₦498,584/ha. Labour constituted the highest percentage of cost at private value and it was estimated at 44.9% followed by inputs (46.5%) while the least cost at private value was on factor cost estimated at 8.6%. At social value, factor cost represented the highest percentage of cost (42%) while the least cost was the labour and it represented (24.5%). Average total revenue of ₦877,969.16/ha and ₦2,092,194.88/ha was obtained at private and social value in the production system indicating that the system was profitable.

Table 4.8a: Detailed Private and Social budget per hectare for Plantain/Cocoyam Production System in Southwestern Nigeria.

Items	Unit	Qty	Market Price ₦	Social price ₦	Private Value	Social value ₦
Non Tradeables						
Fixed factors (Depreciation on tools)						
Cutlass	No	4	425.5	520	1,702	2,076.4
Hoe	No	4	375.5	132	1,502	527.99
File	No	4	200	32	800	128
Spade	No	1	193.8	240	193.8	240
Sprayer	No	2	1,146.4	1,728	2,292.80	3,462.1
Wheel barrow	No	2	825.84	464	1,651.68	924.94
land rent	Ha		5429		5,429	184,126
Transportation cost	N			17,826.2	17,826.2	17,826.2
Sub total					**31,397**	**209,312**
Labour						
land clearing	MD	23	1,100	825	25,300	18,975
Digging plantain holes	No	1,111	24	18	26,664	19,998
Planting plantain	MD	7	1,100	825	7,700	5,775
planting cocoyam	MD	13	1,100	825	14,300	10,725
Weeding	MD	39	1,100	825	42,900	32,175
Fertilizer Application	MD	7	1,100	825	7,700	5,775
Chemical Application	MD	11	1,100	825	12,100	9,075
Harvesting plantain	M/D	11	1,100	825	12,100	9,075
Harvesting cocoyam	MD	13	1,100	825	14,300	10,725
Sub total					**163,064**	**122,298**
Tradeables						
Suckers	N0	1171	61	61	71,431	71,431
Cocoyam suckers					69,000	69,000
Fertilizer	Kg	150	118	136	17,700	20,400
Pesticides	L	3	1173	369	3,519	1,107
Herbicides	L	3.4	902	233	3,066.80	792.2
Bags	No	14	76	76	1,064	1,064
Baskets	No	12	265	265	3,180	3,180
Subtotal					**168,961**	**166,974**
Grand total cost					**363,422**	**498,584**
Output						
Yield of plantain	Kg	10,266	50.26	179.68	515,969.16	1,844,594.88
Suckers	No	1520	50		76,000	76,000
Cocoyam yield	Kg	2,860	100	60	286,000	171,600
Total revenue					877,969.16	2,092,194.88
Net profit					**514,547.16**	**1,593,610.88**

Source: Field survey, 2013.

Table 4.8b: Summary of budget at private and social price in plantain/cocoyam production system/hectare

Item	**Private price ₦**	**Social Price ₦**
Factors	31,397 (8.6%)*	209,312 (42%)
Labour	163,064 (44.9%)	122,298 (24.5%)
Input	168,961 (46.5%)	166,974 (33.5%)
Total cost	363,422	498,584
Revenue	515,969	1,844,594.88
Revenue from suckers	76,000	76,000
Revenue from cocoyam	286,000	171,600
Total Revenue	877,969.16	2,092,194.88
Profit/Ha	514,547.16	1,593,610.88

Source: Field Survey, 2013
*Figures in parentheses are percentages

4.3.1.5 Private and Social Budget of Plantain/Cassava Production system

The result of the analysis (detailed budget table 4.9a, summary of budget, table 4.9b) indicated that the total cost of production in plantain/cassava was estimated at ₦314,670/ha and ₦449,703/ha at private and social value. The analysis further indicated that at private value, labour constituted the highest percentage of cost (51.8%), and followed by input 36.2% while factor constituted the least cost (12.0%). At social value, factor cost constituted the highest percentage of cost (47.9%), followed by labour (27.2%) while the least was recorded with input (24.9%). Average revenue of ₦669,249.16/ha and ₦1,931,414.08/ha was observed at private and social value while net profit of ₦354,579.16/ha and ₦1,481,711.08/ha were obtained at private and social value respectively.

Table 4.9a: Detailed Private and Social Budget per hectare for Plantain/Cassava Production System in Southwestern Nigeria.

Items	Unit	Qty	Market Price ₦	Social price ₦	Market Value	Social value ₦
Non Tradeables						
Fixed factors (Depreciation on tools)						
Cutlass	No	4	425.5	520	1,702	2,076.4
Hoe	No	4	375.5	132	1,502	527.99
File	No	4	200	32	800	128
Spade	No	1	193.8	240	193.8	240
Sprayer	No	2	1,146.4	1,728	2,292.80	3,462.1
Wheel barrow	No	2	825.84	464	1,651.68	924.94
land rent	Ha		5429		5,429	184,126
Transportation cost	N			24,060	24,060	24,060
Sub total					**37,631**	**215,545**
Labour (Mandays = MD)						
land clearing	MD	23	1,100	825	25,300	18,975
Digging plantain holes	No	1,111	24	18	26,664	19,998
Planting plantain	MD	7	1,100	825	7,700	5,775
planting cassava	MD	11	1,100	825	12,100	9,075
Weeding	MD	39	1,100	825	42,900	32,175
Fertilizer Application	MD	7	1,100	825	7,700	5,775
Chemical Application	MD	11	1,100	825	12,100	9,075
Harvesting plantain	M/D	11	1,100	825	12,100	9,075
Harvesting cassava	M/D	15	1,100	825	16,500	12,375
Sub total					**163,064**	**122,298**
Tradeables						
Suckers	N0	1171	61	61	71,431	71,431
Cassava stems		11	770	770	8,470	8,470
Fertilizer	Kg	200	118	136	23,600	27,200
Pesticides	Litre	4.28	1173	369	5,020.40	1,579.32
Herbicides	Litre	3.4	902	233	3,066.80	792.2
Bags	No	7	76	76	532	532
Baskets	No	7	265	265	1,855	1,855
Subtotal					**113,975**	**111,860**
					314,670	**449,703**
Output						
Yield of plantain	Kg	10,266	50.26	179.68	515,969.16	1,844,594.88
Suckers	No	1520	50		76,000	76,000
Cassava root	Kg	5,250	14	2	77,280	10,819.2
Total revenue					**669,249.16**	**1,931,414.08**
Net profit					**354,579.16**	**1,481,711.08**

Source: Field Survey, 2013.

Table 4.9b: Summary of budget at private and social price in plantain/cassava production system/hectare

Item	**Private price ₦**	**Social Price ₦**
Factors	37,631 (12.0%)*	215,545 (47.9%)
Labour	163,064 (51.8%)	122,298 (27.2%)
Input	113,975 (36.2%)	111,860 (24.9%)
Total cost	314,670	449,703
Revenue	515,961.6	1,844,594.88
Revenue from suckers	76,000	76,000
Revenue from cassava	77,280	10,819.2
Total Revenue	669,249.16	1,931,414.08
Profit/Ha	354,579.16	1,481,711.08

Source: Field Survey, 2013.
*Figures in parentheses are percentages

Cursory observation of the production cost involved in the plantain production system indicated that highest cost of production at private and social value was observed in Plantain/Cocoyam production system (₦363,422/ha) at private value and at social value (₦498,584/ha). This was followed by Plantain/Cassava production system (₦314,670/ha) at private value and ₦449,703/ha at social value. The least total production cost at private and social value was observed when plantain was planted sole at ₦243,617/ha (private value) and ₦387,105/ha (social value). The higher cost associated with the intercropping system was due to the cost of procuring planting materials for the intercrop, labour and cost of transportation of the commodities involved.

4.3.2 Estimated Average Private and Social budget in Plantain Marketing

There are four types of participants in the marketing chain of plantain in the study area. These are Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers, and Retailers.

4.3.2.1 Private and Social budget in Plantain Farm Assemblers

For Farm-Gate Assemblers, an average total cost of ₦43,300/tonne and ₦42,590/tonne was incurred on tradeable inputs at private and social value while an average of ₦2,800/tonne and ₦2,250/tonne was incurred on domestic factor at private and social value (detailed budget table 4.10a, summary of budget, table 4.10b)). Tradeable inputs include the plantain fruits and other items such as bags while the non tradeable were cost involved in the hiring of labour, rent on stalls and transportation cost. In the cost share based on tradeable and non tradeable, tradeable cost in plantain marketing at farm assembling represented 93.53% of the total cost while the non tradeable represented 6.47% of the total cost at private value. At social value, tradeable costs constituted 94.72% while the non tradeable constituted 5.28% of the total cost. This implies that in plantain farm assembling, the highest percentage of cost is incurred on tradeable which are majorly the plantain fruits. The result of the analysis implied that in Farm-Gate Assembling of plantain, lower costs are involved in the non tradeable compared to tradeable input. The high cost involved in the tradeable was attributable to the cost of plantain fruits.

Table 4.10 a: Detailed Private and Social Budget/tonne for Plantain farm Assemblers in South western Nigeria.

Item	Unit	Qty	Market price ₦/kg	Social price ₦/kg	Market value ₦/kg	Social value ₦/kg
Revenue						
Plantain fruit in Kg	Kg	1,000	61.3	181.0	61,300	180,835
Tradeable Inputs						
Plantain fruits	Kg	1,000	39.7	39.7	39,700	39,700
Sacs	No	4	200	160	800	640
Total cost					**40,500**	**40,340**
Non tradeable input						
Labour	No	2	500	375	1,000	750
Rent on stalls			200	200	200	200
Transportation			1,600	1,600	1,600	1,600
Sub total					**2,800**	**2,250**
Total cost					**43,300**	**42,590**
Net profit					**18,000**	**138,245**

Source: Field Survey, 2013.

Table 4.10b: Summary of budget/tonne at private and social price for farm assemblers

Item (s)	Private price ₦	Social Price ₦
Factors		
Labour	2,800 (6.47%)*	2,250 (5.28%)
Input	40,500 (93.53%)	40,340 (94.72%)
Total Cost/tonne	43,300	42,590
Revenue from Plantain/tonne	61,300	180,835
Profit/tonne	18,000	138,245

Source: Field Survey, 2013.

*Figures in parentheses are percentages

4.3.2.2: Budget at Private and Social Price/tonne for Plantain Market-Arena Assemblers

For Market-Arena Assemblers of plantain (detailed budget table 4.11a, summary of budget, table 4.11b)). The total cost incurred by the market-arena assemblers at private and social value was ₦53,000/tonne and ₦52,590/tonne at private and social value. In cost sharing, the total cost on tradeable input was estimated at ₦51,800/tonne (97.74%) while the total cost incurred on domestic factors was estimated at ₦1,200/tonne (2.26%) of plantain at private value. At social value, total cost incurred on tradeables was estimated at ₦51,640/tonne (98.19%) while on non tradeables, an average of ₦950/tonne (1.81%) was incurred.

Table 4.11a: Detailed Private and Social Budget for Plantain Market Assemblers in south western Nigeria.

	Units	Quantity	Market price ₦/kg	Social price ₦/kg	Market value ₦/kg	Social value ₦/kg
Revenue						
Plantain fruit in Kg	Kg	1,000	67	181.0	67,000	180,900
Tradeable Inputs						
Plantain fruits	Kg	1,000	51	51.0	51,000	51,000
Sacs	No	4	200	160	800	640
Sub total					**51,800**	**51,640**
Non tradeable input						
Labour	No	2	500	375	1,000	750
Rent on stalls			200	200	200	200
Transportation			0*		0	0
					1,200	**950**
Total cost					**53,000**	**52,590**
Marketing Margin/tonne					**14,000**	**128,310**

Source: Field Survey, 2013.

*The transportation cost for market arena assembler was zero because they are located in the market. They collate and sell their plantain in the local market.

Table 4.11b: Summary of budget at private and social price for Market-Arena Assemblers

Item (s)	Private price ₦	Social Price ₦
Factors		
Labour	1,200 (2.26%)*	950 (1.81%)
Input	51,800 (97.74%)	51,640 (98.19%)
Total Cost/tonne	53,000	52,590
Revenue from Plantain/tonne	67,000	180,900
Profit/tonne	14,000	128,310

Source: Field Survey, 2013.

*Figures in parentheses are percentages

4.3.2.3: Private and Social Budget/ton for Plantain wholesalers

Higher costs on Tradeable and Non tradeables were incurred by wholesalers in the business of plantain marketing in the study area compared to Farm-Gate and Market-Arena Assemblers (detailed budget table 4.12a, summary of budget, table 4.12b). This was due to higher cost of transportation involved in Wholesaling compared to the other two participants. The total cost incurred on tradeable and non tradeable by plantain wholesalers was estimated at ₦63,400/tonne and ₦63,240/tonne at private and social value representing 90.83% and 91.3%. At social value, an average total of ₦69,265/tons were incurred in plantain marketing while at private average total cost of ₦69,800/tonne were incurred on marketing of plantain in the study area. Average total revenue of ₦106,300/tonne and ₦180,710/tonne were obtained in Plantain wholesale marketing.

Table 4.12a: Detailed Private and Social Budget for Plantain wholesalers in south western Nigeria.

Item	Units	Quantity	Market price ₦/kg	Social price ₦/kg	Market value ₦/kg	Social value ₦/kg
Revenue						
Plantain fruit in Kg	Kg	1,000	106.3	181	106,300	180,710
Tradeable Inputs						
Plantain fruits	Kg	1,000	62.6	62.6	62,600	62,600
Sacs	No	4	200	160	800	640
Sub Total					**63,400**	**63,240**
Non tradeable input						
Labour	No	3	500	375	1,500	1,125
Rent on stalls		100		100	100	100
Transportation			4,000		4,800	4,800
Sub total					**6,400**	**6,025**
Total cost					**69,800**	**69,265**
Net marketing Margin/tonne					**36,500**	**111,445**

Source: Field Survey, 2013.

Table 4.12b: Summary of budget/tonne at private and social price for wholesalers

Item (s)	Private price ₦	Social Price ₦
Factors		
Labour	6,400 (9.17%)*	6,025 (8.70%)
Input	63,400 (90.83%)	63,240 (91.30%)
Grand Total Cost/tonne	69,800	69,265
Revenue from Plantain/tonne	106,300	180,710
Profit/tonne	36,500	111,445

Source: Field Survey, 2013.

*Figures in parentheses are percentages

4.3.2.4 Private and Social Budget/tonne for Plantain Market Retailers

Similar trends were also observed with retailers, the costs incurred on tradeable (₦104,600/tonne) and non tradeable (₦2,467/tonne) at private value were higher compared to the Farm-Gate Assemblers, Market-Arena assemblers and Wholesalers counterpart (detailed budget table 4.13a, summary of budget, table 4.13b). The total cost incurred on tradeable input at private and social value in Retail Plantain Marketing was estimated at ₦104,600/ton and ₦104,480/ton. For non tradeable, total cost incurred on non tradeables at private and social value was estimated at ₦2,467/ton and ₦2,342/ton. Higher costs compared to the other participants are involved in retail marketing of plantain. Total revenue of ₦136,300/tonne and ₦181,279/tonne were obtained at private and social value by the participants.

Table 4.13a: Detailed Private and Social Price/tonne for Plantain Market Retailers in south western Nigeria.

	Units	Quantity	Market price ₦/kg	Social price ₦/kg	Market value ₦/kg	Social value ₦/kg
Revenue						
Plantain fruit in Kg	Kg	1,000	136.3	181.0	136,300	181,279
Tradeable Inputs						
Plantain fruits	Kg	1,000	104	104.0	104,000	104,000
Sacs	No	3	200	160	600	480
Sub total					**104,600**	**104,480**
Non tradeable input						
Labour	No	1	500	375	500	375
Rent on stalls			100	100	100	100
Transportation			1,867		1,867	1,867
Sub total					**2,467**	**2,342**
Total cost					**107,067**	**106,822**
Net marketing Margin					**29,223**	**74,457**

Source: Field survey, 2013

Table 4.13b: Summary of budget/tonne at private and social price for retailers

Item (s)	Private price ₦	Social Price ₦
Factors		
Labour	2,467 (2.30%)*	2,342 (2.19%)
Input	104,600 (97.70%)	104,480 (97.81%)
Total Cost/ton	107,067	106,822
Revenue from Plantain/ton	136,300	181,279
Profit/tonne	29,223	74,457

Source: Field survey, 2013.

Figures in parentheses are percentages

4.3.3 Estimated Private and Social Budget in Plantain Processing

Plantain flour and Plantain chips was common Plantain product in the study area. They are also tradeable in the domestic, regional and international market. The cost outlay in plantain processing is discussed below.

4.3.3.1: Estimated Average Private and Social Budget in Plantain flour Processing

The total cost incurred in plantain flour processing was estimated at ₦305,599/tonne and ₦293,631/tonne at private and social value (detailed budget table 4.14a, summary of budget, table 4.14b). The variation in the private and social price was due to differences in the private and social value of equipment used in processing the flour. In cost sharing input cost represented 84.22%, labour represented 12.11% while factor represented 3.67% at private value. At social value, input cost constituted 87.19%, labour 9.45% and factor 3.36%. The major cost component in the input of plantain flour processing was the plantain fruit. In plantain flour an estimated average of 269.23kg of plantain flour was realized from one tonne of plantain fruits processed. Average total revenue of ₦714,300/tonne and ₦855,600/tonne was obtained from processing flour at private and social value while net margin of ₦408,701/tonne and ₦561,969/tonne was obtained at private and social value for the flour.

Table 4.14a: Detailed Private and Social Price/tonne for Plantain flour

	Units	Quantity	Market price ₦/kg	Conversion factor	Social price ₦/kg	Market value ₦/kg	Social value ₦/kg
Revenue							
Plantain flour in Kg (269.23kg from 1000kg plantain fruit)	Kg	1,000	714.30	1.48	855.6	714,300	855,600
Tradeable Inputs							
Plantain fruits	Kg	4,000	58.33	1.0	58.33	233,320	233,320
Sacs	No	15	250.0	0.64	160.0	3,750	2,400
Plastic	No	37	300	1.0	300	11,100	11,100
Basket	No	46	200	1.0	200	9,200	9,200
Sub total						**257,370**	**256,020**
Non tradeable input							
Labour	No	37	1,000	0.75	750	37,000	27,750
Knife	No	19	200	0.64	128.0	3,800	2,432
Rent on stalls			500	1.0	500	1,857.15	1,857.15
Transportation			1,500	1.0	1,500	5,571.44	5,571.44
Sub total						**48,229**	**37,611**
Total cost						**305,599**	**293,631**
Net Profit/tonne						**408,701**	**561,969**

Source: Field Survey, 2013.

Table 4.14b: Summary of budget at private and social price/tonne in plantain flour processing.

Item (s)	Private price ₦	Social Price ₦
Factors	11,229 (3.67%)*	9,861 (3.36%)
Labour	37,000 (12.11%)	27,750 (9.45%)
Input	257,370 (84.22%)	256,020 (87.19%)
Grand Total Cost/tonne	305,599	293,631
Revenue from Plantain/tonne	714,300	855,600
Profit/tonne	408,701	561,969

Source: Field Survey, 2013.

*Figures in parentheses are percentages

4.3.3.2: Budget at Private and Social Price for Plantain Chips

The total cost incurred in plantain chip processing was estimated at ₦406,991/tonne and ₦397,207/tonne at private value and social value (detailed budget table 4.15a, summary of budget, table 4.15b). In cost sharing, input represented 81.26%, labour represented 5.9% while factor represented 12.84% at private value. An average of 247kg of plantain chips was obtained from one ton of fresh plantain fruits processed in the study area. At social value, input cost represented 83.1%, labour (4.53%) while factor represented 12.29% of the total cost of production. The higher tradeable cost incurred in plantain chips production (₦330,724/tonne) compared to plantain flour (₦257,370/tonne) is traceable to cost of equipment, fuel and materials such as oil, salt, sugar amongst others used in plantain chip processing.

Table 4.15a: Detailed Budget at Private and Social Price/tonne for Plantain Chips

	Units	Quantity	Market price ₦/kg	Conversion factor	Social price ₦/kg	Market value ₦/kg	Social value ₦/kg	
Revenue								
Plantain chip in Kg (247kg	Kg	1,000	833.33	1.76		833,330	1,162,000	
from 1000kg planta in fruit)					1,162			
Tradeable Inputs								
Plantain fruits	Kg	4,000	65.00	1.0	65.0	260,000	260,000	
Ground nut oil						48,582.99	48,582.99	
Basket	No	16	250	1.0	250	4,000	4,000	
Plastic	No	32	200	1.0	200	6,400	6,080	
Nylon						2,024.29	2,024.29	
Sugar						4,048.58	4,048.58	
Wood						5,668.01	5,668.01	
Sub total						**330,724**	**330,404**	**330,040**
Non tradeable input								
Knives	No	20	200	0.64	128	4,000	2,560	
Slicers						6,072.87	4,048.58	
Labour	No	48	500	0.75	375	24,000	18,000	
Rent on stalls			1000			4,048	4,048.58	
Transportation						12,145.75	12,145.75	
Fixed inputs								
Depreciation on frying pan	No	20	600			12,000	12,000	
Long spoon	No	28	500			14,000	14,000	
						76,267	**66,803**	
Total cost						**406,991**	**397,207**	
Net Profit						**426,339**	**764,793**	

Source: Field Survey, 2013.

Table 4.15b: Summary of budget at private and social price in plantain chip processing.

Item (s)	Private price ₦	Social Price ₦
Factors	52,267	48,803
	(12.84%)*	(12.29%)
Labour	24,000	18,000
	(5.9%)	(4.53%)
Input	330,724	330,404
	(81.26%)	(83.18%)
Grand Total Cost/tonne	406,991	397,207
Revenue from Plantain/tonne	833,330	1,162,000
Profit/tonne	426,339	764,793

Source: Field Survey, 2013.

*Figures in parentheses are percentages

4.3.4: Budgetary Analysis of whole Plantain Value Chain

Value chain of plantain fruit to flour was considered. This is because plantain flour is one of the twenty five most exportable commodities in the country (Foraminifera, 2013). The budgetary analysis was carried out on per hectare basis and was evaluated in private and social prices. The Plantain Commodity Chain is made up of four set of activities and value is added at each stage of the activity. The activities are farm level, assembling, processing and marketing. The private and social costs are further classified into factors, labour and inputs and this are evaluated on per hectare basis. The depreciation values of fixed inputs were used and this was estimated using the straight line method.

4.3.4.1: Value Structure at Farm level

The study revealed that there are four prominent production systems for Plantain. These are Sole Plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava. Result of the analysis (Table 4.16) revealed that in Sole Plantain Production system, total value of all inputs into primary production was estimated at ₦92,650/ha and ₦91,624/ha at private and social value. The value of the basic output (Plantain fruits) was ₦233,824/ha and ₦531,418/ha at private and social values respectively. The net gain in sole Plantain production system were ₦140,695/ha (after tax deduction) and ₦439,794/ha at private and social values. This represented 60.2% and 82.8% of the value of final output valued at private and social prices. The most important contributor to value addition in the activity are labour (58.2% and 58.6% at private and social value) followed by inputs such as fertilizers, suckers, pesticides (41.7% and 41.2% at private and social values) while the least contributor to value addition was factor such as equipment (0.1% and 0.2% at private and social value). In Plantain/Cocoa production systems (Table 4.16), the total value of all inputs used at farm level production was ₦136,653/ha and ₦135,627/ha at private and social value. The value of basic output was ₦233,824/ha and ₦531,418/ha at private and social values respectively. The net gain in Plantain/Cocoa production system were ₦96,681/ha (after tax deduction) and ₦395,791/ha at private and social value. This represented 41.3% and 74.5% of the final output value at private and social prices. This was lower than what was observable in the Sole Plantain production system. The reduction in net gain in the production system was attributable to the cost involved in the Cocoa that was incorporated in the cropping system. For Plantain/Cocoyam production

system (Table 19), the total value of primary inputs used in the production chain was estimated at ₦129,527/ha and ₦128,181/ha at private and social value. The value of basic output was ₦347,993/ha and ₦731,418/ha at private and social values with the net gain of ₦217,946/ha (after tax deductions) and ₦603,237/ha at private and social value representing 62.6% and 82.5% of the final output value at private and social value. In Plantain/Cassava production system (Table 4.16), the total value of inputs used at farm level was ₦122,491/ha and ₦120,843/ha at private and social value. The value of basic output was estimated at ₦311,824/ha and ₦560,420/ha at private and social value. The net gain in Plantain/Cassava production system was ₦188,733/ha (after tax deductions) and ₦439,577/ha at private and social values. This represented 60.5% and 78.4% at private and social value in the Plantain/Cassava production system. Result of the analysis of the value structure at farm level production of plantain fruit showed that value added was highest in Plantain/Cocoyam production system (62.6%), followed by Sole Plantain (60.2%), Plantain/Cassava (60.5%) while the least value was obtained in Plantain/Cocoa (41.3%) at private value. At social value highest contribution of benefit to final output value was obtained in sole Plantain (82.8%), Plantain/Cocoyam (82.5%), Plantain/Cassava (78.4%) and Plantain/Cocoa (74.5%). This is an indication that for food security and economic development, efforts should be concentrated on Sole Plantain and Plantain/Cocoyam production system. This is because the two systems contributed the highest profits to private income of the farmers and the national income.

Table 4.16: Summary of Private and Social Budget at farm level of plantain production in Southwestern Nigeria

Item	Private price (Naira)	Social Price (Naira)
Farm level (Sole Plantain)		
Factors	90	181
Labour/land	53,929	53,667
Input	38,631	37,776
Subtotal cost/Ha	92,650	91,624
Revenue for Plantain fruit	233,824	531,418
Profit/loss (Before Tax)	141,174	439,794
Profit/loss (After Tax)	140,675	439,794
Farm level (Plantain/cocoa)		
Factors	93	184
Labour/land	62,929	62,667
Input	73,631	72,776
Subtotal cost/Ha	136,653	135,627
Revenue for Plantain fruit	233,824	531,418
Profit/loss (Before Tax)	97,171	395,791
Profit/loss (After Tax)	96,681	395,791
Farm level (Plantain/cocoyam)		
Factors	255	507
Labour/land	65,093	64,350
Input	64,179	63,324
Subtotal cost/Ha	129,527	128,181
Revenue for Plantain fruit	347,993	731,418
Profit/loss (Before Tax)	218,466	603,237
Profit/loss (After Tax)	217,946	603,237
Farm level (Plantain/cassava)		
Factors	91	183
Labour/land	64,050	63,210
Input	58,350	57,450
Subtotal cost/Ha	122,491	120,843
Revenue for Plantain fruit	311,824	560,420
Profit/loss (Before Tax)	189,333	439,577
Profit/loss (After Tax)	188,733	439,577

Source: Computed from PAM software

4.3.4.2: Value structure at Assembling

The total value of inputs into assembling of plantain was estimated at ₦76,222/tonne and ₦155,998/tonne at private and social value (Table 4.17). The value of output (Plantain fruits) was estimated at ₦98,529/tonne and ₦151,140/tonne at private and social prices. The value addition at this stage of the value chain was estimated at ₦21,707 at private value after deducting tax. There was a loss of ₦4,858/tonne at social values. At private value, the value of the output contributed 22% to value addition. The key contributor to value addition at private prices was plantain fruits (75%), input (1.5%), labour/land (0.75%), and factors (0.1%). Similarly, at social prices, input contributed 1.68%, and labour/land (0.36%) while factors contributed (0.050%).

Table 4.17: Summary of Private and Social Budget at Assembly level of plantain in Southwestern Nigeria

Item	Private price (₦)	Social Price (₦)
Farm to Processing		
Factors	65	80
Labour/land	735	551
Input	1509	2541
Raw materials	73913	152,826
subtotal cost/Ha	76,222	155,998
Revenue for Produce	98529	151,140
Profit/loss (Before Tax)	22307	(4858)
Profit/loss (After Tax)	21,707	(4858)

Source: Computed from PAM software

4.3.4.3: Value Structure at Processing

The value of inputs into primary processing was ₦120,999/tonne and ₦171,441/tonne at private and social value. The value of output was ₦216,819/tonne and ₦714,300/tonne at private and social value (Table 4.18). The value addition was ₦88,820/tonne (after tax deduction) and ₦542,859/tonne at private and social value. At private value labour and input contributed 2.75% and 22.5% while factor contributed 0.032% respectively to value addition. At social price, input (3.4%), and labour (0.34%) while factor contributed 0.001% to value addition. This indicates that the processing of the commodity is competitive and the processing can be sustained given the current macroeconomic situation in the country.

Table 4.18: Summary of Private and Social Budget at processing level of plantain in Southwestern Nigeria

Item	Private price (₦)	Social Price (₦)
Processing		
Factors	50	75
Labour/land	2442	1831
Input	19978	18395
raw materials	98529	151,140
Subtotal cost/Ha	120,999	171,441
Revenue	216819	714300
Profit/loss (Before Tax)	95820	542,859
Profit/loss (After Tax)	88820/tonne	542,859/tonne

Source: Computed from PAM software

4.3.4.4: Value Structure at Marketing

The activities undertaken in this stage are transportation of the processed products to the marketing centres. The total value of inputs per tonne at this stage of the chain was ₦274,420 and ₦770,237/tonne at private and social value. The value of output at private and social value at the stage of the chain was ₦540,399 and ₦1,520,203/tonne. The key contributor to value addition at this stage of the chain was the plantain fruit which constituted 83.1% and 33.8% at private and social value (Table 4.19)

Table 4.19: Summary of Private and Social Budget at marketing level of plantain in Southwestern Nigeria.

Item	Private price (₦)	Social Price (₦)
Central Market		
Factors	30	45
Labour/land	2718	2039
Input	54853	53,853
raw materials	216819	714,300
Subtotal cost/Ha	274420	770,237
Revenue for Plantain fruit	540,399	1,520,203
Profit/loss (Before Tax)	265,979	749,966
Profit/loss (After Tax)	260,979	749,966

Source: Computed from PAM software

4.3.5 Breakeven Point Sensitivity Analysis of whole Plantain Value Chain

Break-even point is the point at which the total returns equals total cost. It is an indication of the minimum yield that the participants need to produce, process and market to cover costs. This was estimated for the yield, price, post-harvest cost and factor costs in Plantain Value Chain. The Analysis (Table 4.20) showed the sensitivity of Plantain fruits and Plantain flour to changes in the yield, price of final product, post-harvest cost at private and social prices. The result of the analysis indicated that the zone had comparative advantage till the yield decreased to 4.12 tons/hectare at market level and 7.75 tonne/hectare at social level. This represented 40.5% and 76.1% of the current yield at market and social value respectively. The lowest price that maintains comparative advantage is ₦136,919.09 and ₦133,900.8 at private and social value which represented 41% and 25% of the current prices at market and social prices respectively. For the post-harvest cost, the lowest cost that maintained comparative advantage was ₦211,389.25 and ₦486,715.2 at private and social value. This value (Post harvest cost) represented 257% and 607% of the current value of the post-harvest cost. The lowest factor cost that will sustain competitiveness and comparative advantage was estimated at ₦231,625.5 and ₦434,869.4 at private and social value. This constituted 657% and 1532.7% at private and social value. The participant's current performance is above the minimum level that was estimated in the breakeven analysis. Thus plantain and its derivatives are competitive and the zone has comparative advantage in the commodity value chain.

Table 4.20: Break Even Sensitivity Analysis

	At market price	At Social Price
Yield:	4.12	7.75
% (fraction) of current value)	0.405	0.761
Price of final product:	136919.09	133900.8
% (fraction) of current value)	0.411	0.248
Post-harvest cost:	211389.25	486715.2
% (fraction) of current value)	2.570	6.067
Factors cost:	231625.522	434869.4
% (fraction) of current value)	6.578	15.328

Source: Field Survey, 2013.

4.3.6. Competitiveness of Plantain along the stages of the value chain

4.3.6.1 Competitiveness of Plantain Production Systems

The competitiveness was evaluated in tonne per hectare following Liverpool *et al*, (2009), Ugochuckwu and Ezedinma, (2011), Toure *et al*, (2013) approach. Table 4.21 showed the competitiveness of the four plantain production systems (Sole plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava). The results of the analysis showed that Plantain production was privately profitable in the four production systems. Positive private profit of ₦348,352.16/ha was obtained in Sole plantain production system, Plantain/Cocoa (₦303,150.16/ha), Plantain/Cocoyam (₦514,547.16/ha) and Plantain/Cassava (₦354,579.16/ha). This indicates that plantain production is competitive and the producers are realizing financial gains under existing policies, technologies, output values, input costs, and policy transfers. It also implies that farmers in the study area can produce plantain without transfer from government. Plantain/Cocoyam production system was the most competitive out of the four evaluated production system with a private profitability of ₦514,547.16/ha followed by Plantain/Cassava production systems (₦354,579/ha), Sole plantain (₦348,352.16/ha) while the least competitive production system was the Plantain/Cocoa (₦303,150.16/ha). This is an indication that Plantain/Cocoyam produced highest financial gain at private price compared to the other systems. The high private profitability recorded in Plantain/Cocoyam production system was due to additional income realized from the sale of cocoyam tubers and the associated higher price per unit of cocoyam.

The competitiveness of plantain production system was also confirmed by the Private Cost Ratio (PCR). The PCR is the ratio of domestic factor costs (C) to value added in observed prices (A – B). The producers earn excess profit when the PCR is less than unity. When it is greater than unity, it implies negative private profits and high factor costs. Minimizing PCR is equivalent to maximizing private profits (Monke and Pearson, 1989). The result of the analysis (Table 4.21) showed that PCR ratio of 0.30 was obtained for sole plantain production systems, Plantain cocoa (0.35), Plantain/Cocoyam (0.27), Plantain/Cassava (0.36). The PCR value of plantain/cocoyam was also the lowest and this further confirms competitiveness of the production system compared to the other systems

of production. The PCR which was less than unity indicated that value added was relatively large in comparison with domestic factor costs. It also indicates that costs involved in the production were smaller than the corresponding benefits. Similar trends about competitiveness of plantain production enterprise were also reported by Ekunwe and Ajayi, (2010), Baruwa *et al*, (2011), Kainga and Seiyabo, (2012). Ekunwe and Ajayi (2010) found that returns per naira in plantain production in Edo state was 37 kobo indicating viability of the enterprise. Baruwa *et al*, (2011) found that net returns accruing to an average plantain farmer was ₦65, 781.67/ha. Kainga and Seiyabo, (2012) reported that net income estimated from plantain production in Bayelsa was ₦223, 420.00 indicating that plantain production is competitive.

Table 4.21: Competitiveness of Plantain Production Systems in Southwestern Nigeria

Production system	Revenue/ha	Cost of tradeable input/ha	Cost of Domestic Factors/ha	Private Profitability/ha	Private Cost Benefit Ratio
Sole Plantain	591,969.16	92,926	150,691	348,352.16	0.30
Plantain/Cocoa	591,969.16	127,380	161,439	303,150.16	0.35
Plantain/Cocoyam	877,969.16	168,961	194,461	514,547.16	0.27
Plantain/Cassava	669,249.16	113,975	200,695	354,579.16	0.36

Source: Field Survey, 2013.

4.3.6.2: Competitiveness in Plantain Marketing System

The result of the analysis (Table 4.22) shows the competitiveness and Private Cost Ratio of participants involved in plantain marketing in southwestern Nigeria. The result of the analysis indicated that the Farm-Gate assemblers, Market-Arena assemblers, wholesalers and retailers had positive private profit of ₦17,867/tonne, ₦14,000/tonne, ₦36,800/tonne and ₦29,233/tonne. This implies that plantain marketing in southwestern Nigeria is competitive under the existing policy and transfers. It was observed that among the participants the wholesalers had higher private profits compared to their counterparts in the trade while the market-arena had the least profit. This is attributable to the mobile nature of the Wholesalers in the movement of the commodity to the consumption centres in major metropolis. The Private Cost Ratio of the various intermediaries were also less than one and ranges between 0.08 - 0.38 indicating that value added was greater than cost involved in the marketing of the commodity. The result of the analysis implies that operators in the different segment of the market chain earned positive private profits. The findings of this study are similar to the report of Adetunji and Adesiyan, (2008), Oladejo and Sanusi, (2008) and Olabode *et al*, (2010). They reported that plantain marketing was profitable in southwest Nigeria.

Table 4.22: Competitiveness of Plantain Marketing Systems in South-western Nigeria

Participants	Revenue/tonne	Cost of tradeable input/tonne	Cost of Domestic Factors/tonne	Private Profitability/tonne	Private Cost Ratio
Farm	61,300	40,500	2,933	17,867	0.14
Assemblers					
Market	67,000	51,800	1,200	14,000	0.08
Arena					
assemblers					
Wholesalers	106,300	63,400	6,100	36,800	0.38
Retailers	136,300	104,600	2,467	29,233	0.08

Source: Field survey, 2013.

4.3.6.3 Competitiveness in Plantain Processing

Plantain chips and flour are the commonest plantain products that are tradeable in the study area. The result of the analysis (Table 4.23) indicated that plantain chips production had positive private profit of ₦426,339 per tonne while plantain flour has positive private profit of ₦408,701/ton. This implied that plantain flour and plantain chip processing were competitive given prevalent government policies and transfers. The Private Cost Ratio (PCR) of 0.11 was obtained for plantain flour while 0.15 was obtained for plantain chips indicating that the enterprises were profitable. Plantain flour was most competitive in this instance because of the lower value of PCR obtained compared to the PCR value obtained in Plantain Chips. Thus Plantain flour processing utilized less domestic factors compared to plantain chips. This agrees with the findings of Ekunwe and Atalor, (2007). They found that plantain flour and plantain chip processing was profitable with a gross margin of ₦21, 857.86 and ₦14, 073.71/tonne respectively. Similarly, Folayan and Bifarin (2011) also reported that plantain flour processing was a profitable venture with gross margin per annum of ₦192, 007.66.

Table 4.23: Competitiveness (tonne) in Plantain Processing.

Types of Plantain product	Revenue	Cost of tradeable input	Cost of domestic factors	Private profitability/ha	Private cost Ratio
Plantain Chips	833,330	330,724	76,267	426,339	0.15
Plantain flour	714,300	257,370	48,229	408,701	0.11

Source: Field Survey, 2013.

4.3.7: Competitiveness, Comparative Advantage and Divergences in whole Plantain Value Chain

Result of the competitiveness, comparative advantage and divergences in the entire Plantain commodity Value chain is presented in Table 4.24. The table showed the competitiveness of the value chain of four plantain production systems (Sole plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava). The results showed that Plantain and its derivatives were privately profitable in the four production systems. Positive private profit of ₦94,548/tonne was estimated in Sole plantain value chain, Plantain/Cocoa (₦66,773/tonne), Plantain/Cocoyam (₦185,128/tonne) and Plantain/Cassava (₦62,847/tonne). This indicates that plantain and its derivatives was competitive and the participants are realizing financial gains under existing policies, technologies, output values, input costs, and policy transfers. Plantain/Cocoyam system was the most competitive out of the four evaluated production system with a private profitability of ₦185,128/tonne. This is an indication that Plantain/Cocoyam produced highest financial gain at private price compared to the other systems. Table 4.24 showed also the social profitability of plantain value chain in the four production systems. The social profitability is an indicator of comparative advantage. The result of the analysis indicated plantain and its derivative is socially profitable in the study area. Positive social profit of ₦316,419/tonne was estimated for sole Plantain value chain, Plantain/Cocoa (₦291,419/tonne), Plantain/Cocoyam (₦283,419/tonne) and Plantain/Cassava (₦288,429/tonne). Positive social profit implies that the participants were utilizing scarce resources efficiently in the chain of the commodity. It also indicates that the system can survive without government interventions. The result of the social profitability analysis indicated that plantain could be produced in southwestern Nigeria for export given the current macroeconomic conditions and policies. This is because social benefit in the value chain was greater than social cost indicating that if export can be promoted, they stand a chance to benefit more from the commodity chain.

Table 4.24: Policy Analysis Matrix Result for Plantain/tonne

Item	Revenues	Costs		Profits
		Cost of tradable input	Domestic Factors	
Sole Plantain				
Private Prices	231,467	101,704	35,215	94,548
Social Prices	450,320	105,530	28,371	316,419
Divergences	(218,853)	(3,826)	6,843	(221,871)
Plantain/Cocoa				
Private Prices	231,467	129,479	35,215	66,773
Social Prices	450,320	130,530	28,371	291,419
Divergences	(218,853)	(1,051)	6,843	(224,646)
Plantain/Cocoyam				
Private Prices	327,047	126,704	35,215	185,128
Social Prices	450,320	138,530	28,371	283,419
Divergences	(123,273)	(3,826)	6,843	(98,291)
Plantain/Cassava				
Private Prices	224,766	122,704	35,215	62,847
Social Prices	450,320	133,520	28,371	288,429
Divergences	(225,554)	(3,826)	6,843	(225,582)

Compiled from PAM software

4.3.8.0: Comparative Advantage of Plantain along the stages of value chain

This was evaluated for the participants involved in production, processing and marketing.

4.3.8.1: Comparative Advantage of Plantain production systems

Positive social profits imply efficient use of scarce resource and indicate that the enterprise has a comparative advantage because it produces at social costs that are less than the social benefits. Negative social profits indicate that the system is operating at social costs higher than the social revenues and such a system cannot survive unless there are some incentives given to it through particular government policies directed towards traded inputs or domestic factors, since the social costs include both traded inputs and domestic factor costs (Liverpool *et al*, 2009, Toure, 2013). Social profitability is evaluated in the same way as private profitability, with the difference that all budget items (revenues and costs) are evaluated at their social opportunity cost (reference prices), which reflect scarcity values or reference prices.

Table 4.25 showed the average social profitability of plantain production systems. The result of the analysis indicated plantain production is socially profitable in the study area. Positive social profit of ₦1,533,489.88/ha was estimated for sole plantain, plantain/cocoa (₦1,492,691.88/ha), plantain/cocoyam (₦1,593,610.88/ha) while positive social profit of ₦1,481,711.08/ha was realized in plantain/cassava production system. Positive social profit implies that the producers were utilizing scarce resources efficiently in the production of the commodity under the current scenario/time of analysis. It also indicates that the system can survive without government interventions. However, social profitability was highest in Plantain/cocoyam production systems (₦1,593,610.88/ha) followed by Sole plantain (₦1,533,489.88/ha), Plantain/Cocoa (₦1,492,691.88/ha) while the least social profitability was obtained with Plantain/Cassava production systems (₦1,481,711.08/ha). The high social profitability in plantain/cocoyam system compared to the other system was due to additional revenue from the intercrop. This is an indication that yield component is a very important criteria in achieving positive/negative social profitability. The result of the social profitability analysis indicated that plantain could be produced in southwestern Nigeria for export given the current macroeconomic conditions and policies.

The DRC is the ratio of domestic factor costs to value added at social prices. It is also an indicator of comparative advantage. A ratio of DRC < 1 implies an efficient use of domestic resources while DRC> 1 indicates that the agricultural system is inefficient and the activity that cannot survive unless government takes further measures to provide incentives to the sector. Result indicated that DRC values were less than 1 for the production systems. A DRC value of 0.16 was obtained in sole plantain, plantain/cocoa (0.17), plantain/cocoyam (0.17) and plantain/cassava (0.19). This indicates economic profitability and comparative advantage in plantain production system. It also implies that the social net value added is greater than the social costs of domestic production factors. Based on comparative advantage ranking of the production system, the comparative advantage was higher (lowest DRC ratio) in Sole plantain (0.16) followed by Plantain/Cocoa (0.17). This was followed by Plantain/Cocoyam (0.17) while the least was Plantain/Cassava (0.19). Thus, the sole plantain with least value of the DRC had the highest comparative advantage since the lower the DRC, the greater is the degree of economic efficiency (Rasmikayati and Nurasiyah, 2004). The result of DRC is supported by the SCB ratio. SCB is a measure of the ratio of the sum of tradable inputs costs and domestic factors costs to gross revenue, all valued at reference prices (Masters, 1995). Ratio of SCB greater than one indicates that the system is not making profits and there are some efficiency losses. With a ratio of less than one (> 1), the activity gross revenues are higher than the sum of all the system's inputs and domestic factors of production. SCB ratio of 0.21 was obtained in sole plantain, plantain/cocoa (0.24), plantain/cocoyam (0.26) and plantain/Cassava (0.25) respectively. The result of the SCB indicates that the sum of tradable inputs and domestic factors costs are less than the gross revenue under the prevailing output and input market conditions. These results are supported by the findings of Liverpool *et al*, (2009), Ugochuckwu and Ezedinma, (2011) and Akande and Ogundele, (2009). In Liverpool *et al*, 2009 and Ugochuckwu and Ezedinma, (2011), social profitability was positive for staple crop production (rice) systems with DRC and SCB ratio less than one indicating that the country has comparative advantage in the production of the commodity. Akande and Ogundele, (2009) also found positive social profitability for Yam in south western Nigeria with the DRC and SCB less than unity.

Table 4.25: Comparative Advantage of Plantain production systems

Production system	Revenue	Cost of tradeable input	Cost of domestic factors	Social profitability/ha	Domestic Resource cost ratio*	Social cost Benefit Ratio
Sole Plantain	1,920,594.88	92,115	294,989.63	1,533,489.88	0.16	0.21
Plantain/Cocoa	1,920,594.88	124,365	303,538	1,492,691.88	0.17	0.24
Plantain/Cocoyam	2,092,194.88	166,974	331,610	1,593,610.88	0.17	0.26
Plantain/Cassava	1,931,414.08	111,860	337,843	1,481,711.08	0.19	0.23

Source: Field Survey, 2013.

*In term of ranking, comparative advantage was highest in sole plantain production system because the DRC value was lowest in the system. The lower the DRC value, the higher the comparative advantage of the commodity.

4.3.8.2: Comparative Advantage in Plantain Marketing

The result of the analysis (Table 4.26) showed that the social profit of Farm-Gate assemblers, Market-Arena Assemblers, wholesalers and Plantain retailers were positive indicating that marketing of plantain is economically efficient in the study area. Average Social profit of ₦137,812/tonne, ₦128,310/tonne, ₦111745/tonne and ₦74,475/tonne were recorded for Farm-Gate assemblers, Market-Arena assemblers, Wholesalers and Retailers respectively. The higher value added (social profit) at Farm-Gate Assembling indicates their dominance in the plantain marketing emphasizing their importance in determining the returns to the Producers. The result of the analysis indicates economic profitability in marketing plantain by the different participants in the chain in southwestern Nigeria. It also implies that it is an activity that can be ventured into with positive returns at private and social value. DRC of 0.02 was obtained for Farm-Gate Assemblers, Market-Arena Assemblers (0.08), Wholesalers (0.05) and Retailers (0.03) indicating comparative advantage in the marketing of the commodity. The result of the DRC is supported by the SCB ratios. SCB ratio of 0.24 was obtained for the Farm-Gate Assemblers, Market-Arena Assemblers (0.29), Wholesalers (0.38) and Retailers (0.59). This also indicates comparative advantage in the marketing of the commodity.

Table 4.26: Comparative Advantage of Plantain Marketing Systems

Types of Market	Revenue/tonne	Cost of tradeable input/tonne	Cost of domestic factors/tonne	Social profitability/tonne	DRC	SCB
Farm Assemblers	180,835	40,340	2,683	137,812	0.02	0.24
Market Arena assemblers	180,900	51,640	950	128,310	0.08	0.29
Wholesalers	180,710	63,240	5,725	111745	0.05	0.38
Retailers	181,279	104,480	2,342	74,475	0.03	0.59

Source: Field Survey, 2013.

4.3.8.2: Comparative Advantage in Plantain Processing

The result of the analysis indicated that plantain flour processing had positive social profit of ₦561,969/tonne while plantain chips processing had positive social profit of ₦764,793/tonne (Table 4.27). This implies that processing of Plantain into flour and chip is economically profitable under existing government policies and transfers. It also indicated that scarce resources are being utilized efficiently in the processing of the two products. However, based on the result of the analysis, higher social profit was obtained with Plantain chip compared to Plantain flour. This was attributable to higher social price per kilogram that was obtained with the Plantain chips. The result of the analysis of the DRC for plantain flour (0.06) and plantain chips (0.08) that were less than unity indicated that the study area had comparative advantage in the processing of the two products. It also implies that cost of domestic factors is lower than value added in social prices. This is further confirmed by the SCB which was also less than unity for plantain flour (0.344) and plantain chips (0.342) confirming the existence of comparative advantage in processing of plantain flour and plantain chips. It can therefore be inferred that the processors have comparative advantage for export which further supports the results of the DRC.

Table 4.27: Comparative Advantage in Plantain Processing in Southwestern Nigeria.

Types of Product	Revenue/ tonne	Cost of tradeable input/ tonne	Cost of domestic factors/ tonne	Social profitability/tonne	DRC	SCBR
Plantain flour	855,600	256,020	37,611	561,969	0.06	0.344
Plantain chip	1,162,000	330,404	66,803	764,793	0.08	0.342

Source: Field Survey, 2013.

4.4: Transfer and Effects of Government policies on Comparative advantage and competitiveness along each stage of plantain value chain and the whole commodity chain.

In order to measure the effect of various government policies (such as subsidies, tax, availability of agricultural infrastructure and credit scheme) on comparative advantage and competitiveness, divergences in output, input, factors and profits, protection coefficients and incentives in plantain production systems were analyzed and discussed in the section. This was calculated on each stage of the value chain and the entire value chain.

4.4.1: Transfers and Effects of government policies along the stages of Plantain value chain

This was evaluated for the production, processing and marketing systems of plantain.

4.4.1.1 Transfers and Effects of government policies on Plantain production systems

Transfers and impacts of government policies were measured by the divergences in output, input, factors and profit in the Policy Analysis Matrix. Divergence arises either because a distorting policy and market failure causes a private market price to diverge from the social price. Divergences in PAM are differences between private and the social Valuations of revenues, costs, and profits (Khai and Yabe, 2013).

Table 4.28 showed the result of the output transfer for the plantain production systems. An output transfer is a measure of implicit tax or subsidy on a commodity; it is also defined as the difference between the actual markets prices of a commodity produced by an agricultural system and the efficiency valuation for that commodity. Positive output transfer indicates an implicit subsidy or transfer of resources in favour of the agricultural system while negative output transfers imply an implicit tax or transfer of resources away from the system (Pearson *et al*, 2003).

The result indicated that output transfer for Sole Plantain production system in Southwestern Nigeria was -₦1,328,635.72/ha, Plantain/Cocoa -₦1,328,625.72/ha, Plantain/Cocoyam -₦-1,214,225.72/ha while -₦1,262,164.92/ha was obtained for plantain/cassava production system. Result of the analysis indicated that output transfers were negative for the production system indicating implicit tax and transfer of resources from the system. The tradable-input transfers is the difference between the total costs of

the tradable inputs valued in private prices and the total costs of the same inputs measured in social prices. This divergence can either be positive causing an implicit tax or transfer of resources away from the system or negative causing an implicit subsidy or transfer of resources in favour of the agricultural system (Pearson *et al*, 2003). Input transfer of ₦811/ha was obtained for sole plantain production system, plantain/cocoa ₦3,015/ha, plantain/cocoyam ₦1,987/ha and plantain/cassava ₦2,115/ha. This is an indication that the market prices for inputs are higher than their comparable world prices indicating tax on the inputs used in the production of plantain.

Factor transfers are the difference between the costs of all factors of production valued in actual market prices and the social costs of these factors. Factor divergence can be either positive causing an implicit tax or transfer of resources away from the system or negative causing an implicit subsidy or transfer of resources in favour of the agricultural system (Pearson *et al*, 2003). Factor transfers were negative in the four identified production systems. Factor transfer of -₦144,298.63 was obtained in Sole Plantain, Plantain/Cocoa production systems (₦-142,099/ha). In the case of Plantain/Cocoyam, factor transfer of -₦137,149 was obtained while in the Plantain/Cassava production system, factor transfer of -₦137,148 was obtained. This is an indication of implicit subsidy and transfer of resources to the system. The net transfer explains the difference between private and social profits. The net transfer shows the extent of inefficiency in an agricultural system. If the overall effect of all policies and/or market failures on input and output prices is in favour of the producers (in the short run), net transfer will have a positive value. However, net transfer will have a negative value if the policies and/or market failures are working to the detriment of the producers.

Table 4.28 indicates that the net transfer for all the plantain production system was negative. Net transfer of -₦1,185,137.72 was obtained for sole plantain, for Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava, Net transfer of -₦1,189,541.72, -₦1,079,063.72, -₦1,127,131.92/ha were obtained indicating that the net effect of all policies is to the detriment of the producers. The detrimental policies include unavailability of agricultural infrastructures such as storage facilities and tax on input utilized in production.

Table 4.28: Policy Transfers in Plantain Production System

Production system	Output transfer	Tradeable input transfer	Domestic factors transfer	Net Transfer
Sole Plantain	-1,328,625.72	811	-144,298.63	-1,185,137.72
Plantain/Cocoa	-1,328,625.72	3,015	-142,099	-1,189,541.72
Plantain/Cocoyam	-1,214,225.72	1,987	-137,149	-1,079,063.72
Plantain/Cassava	-1,262,164.92	2,115	-137,148	-1,127,131.92

Source: Field survey, 2013

4.4.1.2: Transfers and Impact of government policies on Plantain marketing

The result of the analysis indicated negative transfers in output for the participants in the market chain of plantain. Negative transfers of -₦119,535/tons, -₦113,900/ton, -₦74,710/tons and -₦44,979/tons were obtained for Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers and Retailers (Table 4.29). The negative value of the output transfers implies that social revenue in plantain marketing was higher than the private revenue. This is also an indication of transfer of resources from the system. In the case of tradeable input transfer and domestic factors, positive values were obtained for all the participants.

Net transfers were negative for all the participants in the plantain marketing chain. Net transfers of -₦119,945, -₦114,310, -₦74,945 and -₦44,979/ton were obtained for the Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers and Retailers in the study area. This implies that social profit obtained in the plantain marketing system was greater than the private profit indicating transfer of resources from the plantain marketing system and the marketers are obtaining lower profit compared to the border price. The country stands the chance to benefit more from the commodity chain by promoting export of the commodity.

Table 4.29: Policy Transfer in Plantain Marketing

Types of Market	Output transfer	Tradeable input transfer	domestic factors transfer	Net Transfer
Farm Assemblers	-119,535	160	250	-119,945
Market Arena assemblers	-113,900	160	250	-114,310
Wholesalers	-74,710	160	375	-74,945
Retailers	-44,979	120	125	-45,242

Source: Field Survey, 2013

4.4.1.3: Transfer and Effects of government policies in Plantain processing

Result indicated negative value of output transfer of -₦141,300/ton and -₦328,670/ton in Plantain Flour and Plantain Chip processing in the study area (Table 4.30). This is an indication that private revenue in Plantain Flour and Plantain Chips is lower than the social revenue. This also implies that there is transfer of resources from the plantain processing system since the revenue obtained at private value was lower than the social value. In the case of tradeable input for the two products, positive value of ₦1,350/ton and ₦320/ton were obtained for Plantain Flour and Plantain Chip indicating implicit tax on the system. Positive values of ₦10,618/ton and ₦9,464/ton were also obtained for factor transfer in plantain flour and plantain chip processing. This is an indication of implicit tax on domestic factors used in the processing of the commodities. Net transfer values of -₦153,268/ton and -₦338,454/tons were obtained for plantain flour and plantain chip. This implies that the social profit in plantain processing exceed the private profit.

Table 4.30: Policy Transfers in Plantain Processing

Types of Product	Output transfer	Tradeable input transfer	Domestic Factor transfer	Net Transfer
Plantain flour	-141,300	1350	10,618	-153,268
Plantain chip	-328,670	320	9464	-338,454

Source: Field Survey, 2013.

4.4.2.0: Protection Coefficients and Incentives along the stages of Plantain value chain

This was evaluated for the production, processing and marketing system of Plantain.

4.4.2.1: Protection Coefficients and Incentives in Plantain production systems: The protection coefficients are used to evaluate the level of protection offered by policy intervention (Pearson *et al*, 2003). The protection coefficients are ratios that are free of currency or commodity distinctions. The common protection indicators are: the Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), Producer Subsidy Estimate (PSE), Subsidy Ratio to Producers (SRP), the net transfer, and the Profitability Coefficient (PC).

The Nominal Protection Coefficient (NPC) is the ratio between the observed market price paid to producers of a given product and the good's underlying social opportunity cost. According to Pearson *et al*, (2003), the indicator can be computed in the case of tradable outputs to get the Nominal Protection Coefficient on tradable Outputs (NPCO). It can also be calculated in the case of tradable inputs to get the Nominal Protection Coefficient on tradable inputs (NPCI).

Nominal Protection Coefficient on Output (NPCO) is used in measuring output transfers. NPCO shows the extent to which domestic prices of output differ from the world market price. NPCO greater than one indicates that the domestic price is higher than the export price and thus the system is receiving protection. If NPCO is less than one, the domestic price is lower than the comparable world price and the system is not protected by policy (Monke and Pearson, 1989). The result of the analysis indicated that Nominal Protection Coefficient on output (NPCO) for the production systems were less than 1 (Table 4.31). NPCO value of 0.31 was obtained for sole plantain, plantain/cocoa (0.31), plantain/cocoyam (0.42) and plantain/cassava (0.34). This implies that the domestic price of plantain is less than the international price. This further implies implicit transfer of resources from the system and the system is unprotected by policy since the participants are earning less in private value compared to social value. The result of the NPCO in the plantain production system is also an indication that the output prices are lower than the border price.

NPCI is a ratio used to measure tradable input transfers. NPCI ratio shows how much domestic prices of tradable inputs differ from their social prices. If NPCI exceeds one, the domestic input cost is higher than the input cost at world prices and the system is taxed by policy. NPCI less than one implied that the domestic price is lower than the comparable world price and the system is subsidized by policy. The NPCI on input such as chemical, fertilizers, sprayers (NPCI) for the production systems were greater than one. NPCI value of 1.04 was obtained for sole plantain, plantain/cocoa (1.03), plantain/cocoyam (1.02) and plantain/cassava (1.03). This implies that input price at market price is greater than what is observed in the world reference price.

The EPC ratio compares valued added in domestic prices with value added in world prices. EPC shows the joint effect of policy transfers affecting both tradable outputs and tradable inputs. The EPC nets out the impact of protection on inputs and outputs, and reveals the degree of protection accorded to the value added process in the production activity of the relevant commodity (Mohanty *et al*, 2003). An EPC > 1 is an indicator that producers are protected, while an EPC < 1 indicates that producers are taxed (Monke and Pearson, 1989). EPC of less than one was obtained in the production system. EPC values of 0.27, 0.26, 0.37 and 0.31 were obtained for Sole Plantain, Plantain/Cocoa, and Plantain/Cocoyam and Plantain/Cassava production systems. The EPC values of less than unity obtained for the plantain production system indicates that value added at market prices were lower than value added at world reference price.

The profitability coefficient (PC) measures the impact of all transfers on private profits and indicates the proportion of incentives provided to producers through policy effects. PC equals the ratio of private profits to social profits. The absences of incentives were further reinforced by the result of the profitability coefficient presented in Table 34. The profitability coefficient was also less than one for the production system. Profitability coefficient of 0.23, 0.20, 0.32 and 0.24 were obtained for sole plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava productions system. The result of the analysis of the profitability coefficient indicated that private profits were less than the profits evaluated at world reference price and there is lack of incentives in the production system. Subsidy ratio to Producers (SRP) compared net policy transfer to value of output at world reference price. SRP values of -0.62, -0.62, -0.52 and -0.58 were obtained for Sole

Plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava production systems. The negative SRP indicates that the producers were taxed in the production of the commodity and there is decrease in gross revenue. The Producer Subsidy Estimate for the production systems were also less than one indicating implicit tax and transfer of resources from the system (Table 4.31).

Table 4.31: Protection coefficient and incentives in Plantain production

Production system	Nominal Protection Coefficient on output	Nominal Protection Coefficient on input	Effective protection coefficient	Profitability coefficient	Producer subsidy ratio	PSE
Sole Plantain	0.31	1.04	0.27	0.23	-0.62	-2.00
Plantain/Cocoa	0.31	1.03	0.26	0.20	--0.62	-2.01
Plantain/Cocoyam	0.42	1.02	0.37	0.32	-0.52	-1.23
Plantain/Cassava	0.34	1.03	0.31	0.24	-0.54	-1.68

Source: Field survey, 2013.

4.4.2.2: Protection Coefficients and Incentives in Plantain marketing systems

The NPCO of the plantain marketing system for the participants in the marketing chain were less than 1 (Table 4.32). NPCO values of 0.34, 0.37, 0.59 and 0.75 were obtained for Farm-Gate Assemblers, Market-Arena assemblers, Wholesalers and Retailers of plantain. The NPCO values estimated in plantain marketing that was less than one indicates that private revenue in plantain marketing is lower than the reference price and the system is not protected by policy.

The NPCI values for the participants in the marketing chain (Table 4.32.) were greater than one indicating that there are implicit taxes on the system. EPC values of 0.15, 0.12, 0.37 and 0.41 were obtained for the Farm-Gate Assemblers, Market-Arena assemblers, Wholesalers and Retailers. This indicates that value added in private price is lower than the value added at reference price. Absences of protection were made more evident by the result of the profitability coefficient presented in Table 4.32. The profitability coefficient was also less than one for the marketers. Profitability coefficient of 0.13, 0.11, 0.33, 0.39 were obtained for Farm-Gate Assemblers, Market-Gate Assemblers, Wholesalers and Retailers. Higher profitability coefficient was obtained for wholesalers (0.33) and Retailers (0.39). This is attributable to the fact that most of the Wholesalers sell at metropolitan area with attendant higher returns compared to the Farm-Gate and Market-Arena assemblers. In the case of retailers, they sell in units smaller units at higher price thereby leading to higher value compared to the other two participants. The result of the analysis of the profitability coefficient indicates that private profits are less than the profits evaluated at world reference price. SRP values of -0.66, -0.63, -0.41 and -0.24 were obtained for farm assemblers, market arena assemblers, wholesalers and retailers. The negative SRP indicates that the marketers were taxed in the marketing of the commodity. The equivalent producer subsidies for the marketing systems were also less than one indicating implicit tax and transfer of resources from the system.

Table 4.32: Protection coefficient and incentives in Plantain marketing

Type of Market	Nominal Protection Coefficient on output	Nominal Protection Coefficient on input	Effective protection coefficient	Profitability coefficient	Producer subsidy ratio	Equivalent producer subsidy
Farm Assemblers	0.34	1.0	0.15	0.13	-0.66	-1.96
Market Arena Assemblers	0.37	1.0	0.12	0.11	-0.63	-1.71
Wholesalers	0.59	1.0	0.37	0.33	-0.41	-0.70
Retailers	0.75	1.0	0.41	0.39	-0.24	-0.33

Source: Field Survey, 2013

4.4.2.3: Protection coefficient and incentives in Plantain Processing

The result of the analysis (Table 4.33) indicated that NPCO of 0.68 and 0.57 was obtained for Plantain Flour and Plantain Chip. This indicates that plantain flour and plantain chip market price is 68% and 57% of the world reference price. This also implies that plantain flour and plantain chip processing system is not protected by policy and there is transfer of resources from the system. The Nominal Protection Coefficients on input such as tools and equipment used in the processing of plantain were greater than one. This implies that input price at market price is greater than the border price. Thus, this implied that the processors are not receiving sufficient incentives in the processing of plantain. Effective Protection Coefficient (EPC) was less than one in the plantain processing. EPC values of 0.76 and 0.60 were obtained for Plantain flour and Plantain chips. The EPC values of less than one obtained for the plantain processing indicates that value added at market prices were lower than value added at world reference price.

This lack of incentives from EPC estimates were further supported by the result of the profitability coefficient presented in Table 4.33 the profitability coefficient was also less than one for plantain flour and plantain chips. Profitability coefficient of 0.73 and 0.56 were obtained for plantain flour and plantain chips. The result of the analysis of the profitability coefficient indicates that private profits are less than the profits evaluated at world reference price. SRP values of -0.18 and -0.29 were obtained for Plantain Flour and Plantain Chips. The negative SRP indicates that the processors were taxed in the processing of the commodity. The equivalent producer subsidy for the processing of the two Plantain products were also less than one indicating implicit tax and transfer of resources from the system. The processors were receiving less in domestic price compared to the border reference price.

Table 4.33: Protection coefficient and incentives in Plantain Processing

Plantain product	Nominal Protection Coefficient on output	Nominal Protection Coefficient on input	Effective Protection efficient	Profitability coefficient	Producer Subsidy ratio	Equivalent producer ratio
Plantain flour	0.83	1.01	0.76	0.73	-0.18	-0.21
Plantain chip	0.72	1.0	0.60	0.56	-0.29	-0.41

4.4.3: Transfers and Effects of government policies on whole Plantain value chain

Transfers and impacts of government policies were measured by the divergences in output, input, factors and profit in the Policy Analysis Matrix. Table 4.34 showed the result of the output transfer for the plantain production systems. The result indicated that output transfer for Sole Plantain value chain in Southwestern Nigeria was -₦218,853/ha, Plantain/Cocoa -₦218,853/ha, Plantain/Cocoyam -₦123,273/ha while -₦225,554/ha was obtained for plantain/cassava value chain. Result of the analysis indicated that output transfers were negative for the systems indicating implicit tax and transfer of resources from the system. This also implies that social revenue is higher than private revenue. Input transfer of -₦3,826/ha was obtained for sole plantain production system, plantain/cocoa -₦1,051/ha, plantain/cocoyam -₦3,826/ha and plantain/cassava -₦3,826/ha. This is an indication that the market prices for inputs are lower than their comparable world prices indicating implicit subsidy on the inputs used in the production of plantain. This is also an indication of transfer of resources to the system. Factor transfers were positive in the four identified production systems. Factor transfers of ₦6,843 were in the production system. This is an indication of implicit tax and transfer of resources from the system. This also meant those factors (equipment) used in the value chain are expensive at private price compared to the reference price. Table 4.34 indicates that the net transfer for all the plantain production system was negative. Net transfer of -₦221,871 was obtained for sole plantain while transfer of Net transfer of -₦224,646, -₦98,295, -₦225,582/ha were obtained for Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava, indicating that the net effect of all policies is to the detriment of the producers.

Table 4.34: Transfers and Effects of government policies on whole Plantain value chain

Production system	Output transfer	Tradeable input transfer	Domestic factors transfer	Net Transfer
Sole Plantain	-218,853	3,826	6,843	-221,871
Plantain/Cocoa	-218,853	1,051	6,843	-224,646
Plantain/Cocoyam	-123,273	3,826	6,843	-98,291
Plantain/Cassava	-225,554	3,826	6,843	-225,582

Source: Computed from PAM software

4.4.4: Protection Coefficients and Incentives in Plantain Value Chain:

The result of the analysis (Table 4.35) showed that PCR ratio of 0.27 was obtained for sole plantain production systems, Plantain cocoa (0.35), Plantain/Cocoyam (0.18), Plantain/Cassava (0.35). The PCR value of plantain/cocoyam was also the lowest and this further confirms competitiveness of the production system compared to the other systems of production. The PCR which was less than unity indicated that value added was relatively large in comparison with domestic factor costs. It also indicates that costs involved in the production were smaller than the corresponding benefits.

The DRC (Table 4.35) for plantain production system indicated that the DRC values were less than 1. A DRC value of 0.08 was obtained in sole plantain, Plantain/Cocoa (0.09), Plantain/Cocoyam (0.09) and Plantain/Cassava (0.09). This indicates economic profitability and comparative advantage in plantain production system. It also implies that the social net value added is greater than the social costs of domestic production factors. The result of DRC is supported by the SCB ratio. SCB ratio of 0.297 was obtained in sole plantain, plantain/cocoa (0.353), plantain/cocoyam (0.377) and plantain/Cassava (0.35) respectively. The result of the SCB indicates that the sum of tradable inputs and domestic factors costs are less than the gross revenue under the prevailing output and input market conditions indicating comparative advantage of the cropping system. Nominal Protection Coefficient on output (NPCO) for the production systems were less than 1 (Table 4.35). NPCO value of 0.51 was obtained for sole plantain, plantain/cocoa (0.51), plantain/cocoyam (0.72) and plantain/cassava (0.52). This implies that the domestic price of plantain and its derivatives is less than the international price and policies are decreasing the market value of plantain to a level of 49%%, 49%%, 28% and 48% in sole plantain, plantain/cocoa, and Plantain/cocoyam and plantain/cassava production system below the world reference price. This further implies implicit transfer of resources from the system and the system is unprotected by policy since the participants are earning less in private value compared to social value. The NPCI on input such as chemical, fertilizers, sprayers (NPCI) for the production systems were less than one. NPCI value of 0.96 was obtained for sole plantain, plantain/cocoa (0.99), plantain/cocoyam (0.91) and plantain/cassava (0.94). This implies that input price at

market price is lower than what is observed in the world reference price. EPC values of 0.38, 0.32, 0.64 and 0.32 were obtained for Sole Plantain, Plantain/Cocoa, and Plantain/Cocoyam and Plantain/Cassava production systems respectively. The EPC values of less than one obtained for the Plantain production system indicates that value added at market prices were lower than value added at world reference price for Plantain and its derivatives.

The absences of incentives were further reinforced by the result of the profitability coefficient presented in Table 4.35. The profitability coefficient was also less than one for the production system. Profitability coefficient of 0.30, 0.23, 0.65 and 0.22 were obtained for sole plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava productions system. The result of the analysis of the profitability coefficient indicated that private profits were less than the social and there is lack of incentives in the production system. Subsidy Ratio to Producers (SRP) compared net policy transfer to value of output at world reference price. SRP values of -0.49, -0.65, -0.22 and -0.50 were obtained for Sole Plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava production systems. The negative SRP indicates that the producers were taxed in the production of Plantain and its derivatives and there is decrease in gross revenue. The Producer Subsidy Estimate for the production systems were also less than one indicating implicit tax and transfer of resources from the system.

Table 4.35: Protection Coefficients Indicators for whole Plantain Value Chain in Southwestern Nigeria.

Indicator	Sole Plantain	Plantain/Cocoa	Plantain/Cocoyam	Plantain/Cassava
Private cost ratio C/A-B	0.27	0.35	0.18	0.35
Domestic resource cost ratio G/E-F	0.08	0.089	0.09	0.09
Social cost benefit ratio F+G/E	0.30	0.35	0.37	0.35
Transfers L = I + J + K	(221,871)	(224,646)	(98,291)	(225,582)
Nominal Protection Coefficient A/E	0.51	0.51	0.72	0.50
Nominal Protection coefficient on input	0.96	0.99	0.91	0.94
Effective Protection Coefficient A-B/E-F	038	0.32	0.64	0.32
Profitability Coefficient D/H	0.30	0.23	0.64	0.32
Producers subsidy ratio L/E	-0.49	-0.65	-0.22	-0.50
Producer Subsidy Estimates L/A	-0.96	-0.97	-0.30	-1.0

Source: Computed from PAM software

4.5.0: Effects of changes in policy indicators on comparative advantage and competitiveness on each stage and whole plantain value chain.

In order to achieve this objective sensitivity analysis was carried out on each stage and the entire commodity chain.

4.5.1.1: Sensitivity Analysis for Producers

Sensitivity analysis was carried out following Liverpool *et al*, (2009), Mohanty *et al*, (2003) under the following scenarios:

1. Changes in farm level productivity (yield) by ±20, ±40 and ±60%.
2. Change in domestic price by ±20, ±40 and ±60%,
3. Changes in the world price by ±20, ±40 and ±60%,
4. Changes in the exchange rate by ±20, ±40 and ±60%.

The scenarios were picked based on information on yield, price and exchange rate observed from the National bureau of statistics and agricultural development project offices in the zone.

4.5.1.1.1: Effects of Changes in yield on Competitiveness and Comparative Advantage of Plantain Production Systems.

Yield per hectare is one of the drivers of agricultural competitiveness (ATA, 2011). Increase in yield (Table 4.36) leads to improvement in overall performance of the plantain production system. The average private profitability increased from ₦379,810/ha (base value) to ₦472,803/ha at 20% increase in yield level. Private profitability improved by 24% and 49% when yield level increased by 20 and 40% and vice versa. At 20% increase in the yield level of Plantain, Plantain becomes more competitive with PCR ratio improving from 0.32 (base value) to 0.27. PCR improves to 0.22 when yield was improved by 60% showing that competitiveness of the commodity improved with increase in the yield level. The social profitability also improved when yield was increased and vice versa. Social profitability improved by 19% and 47% when yield level increased by 20% and 60%. This indicates that increased productivity would translate to higher competitiveness in the production systems. Similar trends were also observed with the Domestic Resource Cost (DRC), Social Cost Benefit (SCB) and NPCO with improvement in yield. The net policy transfer was still negative; it increases from -₦1,142,926.368 (base value) to -₦1,620,022.248 when yield increased to 60% and vice

versa. This indicates that resources were being diverted from the system. Changes in yield lead to improvement in the EPC values. Ratio of value added at domestic prices improved from 0.30 to 0.50 when yield was increased by 20%. Similar trends were observed with the PC with the increase in the yield level and vice versa. However, there were reductions in the transfers from the producers to the society as a result of the increase in the yield level and vice versa. This is represented by the result of the SRP and PSE values.

Table 4.36: Effect of Changes in yield on Competitiveness and Comparative Advantage of Plantain Production.

Indicators of competitiveness	Base value	20%	40%	60%	-20%	-40%	-60%
Pp.	379810	472,803	567,180	614,461	283,927	189,488	142,267
PCR	0.32	0.27	0.23	0.22	0.39	0.52	0.62
Indicators of comparative advantage							
SP	1522736	1805276.928	2092248.088	2234483.768	1233834.708	961113.5475	812120.4225
DRC	0.17	0.15	0.13	0.10	0.20	0.26	0.30
SCBR	0.22	0.20	0.18	0.16	0.26	0.33	0.37
Protection coefficients							
TRA	-1142926	-1021723.	-1525006	-1620022.	-949908	-771625.693	-669853.6525
NPCO	0.34	0.35	0.35	0.35	0.27	0.34	0.35
EPC	0.30	0.50	0.51	0.60	0.48	0.47	0.47
PC	0.25	0.27	0.28	0.29	0.24	0.20	0.17
SRP	-0.59	-0.37	-0.13	-0.06	-0.37	-0.37	-0.36
EPS	-1.75	-1.41	-1.43	-1.42	-1.38	-1.38	-1.25
NPCI	1.03	1.03	1.03	1.03	1.03	1.03	1.03

Source: Field Survey, 2013.

4.5.1.1.2: Effect of Changes in Domestic price on Competitiveness and Comparative Advantage on Plantain Production.

With an increase in domestic price of plantain, an increase in private profitability was observed (Table 4.37). The result showed that a 20% increase in domestic price increased the private profitability from the base value of ₦379,810/ha to ₦498,291/ha. Private profitability increased by 31% and 63% when domestic price increased by 20 and 40% and vice versa. The Private cost ratio also improved from the initial base value of 0.32 to 0.21 at 60% increase in domestic price indicating improved competitiveness with the increase in domestic price and vice versa. The social profitability of plantain is not sensitive to changes in domestic prices, it remains unchanged. This was further shown through the ratios of the DRC and SCBR ratio that were also constant with the varied domestic price level. Although the net policy transfer remains negative but there was reduction in the value compared to the base value. Net policy transfer at base value was estimated at -₦1142926 at base value which reduced to -₦844,555 at 60% increase in domestic price and vice versa. This indicates that the producers received improved protection with the increase in the domestic price of Plantain fruit.

There was an improvement in the level of incentives indicated by the PCR ratio with the increase in domestic price of plantain. PC values improved from 0.25 to 0.39 when domestic price of Plantain increased by 40% and vice versa. This implies that the producers will receive better protection with increase in domestic price of the commodity and vice versa. An improvement was also observed with the EPC with the increase in the domestic price of Plantain. EPC also improved from 0.30 to 0.60 when domestic price increased by 40% indicating greater value added at domestic price. EPC improved by 83% and 100% when domestic price increased by 20% and 40% indicating greater value addition with the increase in the domestic price. Furthermore, with the increase in the domestic price of Plantain reductions were observed in the level of transfers of resources from the producers to the society. This is shown by the result of the SRP and PSE ratios indicating that the producers receives greater protection with increase in the domestic price of plantain and vice versa.

Table 4.37: Effect of Changes in price on Competitiveness and Comparative Advantage of Plantain Production.

Indicators of competitiveness	**Base Value**	**20%**	**40%**	**60%**	**-20%**	**-40%**	**-60%**
PP	379810	498291	618197	678181	258438	133532	78549
PCR	0.32	0.26	0.22	0.21	0.39	0.54	0.68
Indicators of comparative advantage							
SP	1522736	1522736	1522736.	1522736	1522736	1522736	1522736
DRC	0.17	0.17	0.17	0.17	0.17	0.17	0.17
SCBR	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Protection coefficients							
TRANS	-1142926.	-1024445	-904,539	-844,555	-1,264,297	-1,389,204	-1,444,187
NPCO	0.35	0.39	0.45	0.46	0.30	0.21	0.24
EPC	0.30	0.55	0.60	0.62	0.25	0.19	0.18
PC	0.25	0.33	0.39	0.43	0.19	0.13	0.07
PSR	-0.58	-0.31	-0.26	-0.23	-0.62	-0.67	-0.67
EPS	-1.75	-0.41	-0.84	-0.76	-2.08	-2.9	-3.14
NPCI	1.03	1.031	1.031	1.031	1.031	1.031	1.031

Source: Field survey, 2013.

4.5.1.1.3: Effect of Changes in World price on Competitiveness and Comparative Advantage of Plantain Production.

The sensitivity of the world price (FOB) to policy indicators (DRC, SCB, EPC etc.) is presented in Table 4.38. The private profitability and private cost ratio remained unchanged thus an increase in world price had no effect on the private profitability/competitiveness of the commodity. The social profitability increases vice versa compared to the base value. Social profitability increased by 18%, 48% and 60% when the world price of the commodity increased by 20%, 40% and 60%. This showed that the social profitability increased with higher world price of the commodity. The high social profitability is also reflected in the lower value of DRC and SCB ratio compared to the base value.

The DRC improved from base value of 0.17 to 0.11 at 60% increase in the world price of plantain. The Lower the DRC value the higher the comparative advantage. This further implies that with the increase in the world price, it will lead to improvement in comparative advantage of the commodity. The net policy transfer was negative and it increases vice versa in the production system indicating transfer of resources from the producers to the consumers. There were reductions in the value of NPCO and PC values with increase in the world price of the commodity. The Profitability coefficient worsened with increase in the world price of Plantain. It reduced from 0.25 to 0.18 with 60% increase in world price. This implied that there is reduction in the level of incentives to producers at domestic price when the world price increases and vice versa. This is because in PAM context, with increase in world price, lower value will be added at domestic price thus worsening the profitability coefficient.

Table 4.38: Effect of Changes in FOB on Competitiveness and Comparative Advantage of Plantain Production

Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	379810	379810	379810	379810	379810	379810	379810
PCR	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Indicators of comparative advantage							
SP	1522736.35	1,799,197.028	2258890.62	2442505.59	1155625.988	787946.107	604106.167
DRC	0.17	0.15	0.1205	0.11	0.21	0.25	0.34
SCBR	0.22	0.19	0.17125	0.15	0.27	0.35	0.42
Protection coefficients							
TRAN	-1142926	-1,419,387	-1,879,080	-2,062,695	-775,815	-408136	-224,296
NPCO	0.345	0.28	0.25	0.24	0.55	0.64	0.72
EPC	0.30	0.64	0.62	0.62	0.55	0.65	0.73
PC	0.25	0.23	0.19	0.18	0.34	0.49	0.61
PSR	-0.59	-0.22	-0.265	-0.15	-0.28	-0.13	-0.013
EPS	-1.75	-1.45	-1.85	-2.01	-0.96	-0.53	-0.30
NPCI	1.03	1.031	1.031	1.031	1.031	1.031	1.031

Source: Field survey, 2013.

4.5.1.1.4: Effect of Changes in Exchange Rate on Comparative Advantage and Policy Indicators.

The exchange rate sensitivity results are presented in Tables 4.39. The private profitability and the private cost ratio remain unchanged with changes in the exchange rate. The social profitability increased in comparison to the base value. At 20% increase in exchange rate, social profitability increases from base value of ₦1,525,375.93 to ₦1,938,012.65/ha representing 27% increase in social profitability. Increase in the exchange rate (depreciation of the naira) led to increase in the comparative advantage of the commodity and vice versa. Because participants will enjoy higher benefit if they are able to export plantain and products. Improvement was observed in the DRC for the commodity but has not altered comparative advantage of the commodity. With increase in the exchange rate plantain appear to be having higher comparative advantage with DRC reducing from base value of 0.17 to 0.12 at 40% increase in exchange rate. Similar trends were observed with the SCB ratio with the increase in the exchange rate. The appreciation of the Naira against the US$ would not benefit the Plantain cropping system in term of the comparative advantage of the commodity. The stronger the Naira against the US$, the weaker is the comparative advantage of Plantain Cropping system. The weaker the Naira against US$ (depreciation), the stronger is the comparative advantage of Plantain cropping system. The NPCO and EPC indicated low value added at private price with increase in the rate of exchange rate. The PC also indicated lower incentive/returns to the participant with increase in the exchange rate and vice versa. This is an indication that for the participants to benefit maximally in the chain, the market price of the commodity must be comparable to the world price in order to improve the competitiveness and comparative advantage of the commodity.

Table 4.39: Effect of Changes in Exchange Rate on Competitiveness and Comparative Advantage of Plantain Production

Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
P P	379810	380,157.16	380,157.16	380,157.6	380,157.6	380,157.6	380,157.16
PCR	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Indicators of comparative advantage							
SP	1522736.35	1,938,012.65	2,382,816.95	2,605,219.55	1,007,557.15	562,531.95	340,129.34
DRC	0.17	0.14	0.12	0.11	0.23	0.36	0.48
SCB	0.22	0.18	0.16	0.14	0.30	0.43	0.56
Protection coefficients							
Transfer	-1142926	-1,557,866.49	-2,002,659.79	-2,225,062.39	-627,179.99	-187,379.79	40,027.82
NPCo	0.345	0.29	0.24	0.22	0.47	0.68	0.87
NPCI	1.03	1.02	1.02	1.02	1.02	1.02	1.02
EPC	0.30	0.25	0.21	0.19	0.38	0.63	0.84
PC	0.25	0.20	0.16	0.15	0.38	0.68	1.11
SRP	-0.59	-0.65	-0.71	-0.73	-0.43	-0.18	0.05
PSE	-1.75	-2.28	-2.9	-3.26	-0.92	-0.27	0.06

Source: Field survey, 2013.

4.5.2: Sensitivity Analysis Results for marketers

4.5.2.1: Effects of Changes in Domestic Price of Plantain on Competitiveness of Plantain Marketing.

Increase in domestic price of plantain and vice versa resulted in improved competitiveness of plantain marketing. An increase of private profitability of 77% was observed when domestic price increased by 20% and vice versa. An improvement in the Private cost ratio was also observed indicating that with increase in domestic price of plantain, marketing plantain becomes more competitive. The DRC and SCB remain unchanged while there was reduction in the net transfer from social revenue to private revenue with the increase in domestic price of plantain and vice versa. The NPCO, EPC and PC improved with the increase in the domestic price and vice versa. The NPCO increased from 0.43 to 0.648 when domestic price increased to 60% and vice versa. Similar increase was observed with the EPC and PC ratios. The SRP and PSE reduced with increase in the domestic price of plantain indicating less transfer of resources from the marketers to the society (Table 4.40).

Table 4.40: Effects of Changes in Domestic Price of Plantain on Competitiveness of Plantain Marketing

Indicators of competitiveness	Base value	20%	40%	60%	-20%	-40%	-60%
PP	22889	40529	54169	61989	7249	-8391	-16211
PCR	0.2	0.072833	0.05489	0.04838	0.430657	0.41265	0.077243
Indicators of comparative advantage							
SP	125955.6667	126289	126289	126289	126289	126289	126289
DRC	0.05	0.02255	0.02255	0.02255	0.02255	0.02255	0.02255
SCBR	0.30	0.301571	0.301571	0.301571	0.301571	0.301571	0.301571
Protection coefficients							
TRANSFERS	-103066.67	-85820	-72120	-333860	-119040	-130867	-142500
NPCO	0.43	0.530103	0.60554	0.648807	0.346033	0.259507	0.216263
EPC	0.21	0.348193	0.426897	0.51792	0.085807	-0.03767	-0.06768
PC	0.19	0.33127	0.443023	0.5067	0.061057	-0.03245	-0.05269
SRP	-0.57	-0.47425	-0.39878	-0.35554	-0.6583	-0.72371	-0.78805
EPS	-1.456666667	-0.99703	-0.01521	-0.63936	-2.07388	-3.03867	-3.91815
NPCI		1.008527	1.008527	1.008527	1.008527	1.008527	1.008527

Source: Field survey, 2013

4.5.2.2: Effect of Changes in the price of Tradeable input on Competitiveness of Plantain Marketing

Plantain marketing appeared to be less competitive with increase in the cost of tradeable input. At 40% increase in the total cost of tradeable input, a reduction of 91% in private profitability was estimated and vice versa. Plantain marketing was observed not to be competitive at 60% increase in the total tradeable input cost. Similar trends were observed with the PCR with the increase in the total tradeable input cost. A reduction of 39.5% was observed in social profit when tradeable input cost increased by 60%. However, reduction in net transfer was observed with the increase in the cost of tradeable input. The Nominal Protection Coefficient on output was not affected by the changes in the tradeable input cost. Reductions in EPC and PC values were observed indicating lower value added with the increase in the tradeable input cost. A reduction of 70% and 85.7% in value added was observed when tradeable input cost rose to 40% increase. SRP and PSE ratio were negative with the increase and vice versa indicating transfers of resources to the society (Table 4.41).

Table 4.41: Effect of Changes in the price of Tradeable input on Competitiveness of Plantain Marketing

Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
Pp	22889	12509	2129	-2261	33269	43649	48839
PCR	0.2	0.226908	0.256	0.356697	0.088143	0.067347	0.060806
Indicators of comparative advantage							
SP	125955.67	115607.7	105259.7	76085.67	136303.7	147051.7	151825.7
DRC	0.05	0.027623	0.030812	0.039736	0.022953	0.039651	0.020406
SCBR	0.30	0.360653	0.417885	0.4465	0.246186	0.14506	0.180338
Protection coefficients							
TRANSFERS	-103066.67	-102721	-102731	-101937	-102699	-26926.7	-102367
NPCO	0.43	0.432531	0.432531	0.432531	0.432531	0.432531	0.432531
EPC	0.21	0.141634	0.058817	-0.0907	0.26109	0.317386	0.340297
PC	0.19	0.11651	0.02787	-0.16253	0.283184	0.302082	0.326518
PSR	-0.57	-0.57014	-0.70966	-0.66286	-0.54729	-0.57182	-0.56777
EPS	-1.46	-1.45638	-0.15166	-1.20983	-1.41726	-1.46157	-1.45014
NPCI	1.00	1.00	1.00	1.00	0.33	1.00	1.00

Source: Field survey, 2013.

4.5.2.3: Effect of Changes in the World price on Competitiveness of Plantain Marketing

The private profitability and the PCR remain unchanged with increase in the FOB of plantain. However, the social profitability improved with the increase in the FOB. At 20% increase in the FOB, the social profitability improved by 29% and vice versa. Similar trends were observed with the DRC and the SCB with the increase in the FOB. The DRC and SCB which are indicators of comparative advantage improved by 68% and 28% when FOB increased by 40%. Reductions were observed in the values of EPC and PC with the increase and vice versa while the SRP and PSE remain negative pointing to transfer of resources away from the system (Table 4.42).

Table 4.42: Effect of Changes in the World price on Competitiveness of Plantain Marketing

Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	22889	22889	22889	22889	22889	22889	22889
PCR	0.2	0.12065	0.120653	0.12065	0.12065	0.12065	0.120683
Indicators of comparative advantage							
SP	125955.67	162340.7	198540.7	216640.7	89947.33	53740.67	35640.67
DRC	0.05	0.019313	0.016157	0.01457	0.03686	0.063497	0.100547
SCBR	0.303333333	0.25407	0.217773	0.203273	0.3811	0.508137	0.60983
Protection coefficients							
TRANSFERS	-103066.6667	-105178	-111482	-193478	-67051.7	-30578.3	-12205
NPCO	0.433333333	0.35989	0.308433	0.293853	0.562037	0.7198	0.864226
EPC	0.213333333	0.162473	0.135677	0.121703	0.296053	0.50575	0.793373
PC	0.19	0.14521	0.117883	0.10805	0.270797	0.483473	0.817873
PSR	-0.566666667	-0.64204	-0.6933	-0.48077	-0.46303	-0.28436	-0.13787
EPS	-1.456666667	-1.9486	-2.4389	-2.68435	-0.96777	-0.47772	-0.22802
NPCI	1.00	1.003333	1.003357	1.003357	1.003357	1.003333	1.003357

Source: Field survey, 2013.

4.5.3: Sensitivity Analysis for Plantain Flour

4.5.3. 1: Effect of Changes in Plantain fruit market price on comparative advantage and Competitiveness in Plantain flour.

Raising Plantain Fruit market price by 20% would reduce private profitability by 5% in Plantain flour processing and vice versa (Table 4.43). A reduction of 15% was observed in private profitability of Plantain flour when domestic price of Plantain fruit used in processing the flour increased by 40%. The values of social profitability, DRC, SCB and NPCO remain unchanged. Increase in the market price of plantain leads to reduction in value added at market prices indicated by the EPC value reducing from 0.77 to 0.73 and vice versa at 20% increase in domestic price of plantain used in processing. Thus lower value added was added at private price with the increase in the domestic price of Plantain fruits used in the processing. Similar trends were observed with the PC and there were increase in the transfer from the processors to the society as a result of the increase in the domestic price of Plantain fruits and vice versa. This was shown through the values of SRP and PSE.

Table 4.43: Sensitivity of Changes in price of Plantain fruit on Competitiveness and Comparative Advantage of Plantain flour

`Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	114,581	108,571	96,901	91,061	131,901	143,571	149,391
PCR	0.10	0.11	0.12	0.12	0.08	0.08	008
Indicators of comparative advantage							
SP	155,903.08	155,903.08	155,903.08	155,903.08	155,903.08	155,903.08	155,903.08
DRC	0.06	0.06	0.06	0.06	0.06	0.06	0.06
SCBR	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Protection coefficients							
TRANSFERS	-41,322.08	-47,332.08	-59,002.08	-64,842.08	-24,002.08	-12,332.08	-6,512.08
NPCO	0.83	0.83	0.83	0.83	0.83	0.83	0.83
NPCI	1.16	1.09	1.3	1.32	0.74	0.56	0.46
EPC	0.77	0.73	0.66	0.45	0.87	0.94	0.98
PC	0.73	0.70	0.62	0.58	0.85	0.87	0.96
PSR	-0.18	-0.21	-0.25	-0.28	-0.10	-0.05	-0.028
EPS	-0.21	-0.25	-0.31	-0.34	-0-.12	-0.06	-0.03

Source: Field survey, 2013

4.5.3.2: Effect of Changes in Exchange rate and World price on Competitiveness and policy indicators in Plantain flour.

Plantain Flour's private profitability and private cost ratio was not sensitive to changes in the exchange rate (Table 4.44) and world price of the product (Table 48). An increase in exchange rate and world reference price by 20% and vice versa lead to a 3% and 5% improvement in social profitability. This showed that depreciation of the naira will lead to higher comparative advantage in the product. At 20% decrease in world reference price, plantain flour appears less competitive with DRC ratio increases from 0.06 to 0.08 while an increase in world reference price lead to an improvement in the DRC. A decrease of 20% in exchange rate reduces the comparative advantage of plantain flour. At 20% increase in world reference price and Exchange rate, the processors will be receiving 4% and 34% above the world reference price on their product. There were reductions in the EPC value indicating lower value added at private prices with the increases in the value of exchange rate and world price of the commodity. There were also greater transfers of resources from the producers to the society with the increase in the exchange rate and world reference price.

Table 4.44: Sensitivity of Changes in exchange rate on Comparative Advantage and Competitiveness of Plantain flour

`**Indicators of competitiveness**	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	114,581	114,581	114,581	114,581	114,581	114,581	114,581
PCR	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Indicators of comparative advantage							
SP	155,903.08	242,298.35	288,368.94	311,504.62	69,388.08	23,317.4	282.09
DRC	0.06	0.04	0.03	0.03	0.13	0.30	0.97
SCBR	0.32	0.24	0.21	0.19	0.52	0.76	0.99
Protection coefficients							
TRANSFERS	-41,322.08	-127,357.35	-173,427.86	-196,563.32	45,552.95	91,623.6	114,658.91
NPCO	0.83	0.61	0.53	0.49	1.34	1.97	2.57
NPCI	1.16	1.16	1.16	1.16	1.16	1.16	1.16
EPC	0.77	0.51	0.43	0.38	1.60	3.81	12.24
PC	0.73	0.47	0.40	0.37	1.66	4.93	407.46
PSR	-0.18	-0.40	-0.48	-0.49	0.32	0.93	1.53
EPS	-0.21	-0.66	-0.90	-1.022	0.24	0.48	0.59

Source: Field Survey, 2013.

Table 4.45: Sensitivity of Changes in FOB (World Price) on Comparative Advantage and Competitiveness of Plantain flour

`**Indicators of competitiveness**	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	114,581	114,581	114,581	114,581	114,581	114,581	114,581
PCR	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Indicators of comparative advantage							
SP	155,903.08	202,168.4	247,973.69	271,019.78	109,772.55	63,701.94	
DRC	0.06	0.05	0.04	0.04	0.08	0.13	0.20
SCBR	0.32	0.35	0.28	0.26	0.40	0.54	0.65
TRANSFERS	-41,322.08	-87,587.94	-133,392.69	-156,438.78	4,808.4	50,879.09	73,915.44
NPCO	0.83	0.69	0.60	0.56	1.04	1.39	1.7
Protection coefficients							
NPCI	1.16	1.16	1.16	1.16	1.16	1.16	1.16
EPC	0.77	0.60	0.49	0.45	1.06	1.73	2.5
PC	0.73	0.50	0.46	0.42	1.04	1.79	2.81
PSR	-0.18	-0.32	-0.41	-0.75	0.02	0.37	0.64
EPS	-0.21	-0.46	-0.69	-0.81	0.03	0.26	0.38

Source: Field Survey, 2013.

4.5.3.3: Effects of Changes in Domestic price of Plantain on Competitiveness and Comparative Advantage of Plantain Chips.

At 20% increase in Plantain fruit market price and vice versa, Plantain chip processing was less competitive with private profitability reducing by 12% implying that the processors would receive less profit in the activity with increase in the domestic price of plantain fruit. The Nominal protection coefficient on input was also increased by 16% indicating that the processors are taxed on input used in the processing of the commodity. The EPC and PC showed reduction in incentives by 11% and 13% with the increase in the market price of plantain fruit by 20%. Transfers from the processors to the society was revealed by the SRP and PSE ratio indicating a 7% and 9% transfer from the processors to the society. The social profitability, DRC and SCB remain unchanged (Table 49).

Table 4.46: Sensitivity analysis on the effect of changes in domestic price on Comparative Advantage and Competitiveness of Plantain Chips Processing

Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	107,332.5	94,332.5	81,332.5	74,832.5	120,332.5	133,332.5	139,832.5
PCR	0.13	0.15	0.16	0.17	0.12	0.11	0.10
Indicators of comparative advantage							
SP	191,074	191,074	191,074	191,074	191,074	191,074	191,074
DRC	0.06	0.06	0.06	0.06	0.06	0.06	0.06
SCBR	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Protection coefficients							
TRAN	-83,741.5	-96,741.5	-109,741.5	-16,241.5	-70,741.5	-57,741.5	-51,241.5
NPCO	0.72	0.72	0.72	0.72	0.72	0.72	0.72
NPCI	1.002	1.16	1.32	1.40	0.84	0.68	0.61
EPC	0.60	0.54	0.48	0.44	0.67	0.73	0.76
PC	0.56	0.49	0.43	0.39	0.63	0.70	0.73
PSR	-0.29	-0.34	-0.38	-0.41	-0.25	-0.20	-0.18
EPS	-0.41	-0.47	-0.53	-0.56	-0.34	-0.28	-0.25

Source: Field survey, 2013.

4.5.3.4: Effects of Changes in world reference price and Exchange rate on Competitiveness and Comparative Advantage of Plantain Chips.

Plantain chips processing appear to be more competitive with increase in FOB and exchange rate by 20%. A percentage increase of 21% in social profit was observed when exchange rate was increased by 20% and vice versa. The DRC and SCB ratios improved with changes in the FOB and exchange rate from 0.07 to 0.05 at 20% increase and vice versa. However reduction in the EPC value was observed with an increase in the exchange rate and FOB. A reduction of 30% in EPC was observed when FOB increased by 20% while reduction of 42% in value added was obtained when exchange rate was increased by 20% and vice versa. This is an indication that increasing exchange rate and FOB value of the commodity would reduce the value added at private price compared to the border price. Increases in the exchange rate and FOB led to reduction in PC and transfer from the processors to the society reflected in the values of SRP and PSE obtained and vice versa (Table 4.47 and 4.48).

Table 4.47: Sensitivity analysis on the effect of changes in FOB on Comparative Advantage and Competitiveness of Plantain Chips

Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	107,332.5	107,332.5	107,332.5	107,332.5	107,332.5	107,332.5	107,332.5
PCR	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Indicators of comparative advantage							
SP	191,074	248,536.6	305,948	334,655	133,710	76,298	47,591.7
DRC	0.06	0.05	0.04	0.03	0.09	0.15	0.22
SCBR	0.33	0.28	0.24	0.22	0.42	0.55	0.67
Protection coefficients							
TRANSFERS	-83,741.5	-141,203.58	-198,615.5	-227,322.6	-26,378.2	31,039	59,740
NPCO	0.72	0.60	0.51	0.48	0.90	1.20	1.43
NPCI	1.002	1.002	1.002	1.002	1.002	1.002	1.002
EPC	0.60	0.47	0.39	0.35	0.84	1.37	1.43
PC	0.56	0.43	0.35	0.32	0.80	1.41	2.25
PSR	-0.29	-0.41	-0.49	-0.53	-0.11	0.18	0.42
EPS	-0.41	-0.67	-0.96	-1.10	-0.13	0.15	0.29

Source: Field survey, 2013

Table 4.48: Sensitivity analysis on the effect of changes in Exchange rate on Comparative Advantage and Competitiveness of Plantain Chips

Indicators of competitiveness	Base Value	20%	40%	60%	-20%	-40%	-60%
PP	107,332.5	107,332.5	107,332.5	107,332.5	107,332.5	107,332.5	107,332.5
PCR	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Indicators of comparative advantage							
SP	191,074	286,586.08	342,998.76	371,705	96,660.72	39,248.04	10,541.7
DRC	0.06	0.05	0.04	0.04	0.12	0.25	0.56
SCBR	0.33	0.25	0.22	0.21	0.50	0.71	0.90
Protection coefficients							
TRANSFERS	-83,741.5	-178,253.58	-235,666.26	-264,372.5	10,671.78	68,084.46	96,790.8
NPCO	0.72	0.54	0.47	0.44	1.07	1.52	1.93
NPCI	1.002	1.002	1.002	1.002	1.002	1.002	1.002
EPC	0.60	0.41	0.35	0.32	1.12	2.33	5.10
PC	0.56	0.38	0.31	0.29	1.11	2.73	10.2
PSR	-0.29	-0.47	-0.53	-0.56	0.05	0.50	0.91
EPS	-0.41	-0.86	-1.14	-1.28	0.05	0.33	0.47

Source: Field survey, 2013

4.5.4: Effects of Changes in Yield on Competitiveness and Comparative Advantage of whole Plantain Value Chain.

Increase in yield (Table 4.49) leads to improvement in overall performance of the Plantain and its derivatives in the chain. The private profitability increased from ₦94,584 (base value) to ₦141,876 at 40% increase in yield level. Private profitability improved by 25% and 50% when yield level increased by 20% and 40% and vice versa. At 20% increase in the yield level of Plantain, Plantain and its derivatives becomes more competitive with PCR ratio improving from 0.27 (base value) to 0.22. PCR improves to 0.18 when yield was improved by 40% showing that competitiveness of the commodity improved with increase in the yield level. The social profitability also improved when yield was increased and vice versa. Social profitability improved by 20% and 40% when yield level increased by 20% and 40%. This indicates that increased productivity would translate to higher competitiveness and efficiency in the production systems. Similar trends were also observed with the Domestic Resource Cost (DRC), Social Cost Benefit (SCB) and NPCO with improvement in yield. The net policy transfer was still negative; it increases from -₦221,871 (base value) to -₦258,849.5 when yield increased to 20% and vice versa. This indicates that resources were being diverted from the system. Changes in yield lead to improvement in the EPC values. Ratio of value added at domestic prices improved from 0.38 to 0.58 when yield was increased by 20%. Similar trends were observed with the PC with the increase in the yield level and vice versa. This is represented by the result of the SRP and PSE values. Succinctly, improvement in the yield level would lead to higher competitiveness and comparative advantage of the commodity value chain. It also brings about reduction in the amount of transfers from the participants in the chain to the society. Policy that will ensure adequate supply of input to the producers at subsidized rate as well as provision of incentives to facilitate export of plantain.

Table 4.49: Effects of Changes in Yield on Comparative Advantage and Competitiveness of Plantain Value Chain

Indicators of competitiveness	Base Value	Increase in yield by 20%	Yield Increase 40%	Yield Increase 60%	Yield decrease 20%	Yield decrease 40%	Yield decrease by 60%
PP	94,584	118,230	141,876	165,522	70,938	47,384	25,584
PCR	0.27	0.221	0.181	0.161	0.321	0.361	0.43
Indicators of comparative advantage							
SP	316,419	379,419	442,619	495,619	253,419	190,219	137,219
DRC	0.08	0.06	0.04	0.02	0.1	0.12	0.14
SCBR	0.297	0.277	0.257	0.237	0.317	0.337	0.357
Protection coefficients							
TRANSFER	(221,871)	(258,849)	(295,828)	(332,807)	(184,892)	(147,914)	(110,930)
NPCO	0.617	0.767	0.867	0.917	0.467	0.367	0.317
NPCI	0.32	0.320	0.320	0.320	0.32	0.320	0.320
EPC	0.376	0.570	0.626	0.676	0.176	0.056	0.026
PC	0.30	0.32	0.34	0.36	0.28	0.26	0.24
SRP	(0.49)	(0.37)	(0.25)	(0.19)	(0.61)	(0.73)	(0.79)
PSE	(0.96)	(0.809)	(0.709)	(0.6085)	(1.106)	(1.209)	(1.309)

Source: Field survey, 2013

4.5.5: Effect of Changes in Domestic price (product) on Competitiveness and Comparative Advantage of Plantain Value Chain.

With an increase in domestic price, an increase in private profitability was observed (Table 4.50). The result showed that a 20% increase in domestic price increased the private profitability from the base value of ₦94,584/ton to ₦116,084/ton. Private profitability increased by 23% and 42% when domestic price increased by 20% and 40% and vice versa. The Private cost ratio also improved from the initial base value of 0.27 to 0.23 indicating improved competitiveness with the increase in domestic price and vice versa. The social profitability of plantain is not sensitive to changes in domestic prices, it remains unchanged. This is because it is not influenced by events in the domestic market. This was further shown through the ratios of the DRC and SCBR ratio that were also constant with the varied domestic price level of Plantain Flour. Although the net policy transfer remains negative but there was reduction in the value compared to the base value. Net policy transfer at base value was estimated at -₦221,871 at base value which reduced to -₦175,871 at 40% increase in domestic price of flour and vice versa. This indicates that the producers received improved protection with the increase in the domestic price of Plantain flour. There was an improvement in the level of incentives indicated by the PC values with the increase in the PC values and vice versa. PC values improved from 0.30 to 0.35 when domestic price of Plantain flour increased by 20% and vice versa. This implies that the participants in the chain will receive better protection with increase in domestic price of the commodity and vice versa. An improvement was also observed with the EPC with the increase in the domestic price of Plantain. EPC also improved from 0.30 to 0.58 when domestic price was increased by 30% indicating greater value added at domestic price. EPC improved by 21% and 42% when domestic price increased by 20% and 40% indicating greater value addition with the increase in the domestic price. Furthermore, with the increase in the domestic price of Plantain flour, reductions were observed in the level of transfers of resources from the producers to the society. This is shown by the result of the SRP and PSE ratios indicating that the producers receives greater protection leading to higher competitiveness at market price with increase in the domestic price of plantain flour and vice versa.

Table 4.50: Effects of Changes in domestic price on Comparative Advantage and Competitiveness of Plantain Value Chain

Indicator of competitiveness	Base Value	Increase in Domestic Price by 20%	Domestic Price Increase 40%	Domestic Price Increase 40%	Domestic Price decrease 20%	Domestic Price decrease 40%	Domestic Price decrease by 60%
PP	94,584	116,084	134,634	155,144	73,084	54,534	34,024
PCR	0.27	0.231	0.19	0.15	0.311	0.35	0.39
Indicator of comparative advantage							
SP	316,419	316,419	316,419	316,419	316,419	316,419	316,419
DRC	0.08	0.08	0.08	0.08	0.08	0.08	0.08
SCBR	0.297	0.297	0.297	0.297	0.297	0.297	0.297
Protection coefficients							
TRANSFER	(221,871)	(198,871)	(175,871)	(152,871)	(244,871)	(267,871)	(290,871)
NPCO	0.617	0.697	0.717	0.737	0.537	0.517	0.497
NPCI	0.32	0.32	0.32	0.32	0.32	0.32	0.32
EPC	0.376	0.456	0.536	0.616	0.296	0.216	0.136
PC	0.30	0.35	0.40	0.45	0.2488	0.2088	0.1788
SRP	(0.49)	(0.22)	(0.17)	(0.13)	(0.76)	(0.81)	(0.85)
PSE	(0.96)	(0.62)	(0.42)	(0.25)	(1.12)	(1.53)	(1.63)

Source: Field survey, 2013

4.5.6: Effect of Changes in world reference price (FOB) on Competitiveness and Comparative Advantage of Plantain Production.

The sensitivity of the world reference price (FOB) to policy indicators is presented in Table 4.51. The private profitability and Private Cost Ratio remained unchanged thus an increase in world price had no effect on the private profitability/competitiveness at market price of the commodity. The social profitability increases vice versa compared to the base value. Social profitability increased by 20% and 31% when the world price of the commodity increased by 20% and 40%. This showed that the social profitability increased with higher world price of the commodity. The high social profitability is also reflected in the lower value of DRC and SCB ratio compared to the base value. The DRC improved from base value of 0.08 to 0.04 at 40% increase in the world price of plantain. This further implies that increase in the world price will lead to improvement in comparative advantage of the commodity. The net policy transfer was negative and it increases vice versa in the production system indicating transfer of resources from the producers to the consumers. There were reductions in the value of NPCO and PC with increase in the world price of the commodity. The Profitability coefficient worsened with increase in the world price of Plantain. This is because the PC reduced from 0.30 to 0.28 with 20% increase in world price indicating lower value at domestic price compared to the world reference price.

Table 4.51: Effects of Changes in FOB on Comparative Advantage and Competitiveness of Plantain Value Chain

Indicator of competitiveness	Base Value	Increase in FOB by 20%	FOB Increase 40%	FOB Increase 40%	FOB decrease 20%	FOB decrease 40%	FOB decrease by 60%
PP	94,584	94,584	94,584	94,584	94,584	94,584	94,584
PCR	0.27	0.271	0.27	0.271	0.27	0.271	0.27
Indicator of comparative advantage							
SP	316,419	379,702	414,591	472,792	253,136	192,936	134,736
DRC	0.08	0.06	0.04	0.02	0.1	0.2	0.3
SCBR	0.297	0.277	0.257	0.237	0.317	0.337	0.357
Protection coefficients							
TRANSFER	(221,871)	(258,849)	(320,849)	(378,849)	(158,588)	(96,588)	(38,588)
NPCO	0.617	0.552	0.522	0.457	0.68	0.71	0.78
NPCI	0.32	0.32	0.32	0.32	0.32	0.32	0.32
EPC	0.376	0.216	0.198	0.185	0.536	0.696	0.856
PC	0.30	0.28	0.26	0.24	0.32	0.35	0.38
SRP	(0.49)	(0.62)	(0.78)	(0.85)	(0.35)	(0.31)	(0.28)
PSE	(0.96)	(1.05)	(1.35)	(1.65)	(0.73)	(0.52)	(0.31)

Source: Field Survey, 2013.

4.5.7: Effect of Changes in Exchange Rate on Competitiveness, Comparative Advantage and Policy Indicators.

The exchange rate sensitivity results are presented in Tables 55. The private profitability and the private cost ratio remain unchanged with changes in the exchange rate. The social profitability increased in comparison to the base model scenario. At 40% increase in exchange rate, social profitability increases from base scenario of ₦316,419 to ₦466,350 representing a 47% increment. The depreciation of the naira leads to increase in the comparative advantage of the commodity and vice versa. Improvement was observed in the DRC for the commodity value chain but has not altered comparative advantage. With increase in the exchange rate plantain and its derivatives appear to be having higher comparative advantage with DRC reducing from base value of 0.08 to 0.06 at 20% increase in exchange rate. Similar trends were observed with the SCB ratio with the increase in the exchange rate. The appreciation of the Naira against the US$ would reduce the comparative advantage of the commodity. The stronger the Naira against the US$, the weaker is the comparative advantage of Plantain Value Chain. The weaker the Naira against US$ (depreciation), the stronger is the comparative advantage of the commodity chain. The NPCO and EPC indicated low value added at private price with increase in the rate of exchange rate. The PC also indicated lower incentive to the participants with increase in the exchange rate and vice versa.

Table 4.52: Effects of Changes in exchange rate on Comparative Advantage and Competitiveness of Plantain Value Chain

Indicator of competitiveness	Base Value	Increase in Exch rate by 20%	Exch rate Increase 40%	Exch rate Increase 40%	Exch Rate decrease 20%	Exch rate decrease 40%	Exch rate decrease by 60%
PP	94,584	94,584	94,584	94,584	94,584	94,584	94,584
PCR	0.27	0.271	0.27	0.271	0.27	0.271	0.271
Indicators of comparative advantage							
SP	316,419	391,419	466,350	516,301	238,419	163,419	107,419
DRC	0.08	0.06	0.04	0.02	0.09	0.1	0.12
SCBR	0.297	0.28	0.26	0.24	0.33	0.35	0.38
Protection coefficients							
TRANSFER	(221,871)	(256,050)	(269,425)	(276,521)	(186,050)	(173,871)	(166,871)
NPCO	0.617	0.58	0.51	0.47	0.657	0.762	0.802
NPCI	0.32	0.32	0.32	0.32	0.32	0.32	0.32
EPC	0.376	0.35	0.33	0.29	0.41	0.43	0.47
PC	0.30	0.24	0.20	0.18	0.36	0.40	0.42
SRP	(0.49)	(0.52)	(0.54)	(0.57)	(0.47)	(0.44)	(0.42)
PSE	(0.96)	(1.16)	(1.36)	(1.56)	(0.76)	(0.56)	(0.36)

Source: Field survey, 2013.

4.6: Impact of Policies on Plantain Sub Sector in Southwestern Nigeria

Result of the analysis (Table 56) showed that the domestic price of plantain was ₦125,000/ton. The prices paid by the consumers represent the domestic prices employed in this analysis. Border price is the price prevailing at the point of exit for an internationally tradable commodity and represents its shadow price or opportunity cost. The border price was adjusted for transportation, marketing and handling cost and was estimated at ₦181,000/ton. Available time series data on production and prices of plantain were scanty in the southwestern Nigeria. Price elasticity of demand for plantain could not be computed due to insufficient time series data. Value of elasticity of demand for plantain was obtained from Erahbor and Ojogho's study of 2011. The demand elasticity of Plantain was -1.050. Coefficient of -1.050 implied that demand for plantain in Nigeria is price elastic showing that changes in prices will affect quantity demanded of the commodity. Elasticity of supply for plantain was calculated from the study's primary data. Negative value was obtained (0.243), which is a common occurrence where short term data are utilized. Similar trend was found in Impact of Livestock Prices in Sub Saharan Africa (Williams, 1993). Supply elasticity value is always positive for data collected on long term basis, agreeing with the apriori expectations. Positive supply elasticity value was used in computation of Welfare impact. The amount of protection provided to the domestic producers was estimated using the Nominal Protection Coefficient (NPC). The nominal protection coefficient measures the divergence between the prices in the domestic market with the prices in the next best alternative use. NPC value of 0.287 obtained indicated that the domestic price was lower than the border price. Following Umesh *et al* (2009) approach, it is assumed that whatever quantity of plantain produced would be consumed in the country.

The value of domestic production and consumption was estimated at ₦1,283,250. The value was similar because it was assumed in the study that quantity of plantain produced equal consumption. The net social loss is the losses in production efficiency that the society as a whole has to bear. The result of the analysis indicated that the net social loss ((i.e. losses in production efficiency) in plantain production was ₦6,552/ton (Table 50). Net economic loss in production in plantain may be attributed to the low price been received by the farmers (low producers price) and the strong influence of middlemen in

pricing/price manipulation in the plantain value chain. Low domestic price of plantain is attributable to increase in the domestic supply especially during the peak season. The net social loss accruing to the producers may also result from the fact that production resources in form of subsidy provided by the government may not be distributed efficiently to the activities connected to the producers leading to the social losses in production. This loss per tonne would not have been this high if some of the produce was processed. Findings revealed that most of the produce (82%) is sold in unprocessed form. Unprocessed products are traditionally expected to command lower value compared to processed product.

Net social gain due to plantain consumption (i.e. economic gain to the society due to consumption of Plantain) was estimated at ₦28,295/ton. The domestic consumers paid lower prices for the fruits during the peak season due to high level of supply in the market. The welfare loss of plantain producers due to policy distortion and market failures was estimated at ₦256,514.25/ton during the 2013 cropping season while the consumers gained ₦234,771.55/ton during the same period. Overall analysis indicated distortion in the market and pricing of plantain in the southwest zone of the country

Table 4.53: Impact of policies on plantain in southwestern Nigeria

Variable	Label	Value
Pd (₦/ton)	Average Consumer price prevailing in domestic market	₦125,000
Pb (₦/ton)	Average World market price (FOB) adjusted for transportation and handing cost	₦181,000
Es	Elasticity of supply of plantain	0.243
Ed	Elasticity of demand of plantain (Erhabor and Ojogho, 2011)	-1.050**
NPC	Nominal Protection Coefficient	0.287
T (NPC -1)	Implicit tariff	-0.713
T (T*NPC)	Tariff rate	0.205
V (₦/ton)	Value of domestic production (Pb * domestic production)	1,283,250
W (₦/ton)	Value of domestic consumption (Pb * domestic consumption)	1,283,250
Analysis		
NeSLp (₦/ton)	Net social losses in production	6,552
NeSLc (₦/ton)	Net social losses in consumption	28,295
Gp (₦/ton)	Welfare loss of producers	256,514.25
Gc (₦/ton)	Welfare gain of consumers	234,771.25

Source: Field survey, 2013

**Sourced from Erhabor and Ojogho (2011).

CHAPTER FIVE

5.0 Summary of major findings

The study examined linkages among participants in plantain value chain; analyzed comparative advantage, competitiveness, effects of policies and impact of distortions in policies on each stage and the whole Plantain Value Chain in Southwestern Nigeria. The study employed three stages sampling technique to randomly select 260 producers and 100 processors while one hundred and forty four marketers were selected from plantain markets in the zone. Primary and Secondary data were utilized for this study. The primary data used were obtained through application of pretested well-structured questionnaire, while the secondary data were sourced from Nigeria Port Authority and International Trade Statistics. The data were analyzed using descriptive statistics and combination of Policy Analysis Matrix with Partial Equilibrium Analysis.

The following were the major findings from the result of the study:

5.1: Key processes and participants in plantain value chain

The Key processes/functions in Plantain Value Chain were input supplies, Production, Farm-Gate Assembling, Market-Arena Assembling, Processing, Wholesaling, Retailing, Consumption and Export, while the key participants are Input suppliers, Producers, Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers and Retailers, Consumers, Exporters. Plantains are mostly traded in unprocessed form and 18% of produce were processed. Employment generated in the chain was 314/tonne with highest (33.8%) in processing stage.

5.2 Competitiveness and Comparative Advantage along each stage of Plantain Value Chain

The result of the Policy Analysis Matrix showed Plantain/Cocoyam production system was the most competitive out of the four evaluated production system with a private profitability of ₦514,547.16/ha followed by Plantain/Cassava production systems (₦354,579.16), Sole plantain (₦348,352.16/ha) while the least competitive production system was the Plantain/Cocoa (₦303,150.16/ha). Social Profitability was highest in Plantain/cocoyam production systems (₦1,593,610.88/ha) while the least was obtained

with Plantain/Cassava production systems (₦1,481,711.08/ha). Social cost benefit ratio (SCB) ratio of 0.21 was obtained in sole plantain, plantain/cocoa (0.24), plantain/cocoyam (0.26) and plantain/Cassava (0.25) respectively. The result of the SCB indicated that comparative advantage was highest in sole plantain production system.

EPC values of 0.27, 0.26, 0.37 and 0.31 were obtained for Sole Plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava production systems indicating that value added were lower at market price compared to the border price and there is lack of incentives in the system. Profitability coefficient of 0.23, 0.20, 0.32 and 0.24 were obtained for sole plantain, Plantain/Cocoa, Plantain/Cocoyam and Plantain/Cassava productions system indicating that private profits were less than the profits which further indicate lack of incentives in the production process. Subsidy Ratio to Producers (SRP) values of -0.62, -0.62, -0.52 and -0.58 were obtained for sole plantain, plantain/cocoa, plantain/cocoyam and plantain/cassava production systems respectively indicating that the producers were taxed in the production of the commodity and transfer of resource from the producers to the society.

The Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers and Retailers had positive private profit of ₦17,867/tons, ₦14,000/tons, ₦36,800/tons and ₦29,233/tons implying that Plantain marketing in southwestern Nigeria were competitive under the existing policy and transfers. Social profit of ₦137,812/ton, ₦128,310/ton, ₦111745/ton and ₦74,475/ton were recorded for Farm-Gate Assemblers, Market- Arena Assemblers, Wholesalers and Retailers indicating that marketing of Plantain is economically efficient in the study area.

Net transfers of -₦119,945/ton, -₦114,310/ton, -₦74,945/ton and -₦44,979/ton were obtained for the Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers and Retailers in the study area. This implies that social profit obtained in the Plantain marketing system was greater than the private profit. EPC values of 0.15, 0.12, 0.37 and 0.41 were obtained for the Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers and Retailers in that order. This indicated that value added in private price was lower than the value added at reference price. Profitability coefficient of 0.13, 0.11, 0.33, 0.39 were obtained for Farm-Gate Assemblers, Market-Arena Assemblers, Wholesalers and Retailers. SRP values of -0.66, -0.63, -0.41 and -0.24 were obtained for

farm assemblers, market arena assemblers, wholesalers and retailers. The negative SRP indicated that the marketers were taxed in the marketing of the commodity.

For the processors, the result of the analysis indicated that Plantain chips production had positive private profit of ₦426,339/ton while Plantain flour had positive private profit of ₦408,701/ton. This indicated that Plantain processing is competitive given the current government policies. The result of the analysis indicated that Plantain flour processing had positive social profit of ₦561,969/ton while Plantain chips processing had positive social profit of ₦764,793/tons. This implies that processing of Plantain into flour and chip was economically profitable under existing government policies and transfers and processing of the commodities is beneficial to the economy. The SCB of Plantain flour (0.344) and Plantain chips (0.342) confirmed the existence of comparative advantage in processing of Plantain flour and Plantain chips. The absence of incentives was further confirmed by the result of the Effective Protection Coefficient (EPC) that was less than one in the Plantain processing. EPC values of 0.76 and 0.60 were obtained for Plantain flour and Plantain chips indicating that value added at market prices was lower than value added at world reference price. The profitability coefficient was also less than one for Plantain flour and Plantain chips. Profitability coefficient of 0.73 and 0.56 were obtained for Plantain flour and Plantain chips indicating lack of incentives in the products. SRP values of -0.18 and -0.29 were obtained for Plantain flour and Plantain chips. The negative SRP indicates that the processors were taxed in the processing of the commodity.

5.3 Competitiveness, Comparative Advantage of the whole commodity system

Result revealed that Plantain production was privately and socially profitable with the flour as the final product. The incentive structures indicated that the participants in the value chain Plantain-Plantain flour were not protected.

5.4 Impact of distortion on Producers and Consumers welfare

Result of the Partial Equilibrium Analysis indicated that the Net Social Loss in Plantain production was estimated at ₦6,552/ton. Net social gain in consumption was estimated at ₦28,295/ton. The welfare loss of Producers of Plantain was estimated at ₦256,514.25/ton while the consumers gained ₦234,771.25/ton. The current market policy structure favours consumers while taxing producers.

5.5 Conclusion

Plantain Value Chain mapping revealed strong horizontal linkages but weak vertical linkages along the stages of the value chain. The produce movement is majorly multilayered passing through various stages and multiple participants' handling in horizontal linkage. A vertical linkage is where produce moves directly from producers to consumers which is rare and involved insignificant quantities. There is minimal involvement of participants in regional and international markets and the product was traded mostly in an unprocessed form. Private profitability and private cost ratio was used to measure competitiveness while social profitability, domestic resource cost ratio and social cost benefit ratio was used to measure comparative advantage. Protection coefficient and transfers were measured using indicators such as the nominal protection coefficient on output and input, effective protection coefficient, profitability coefficient, subsidy ratio to producers while transfers were measured by the divergences in the private and social value of output, input and profit.

The result of the PAM indicated that plantain production, marketing and processing was privately and socially profitable. This was confirmed by the result of the Private Cost Ratio (PCR), Domestic Resource Cost ratio (DRC) and the Social Cost Benefit Ratio (SCBR) that were less than unity indicating competitiveness and comparative advantage along each stage and entire plantain value chain. However, the existing agricultural policies are not consistent with the existing comparative advantage. The net policy effect was negative along each stage and the entire value chain indicating that resources were diverted away from the system and the system was taxed.The indicators of policy incentives like Nominal Protection Coefficient (NPC), Profitability Coefficient, Subsidy Ratio to Producers, Producers Subsidy Equivalent and Effective Protection Coefficient (EPC) showed that lower value was added at private price compared to the social price. According to the sensitivity analysis, yield and domestic price of plantain and its products were very important in the determination of competitiveness of the sub sector. The Partial Equilibrium Analysis which is an indicator of the volume of taxes/support received by the participants indicated that the consumers were protected while the producers were not given incentives in the production process.

5.6 Policy implications and Recommendations

Based on the findings of this study, the following are recommended:

- There is the need to increase the proportion of plantain that goes to value addition in order to improve the prospect of the commodity in the domestic, regional and international market and employment generation. This is so since result of the mapping shows weak linkage in the Chain with Plantain is mostly traded in unprocessed form (82%). However findings have shown that processed forms of plantain are more profitable and generate higher number of employment.
- Sole plantain production practice should be encouraged when production is targeted at improving national income since findings have shown that DRC and SCB were less than one in the production systems with Sole plantain having the highest comparative advantage.
- It is recommended that yield enhancing technology such as soil moisture management and genetic modifications to reduce effect of pest, disease and enhanced yield should be encouraged since findings have shown that yield had influence on competitiveness and comparative advantage of Plantain and its derivatives.

5.7 Suggestions for further studies

1. There is the need to study the issue of trade restrictions and phytosanitary measures in Plantain Value Chain.
2. Further research should examine competitiveness and value chain analyses of Plantain across the geopolitical zones of Nigeria.
3. Need to study the quantum of incentives that will enable the producers and consumers benefit maximally from the value chain.

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APPENDIX 1
Department of Agricultural Economics
Value chain and Competitiveness of Plantain in Southwestern Nigeria

PRODUCERS Questionnaire

Questionnaire code _____ Date of interview:_____ Phone no ……

1	Zone:	
2	State:	
3	Local Govt. Area:	
4	Village:	
5	Sex: _____	Male=1, female=2
6	Marital status:_____	Single=1, Married=2, Separated=3, Divorced=4, Widowed=5
7	Age:_____(years)	
8	Level of Education:_____	No formal=0, Koranic=1, Adult literacy training = 2 Primary=3, Secondary =4, Tertiary=5.
9	Years of education:_____	
	Where is the main source of price and market information?	A. Radio b. Producer group. C. Newspaper c. Others please specify.....
10	What is your primary occupation	1. Farming 2. Fishing 3. Trading 4. Public service 5. Private business 6. Others please specify.
11	What is your secondary occupation	2. Farming 2. Fishing 3. Trading 4. Public service 5. Private business 6. Others please specify
12	Household size:_____	
13	What system of cropping are you engaged in?	Sole cropping = 1, intercropping = 2 mixed cropping = 3
14	If you are intercropping, state the crops you are intercropping with	
15	If you are practicing mixed cropping state the crops	
16	How long have you been in plantain cultivation	
17	What variety of plantain do you cultivate?	
18	How would you describe the scale of your operations? _____	Homestead/Subsistence production – 1 Small scale production – 2 Commercial production - 3 Community project /cooperative – 4

19. **Social Assets: Membership in social groups**

Groups	**Member (Yes/No)**	**Position held**	**Name of Group**	**Membership size**
Cooperative				
Informal work exchange group				
Savings and credit group				
Religious group				
Town union				
Occupational groups				
Social groups				
Plantain Farmers Association				
Others please specify				

SECTION B. PRODUCTION SYSTEM

20. How many times do you produce plantain in a year?

Types of Product	No. of Production in a year	Peak Period of Production	Reasons for Peak Period	Low Period	Reasons for low period of production
Plantain					

21. What is the average size of land used for the production of plantain in the last growing season?

Crop	Size of land cultivated (acres/heaps/hectares) in sole	Size of land cultivated (acres/heaps/hectares) In intercrop
Plantain		
Plantain + intercrop 1 (specify the intercrop)		
Plantain + intercrop 2		
Plantain + intercrop 3		
Plantain + intercrop 4		

C. OUTPUT AND INPUT USED IN PRODUCTION

22. Please provide record of input used in production in the table below per hectare?

Inputs	**Quantity used**			**Price per unit**	**Distance from the market to the farm**	**Transport ation cost**
	Sole	**Intercrop**	**Mixed cropping**			
Plantain suckers						
Fertilizer (in bags)						
Chemicals (in bottle)						
Pesticides (in bottle)						
Herbicides (in bottle)						
Bags						
Baskets						
Planting material for intercrop 1						
Intercrop 2						
Intercrop 3						
Intercrop 4						
Others please specify						

23. Indicate the labour used in the production of plantain per acre:

Activity	Number of men	Days	Wage rate per day
Clearing virgin forest			
Clearing sec. forest			
Digging hole for plantain			
Planting plantain			
Planting other crop 1			
Planting other crop 2			
Planting other crop 3			
1st weeding			
2nd weeding			
3rd weeding			
Fertilizer application			
Chemical application			
Harvesting			
Harvesting crop 1			

Harvesting crop 2			
Harvesting crop 3			

24. Indicate the capital equipment /asset owned for your farming activities in the last growing season and their running costs for your plantain production

Equipment	**Quantity (in number)**	**Date of acquisition**	**Cost of acquisition (₦/one)**	**Expected life span**	**Cost of maintenance per week as applicable**	
					Repair	**Fuelling**
Cutlasses						
Hoes						
Axes						
Files						
Spade						
Basket/Sieve						
Sprayers						
Wheel barrow						
Tractor						
Others (specify)						
1.						
2.						
3.						
4.						

25. Kindly complete the following table on the source and cost of farmland used for your plantain production in the last growing season

Owned [ ] Purchased [ ] Rented [ ]

Land owned (ha)	Land rented (ha)	Cost of rentage per hectare	Total cost

26. Do you have access to credit facility? Yes ( ), No ( )

27. If 'yes' to question 30, kindly complete the table below:

Source of capital	**Yes**	**No**
Personal		
Friends/relatives		
Cooperatives		
Banks		

Local money lender		
Government		

SECTION D. SALES AND MARKETING

28. Please indicate the average quantity of plantain you produced/ha in the last growing season.

Produce	**Peak season**		
	Quantity (kg)/No of bunches Sole	**Quantity of bunches in Inter crop**	**Quantity consumed**
Plantain			
Other crop 1			
Other crop 2			
Other crop 3			

29. In what forms and prices do you normally sell your plantain after harvesting?

Forms of sale	**Response (Yes/ No)**	**Farm gate / Producers price (₦) /bunch**		
		Large	**Medium**	**Small**
Fresh unripe plantain				
Fresh ripe plantain				
Plantain chips				
Plantain flour				
Plantain balls				

30. Kindly indicate the value of other crops produced with plantain

Crop	**Quantity in bags/kg**	**Value (₦)**
Crop 1		
Crop 2		
Crop 3		
Crop 4		

31. Kindly indicate in percentage the proportion of your product you sell to the followings and the transportation cost incurred per bunch:

i. Farm gate
ii. Assemblers
iii. Wholesalers
iv. Retailers
v. Local market
vi. Urban market

32. At what price do you sell to each of the following participants per bunch?

i.Farm gate
ii. Assemblers
iii. Wholesalers

iv. Retailers
v. At local market
vi. At Urban market.

33. Where do you sell your plantain, how do they get to the market and who sells them?

Plantain	Location/ distance of sale (km)			Transportation mode[1]		Sales person[2]			Buyer[3]		
	Home stead	Farm gate	Market	Farm gate	Market	Home stead	Farm gate	Market	Home stead	Farm gate	Market
Fresh ripe plantain											
Fresh unripe plantain											
Others											

**Note: writing down distance (km) indicates someone sells product at that location if not it should be left blank*

1: 1=by foot, 2=bicycle, 3=motor cycle, 4=motorized vehicle, 5=animals (i.e. donkey), 6=others specify

2: 1=husband, 2=wife, 3=other adult male, 4=other adult female, 5=male child, 6=female child

3: 1=direct consumer, 2=processors, 3=traders.

SECTION E. GOVERNMENT POLICY

34. Do you pay tax/levy government at any level? ( ) Yes, ( ) No

35. If yes in question 38, please provide the following information

Level [a]	Items [b]	2011			2012			2013		
		No. Of time	Rate	Amount	No. Of time	Rate	Amount	No. Of time	Rate	Amount

a: 1-Federal, 2-State, 3-LGA, 4-Community, 5-Association, 6- Others (specify) _____

*b: 1-Facilities, 2-Income/Profit, 3-Transaction, 4-Feed Purchase, 5-Water use, 6-Others (specify)*_____

36. Do you receive subsidies from government in any form? ( ) Yes, ( ) No

37. If yes in above question 38, in what form and how much do you receive in a production period

Level [a]	Items [b]	2011			2012			2013		
		No. Of time	Rate	Amount	No. Of time	Rate	Amount	No. Of time	Rate	Amount

a: 1-Federal, 2-State, 3-LGA, 4-Community, 5-Association, 6- Others (specify) _____

*b: 1-Credit, 2-planting materials, 3-fertilizers, 4-Trainning, 5-chemical 6-Technical Assistance 7-Others (specify)*_____

38. What are the major challenges/constraint affecting the growth of your production?

Constraints	**Tick**	**Ranking**	**Perception of severity [b]**
Transport/Road condition			
Corruption/pilfering			
Storage			
Land accessibility			
Credit accessibility			
Man-power			
Training			
Marketing problem			
Others			

b: 1-Not severe, 2-Not very severe, 3-undecided, 4-Just Severe, and 5-Very Severe

APPENDIX 2
DEPARTMENT OF AGRICULTURAL ECONOMICS

VALUE CHAIN AND COMPETITIVENESS OF PLANTAIN IN SOUTHWESTERN NIGERIA.

PROCESSORS Questionnaire

Questionnaire code _____ Date of interview: _____

SECTION A. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

1	Zone:	
2	State:	
3	Local Govt. Area:	
4	Village:	
5	Sex: _____	Male=1, female=2
6	Marital status:	Single=1, Married=2, Separated=3, Divorced=4, Widowed=5
7	Age:_____(years)	
8	Level of Education:_____	No formal=0, Koranic=1, Adult literacy training = 2 Primary=3, Secondary =4, Tertiary=5.
9	Years of education_____	
10	Household size_____	
11	What type of processing system do you operate?	Small-scale=1, medium-scale=2, large-scale=3
12	How long have you been practicing the processing type as indicated in question 1	Small-scale……..years medium-scale…… years large-scale…… years

13. Social Assets: Membership in social groups

Groups	**Member (Yes/No)**	**Position held**	**Name of Group**	**Membership size**
Cooperative				
Informal work exchange group				
Savings and credit group				
Religious group				
Town union				
Occupational groups				
Social groups				
Plantain Farmers Association				
Others please specify				

SECTION B. PROCESSING/SYSTEM/TECHNOLOGY

14. Are there peak and low periods in plantain processing? ( ) Yes ( ) No

a. When is the peak period _____ to _____

b. When is the low period _____ to _____

15. What type of plantain (Variety) do you buy for processing? …….

Others (specify)_____

16. What processing method(s) do you use?

SN	Processing Method[a]	Location [b]	Collaboration (1-Yes, 0-No)
1			
2			
3			
4			

a. 1. -Frying, 2.-Sun drying, 3. Oven drying 7-Spicing, 8-Freezing, 9-Others (specify)_____

*b: 1-within business premises, 2-within locality, 3-other part of the state, 4-other part of country, 5-Others (specify)*_____

17. Do you have processing facilities? Yes ( ), No ( )
18. How did you acquire your processing facilities?

Method of acquisitions	**Type** [a]	**Installation capacity (tons)**	**Date of acquisition**	**Number of machines**	**Cost of acquisition (₦)**	**Rent (₦)**			**Maintenance cost**
						Hourly	Daily	Monthly	
Owned	1)								
	2)								
	3)								
	4)								
Rented	1)								
	2)								
	3)								
	4)								
Given / Inherited	1)								
	2)								
	3)								
	4)								

*a: -1, Drum oven-2, Mud oven-3, Charcoal oven-4, Electric dryer-5, Solar dryer-6, Gas oven-7. Cool Room- 8, Deep Frezer- 9., Cabinet smoking kiln-12, knives, Slicers, Others-13 (specify)*_____

SECTION C. INPUT USED IN PROCESSING

19. How did you acquire the place where you carry out your processing operations?

Method of acquisitions	Cost of land acquisition	Cost of building	Cost/month if rented	Expected life span	Cost of maintenance
Owned					
Rented					
Given/inherited					

20. Where do you obtain your plantain for processing (indicate in percentages)
    i. Farmers
    ii. Assemblers
    iii. Wholesalers
    iv. Retailers
    v. Others please specify
21. How many Kilogram (bunch) of plantain can your facilities process……, per day……., per week…….
22. What is the total cost of plantain you process per day/week……
23. Please indicate the average quantity of plantain processed by (per week) you in the last production cycle?

Products [a]	Peak season				
	Quantity (kg)	Unit price	Quantity in other local measure	Unit price	Quantity in other local measure

*a:1= plantain chips, plantain flour, plantain ballsothers (specify):others (specify):*_____

24. What type of package do you use? _____
25. How much do you spend on packaging per unit_____(Naira)
26. What is the source(s) of power to your processing facilities?

SN	TYPES [a]	COST PER CYCLE	COST PER MONTH
1			
2			
3			
4			

a: Charcoal-1, Firewood-2, Petrol-3, Diesel-4, Electric supply-5, Gas-6, Solar-7

27. Do you have a generator of your own? Yes ( ) No ( ). If yes complete the following below...

Date of Acquisition	Cost of Acquisition	Expected life span	Cost of maintenance (N)	
			Monthly repair	Fuelling per week

28. How much do you pay on electricity bill per month ₦ _____
29. How many days do you operate in a week? _____
30. Do you have access to credit? Yes ( ), No ( )
31. If yes in question 37, fill the following table accordingly…..

Source of capital	Amount (₦: K)	Interest paid per year	Year collected	Pay back year
Personal				
Friends/ relatives				
Cooperatives				
Banks				
Local money lend				
Government				

32. How many hours do you work in a day? _____
33. How many workers do you have, please specify:_____

	Professional			Unskilled		
	Children <18 years	Adult Male≥18 years	Adult Female ≥18 years	Children <18 years	Adult Male ≥18 years	Adult female ≥ 18 years
Number						
Monthly pay/person						
Weekly pay/person						
Daily Pay/ person						
Hourly pay/person						

SECTION D. SALES AND MARKETING

34. In what forms and prices do you normally sell your plantain after processing?

Forms of sale [b]	Response (yes = 1,	Farm gate / producers price (₦ : K)/kg

	No = 0)	Peak season

*a:1= plantain chips, plantain flour, plantain ballsothers (specify):*_____

SECTION E. GOVERNMENT POLICY

35. Do you pay tax/levy to government at any level? ( ) Yes, ( ) No

36. If yes in question 43, please provide the following information

Level [a]	**Items** [b]	**2009**			**2010**			**2011**		
		No. Of time	Rate	Amount	No. Of time	Rate	Amount	No. Of time	Rate	Amount

a: 1-Federal, 2-State, 3-LGA, 4-Community, 5-Association, 6- Others (specify)

_____

*b: 1-Facilities, 2-Income/Profit, 3-Transaction, 4-Feed Purchase, 5-Water use, 6-Others (specify)*_____

37. Do you receive subsidies from government in any form? ( ) Yes, ( ) No

38. If yes in question 45, at what level and how much do you receive in a year?

Level [a]	**Items** [b]	**2009**			**2010**			**2010**		
		No. Of time	Rate	Amount	No. Of time	Rate	Amount	No. Of time	Rate	Amount

a: 1-Federal, 2-State, 3-LGA, 4-Community, 5-Association, 6- Others (specify)

_____

*b: 1-Credit, 2-Feeds, 3-Fish seed, 4-Trainning, 5-Water use, 6-Technical Assistance 7-Others (specify)*_____

39. What are the major challenges/constraint affecting the growth of your production?

Constraints	Tick	Ranking	Perception of severity [b]
Water availability/supply			
Electric supply			
Corruption/pilfering			
Storage			
Land accessibility			
Credit accessibility			
Man-power			
Training			
Others (specify):			

b: 1-Not severe, 2-Not very severe, 3-undecided, 4-Just Severe, and 5-Very Severe

Thanks for your assistance

APPENDIX 3

DEPARTMENT OF AGRICULTURAL ECONOMICS

VALUE CHAIN AND COMPETITIVENESS OF PLANTAIN IN SOUTHWESTERN NIGERIA.

MARKETERS Questionnaire

Questionnaire code _____ Date of interview:_____ phone no……

SECTION A. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

1	Zone:	
2	State:	
3	Local Govt. Area:	
4	Village:	
5	Sex: _____	Male=1, female=2
6	Marital status:	Single=1, Married=2, Separated=3, Divorced=4, Widowed=5
7	Age:_____(years)	
8	Level of Education:_____	No formal=0, Koranic=1, Adult literacy training = 2 Primary=3, Secondary =4, Tertiary=5.
9	Years of education_____	
10	Household size	
11.	Are you a member of a cooperative society	*Yes =1 No =2*
12.	If Yes, which one	
13.	What type of plantain do you sell?	Fresh Ripe =1, Fresh unripe =2, Plantain chips =2, Plantain flour= 3 plantain balls = 4, Others (specify)= 5
14.	How long have you been into marketing of plantain? --------	
15	At what level of market do you operate?	Assemblers .....Wholesale level ( ) Retail level ( )

16. Social Assets: Membership in social groups

Groups	**Member (Yes/No)**	**Position held**	**Name of Group**	**Membership size**
Cooperative				
Informal work exchange group				
Savings and credit group				
Religious group				
Town union				
Occupational groups				
Social groups				
Plantain Farmers Association				
Others please specify				

SECTION B. MARKETING SYSTEM

17. Are there peak and low periods in Plantain marketing? 1. Yes 2. No

a. When is the peak period _____ to _____

b. When is the low period _____ to _____

SECTION C. INPUT USED IN MARKETING ACTIVITIES

18. How did you acquire this place you are carrying out your operations?

Method of acquisitions	Cost of land acquisition	Cost of building	Cost/month if rented	Expected life span	Cost of maintenance
Owned					
Rented					
Given/inherited					

19. Do you have your own means of transportation? Yes ( ), No ( )
20. If yes in question 25, in what form?

Forms	Year of acquisition	Cost of acquisition (₦)	Expected life span (years)	Maintenance cost per (₦)		
				Repairs/month	Fuelling/week	Other cost
Pick-up Van						
Lorry						
Motor-bike						
Bicycle						

21. Indicate the source and what you use and cost of getting your products

Source	Distance (km or Mile)	Method and cost of transportation per week.					
		By head (₦)	Bicycle (₦)	Motor bike (₦)	Pick-up (₦)	Lorry (₦)	Others please specify
From farm to store							
From farm to local periodic market							
From farm to local market							
From farm to urban market							

22. Kindly indicate the cost you obtain your produce from the following source and the transportation cost involved in moving a bunch of plantain:
    I. Farm gate
    II. Rural assemblers

III. Wholesalers
IV. Others please specify

23. How many days do you operate in a week in peak period? ----------

24. How many days do you operate in a week in off season? ……

25. Do you have access to credit? Yes ( ), No ( )

26. If yes in question 33, fill the following table accordingly.

Source of capital	Yes	No
Personal		
Friends/ relatives		
Cooperatives		
Banks		
Local money lend		
Government		

27. How many hours do you work in a day? _____

28. How many workers do you have, please specify:_____ (indicate for peak and low period)

	Professional			Unskilled		
	Children ≤15 years	Adult Male >15 years	Adult Female >15 years	Children ≤15 years	Adult Male >15 years	Children <15 years
Number						
Monthly pay/person						
Weekly pay/person						
Daily Pay/ person(loading and unloading)						

SECTION D. SALES AND MARKETING

29. In what form do you buy your plantain?

Forms of purchase	Quantity (week) in on season			Price at local market (₦) in on season			Price at the central market (₦) in on season		
	Very big bunches (number)	Big bunches (number)	Medium bunches (number)	Very big bunches (number)	Big bunches (number)	Medium bunches (number)	Very big bunches (number)	Big bunches (number)	Medium bunches (number)
Fresh ripe									
Fresh unripe									
Plantain chips									
Plantain flour									
Plantain balls									

30. In what form do you sell your plantain?

Forms of purchase	Quantity sold per week in on season			Price (₦: K) in on season		
	Very big bunches (number)	Big bunches (number)	Medium bunches (number)	Very big bunches (number)	Big bunches (number)	Medium bunches (number)
Fresh ripe						
Fresh unripe						
Plantain chips						
Plantain flour						
Plantain balls						
Others 1						
Other 2:						

31. State the quantity of your product you obtain from the following sources (indicate in percentages) :

i. Farmers
ii. Assemblers
iii. Others wholesalers

32. Who are your buyers*?*

Buy side (indicate the percentage they buy)	What do they purchase?
Individual consumer	
Processors	
Restaurant	
Others please specify	

33. Along with you marketing activities, which other business processes are included within your business's operations?

SN	Business Process [a]	Location [b]	Collaboration (1-Yes, 0-No)
1			
2			
3			
4			

a :1- production of plantain fruits 2- production of chips3- production of plantain flour , 4 production of plantain balls 6. -Others (specify)_____
b: 1-within business premises, 2-within locality, 3-other part of the state, 4-other part of country, 5-Others (specify)_____

SECTION E. GOVERNMENT POLICY

34. Do you pay tax/levy to government at any level? ( ) Yes, ( ) No
35. If yes in question 45, please provide the following information

Level [a]	**Items** [b]	**2009**			**2010**			**2011**		
		No. Of time	Rate	Amount	No. Of time	Rate	Amount	No. Of time	Rate	Amount

a: 1-Federal, 2-State, 3-LGA, 4-Community, 5-Association, 6- Others (specify)
_____
b: 1-Facilities, 2-Income/Profit, 3-Transaction, 6-Water use, 6-Others (specify)_____

36. Do you receive subsidies from government in any form? ( ) Yes, ( ) No

37. If yes in question 47, at what level and how much do you receive in a year?

Level [a]	**Items** [b]	**2009**			**2010**			**2010**		
		No. Of time	Rate	Amount	No. Of time	Rate	Amount	No. Of time	Rate	Amount

a: 1-Federal, 2-State, 3-LGA, 4-Community, 5-Association, 6- Others (specify) _____

*b: 1-Credit, 2-Trainning, 3-Water use, 4-Technical Assistance 5-Others (specify)*_____

38. What are the major challenges/constraint affecting the growth of your production?

Constraints	Tick	Ranking	Perception of severity [b]
Transport/Road condition			
Corruption/pilfering			
Storage			
Land accessibility			
Credit accessibility			
Man-power			
Training			
Others (specify):			
Others			

b: 1-Not severe, 2-Not very severe, 3-undecided, 4-Just Severe, and 5-Very Severe

39. How many hours do you spend in gathering the product especially for assemblers?

40. What is the percentage reduction in the price of plantain if there is no market i.e low patronage?

APPENDIX 4: Estimation of Export Parity Price for Plantain Fruit

Item	**Unit**	**Private Value**	**Social Value**

C.i.f at point of import ($)	$/Tonne	1,400	1,400
Deduct Freight	$/Tonne	32	32
Deduct Insurance	$/Tonne	14	14
F.O.B at point of export (Lagos)	$/Tonne	1,354	1,354
Exchange rate 1$ = ₦160	Naira/Tonne	160	158
FOB (Lagos)	Naira/Tonne	216,640	213,932
Deduct tariffs	%	-	-
Add subsidies	%	-	-
Deduct local port charges (7%)	%	15,165	15,165
0.5% National Export Supervision Scheme	%	1,083.2	1,083.2
Deduct local transport and marketing costs from project to point of export	Naira/Tonne	12,000	12,000
Equals export parity price at project boundary	Naira/Tonne	188,391.8	185,683.8
Deduct local storage	Naira/Tonne	-	-
Local transport and marketing cost	Naira/Tonne	4,000	4,000
Handling cost	Naira/Tonne	2,000	2,000
Equals export parity price at farm gate	Naira/Tonne	182,391.8/ton	179,683.8
		182.39/kg	179.68/kg

APPENDIX 5: Estimation of Export Parity Price for Plantain Chips

Item	Unit	Private Value	Social Value

C.i.f at point of import ($)	$/Tonne	8,112	8,112
Deduct Freight	$/Tonne	32	32
Deduct Insurance (1% of FOB)	$/Tonne	80	80
F.O.B at point of export (Lagos)	$/Tonne	8,000	8,000
Exchange rate 1$ = ₦160	Naira/Tonne	160	158
FOB (Lagos)	Naira/Tonne	1,280,000	1,264,000
Deduct tariffs	%	-	-
Add subsidies	%	-	-
Deduct local port charges (7%)	%	89,600	88,480
0.5% National Export Supervision Scheme	%	6,400	6,320
Deduct local transport and marketing costs from project to point of export	Naira/Tonne	5,000	5,000
Equals export parity price at project boundary	Naira/Tonne	1,179,000	1,164,200
Deduct local storage	Naira/Tonne	-	-
Local transport and marketing cost	Naira/Tonne	1,000	1,000
Handling cost	Naira/Tonne	1,000	1,000
Equals export parity price at farm gate	Naira/Tonne	1,177,000/ton	1,162,200
		1,177/kg	1,162.2kg

APPENDIX 6: Estimation of Export Parity Price for Plantain Flour

Item	Unit	Private Value	Social Value
C.i.f at point of import ($)	$/Tonne	5,993	5,993
Deduct Freight	$/Tonne	32	32
Deduct Insurance (1% of FOB)	$/Tonne	59	59
F.O.B at point of export (Lagos)	$/Tonne	5,902	5,902
Exchange rate 1$ = ₦160	Naira/Tonne	160	158
FOB (Lagos)	Naira/Tonne	944,320	932,516
Deduct tariffs	%	-	-
Add subsidies	%	-	-
Deduct local port charges (7%)	%	66,102.4	65,276.12
0.5% National Export Supervision Scheme	%	4,721.6	4,662.58
Deduct local transport and marketing costs from project to point of export	Naira/Tonne	5,000	5,000
Equals export parity price at project boundary	Naira/Tonne	868,496	857,577.3
Deduct local storage	Naira/Tonne	-	-
Local transport and marketing cost	Naira/Tonne	1,000	1,000
Handling cost	Naira/Tonne	1,000	1,000
Equals export parity price at farm gate	Naira/Tonne	866,496/ton	855,577.3
		866.5/kg	855.6/kg

APPENDIX 7: Estimation of Import Parity Price for NPK Fertilizer

Item	Unit	Private Value	Social Value
FOB at point of export ($)	$/Tonne	430	430

Add Freight	$/Tonne	32	32
Add Insurance (1% of FOB)	$/Tonne	4.3	4.3
c.i.f at point of import	$/Tonne	466.3	466.3
Exchange rate 1$ = ₦160	Naira/Tonne	160	158
C.i.f (Lagos)	Naira/Tonne	74,608	73,675.4
VAT (5%)	%	3,730.4	3,683.77
Add tariffs	%	-	-
Deduct subsidies	%	-	-
Add local port charges (7%)	%	5,222.56	5,157.28
Add local transport and marketing costs		15,000	15,000
Price at the market		98,560.96	97,516.45
Deduct local transport and marketing costs from project to point of export	Naira/Tonne	0	0
Deduct local storage	Naira/Tonne	0	-
Local transport and marketing cost	Naira/Tonne	2,000	2,000
Handling cost	Naira/Tonne	0	0
Equals import parity price at farm gate	Naira/Tonne	96,560.96/ton	95,516.45/ton
		96.56/kg	95.52/kg

APPENDIX 8: Estimation of Import Parity Price for Insecticides

Item	Unit	Private Value	Social Value
FOB at point of export ($)	$/1000 litre	1,750	1,750

Add Freight	$/Tonne	32	32
Add Insurance (1% of FOB)	$/Tonne	17.5	17.5
c.i.f at point of import	$/Tonne	1,799.5	1,799.5
Exchange rate 1$ = ₦160	Naira/Tonne	160	158
C.i.f (Lagos)	Naira/Tonne	287,920	284,321
VAT (5%)	%	14,396	14,216.05
Add tariffs	%	-	-
Deduct subsidies	%	-	-
Add local port charges (7%)	%	20,154.4	19,902.47
Add local transport and marketing costs		10,000	10,000
Price at the market		332,470.4	328,439.5
Deduct local transport and marketing costs from project to point of export	Naira/Tonne	0	0
Deduct local storage	Naira/Tonne	0	-
Local transport and marketing cost	Naira/Tonne	2,000	2,000
Handling cost	Naira/Tonne	0	0
Equals import parity price at farm gate	Naira/Tonne	330,470.4/1000L	326,439.5/1000L
		330.5/L	326.4/L

APPENDIX 9: Estimation of Import Parity Price for Herbicides (1000L)

Item	Unit	Private Value	Social Value
FOB at point of export ($)	$/Tonne	1,000	1,000

Add Freight	$/Tonne	32	32
Add Insurance (1% of FOB)	$/Tonne	10	10
c.i.f at point of import	$/Tonne	1,042	1,042
Exchange rate 1$ = ₦160	Naira/Tonne	160	158
C.i.f (Lagos)	Naira/Tonne	166,720	164,636
VAT (5%)	%	8,336	8,231.8
Add tariffs	%	-	-
Deduct subsidies	%	-	-
Add local port charges (7%)	%	11,670.4	11,524.52
Add local transport and marketing costs		10,000	10,000
Price at the market		196,726.4	194,392.32
Deduct local transport and marketing costs from project to point of export	Naira/Tonne	0	0
Deduct local storage	Naira/Tonne	0	-
Local transport and marketing cost	Naira/Tonne	2,000	2,000
Handling cost	Naira/Tonne	0	0
Equals import parity price at farm gate	Naira/Tonne	194,726.4/1000L	192,392.31/1000L
		194.73/L	192.39/L