ECONOMIC ANALYSIS OF OIL PALM PRODUCTION VALUE-CHAIN IN IMO STATE, NIGERIA

THESIS

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Preface

For whatever has a beginning, surely has an end. In a world marked by ever-changing economic landscapes, and emphasis on sustainable development, the study of agricultural value chains plays a pivotal role in understanding the dynamics of rural economies. The oil palm production value chain in Imo State, Nigeria, stands as a significant contributor to the state's economic growth and social fabric. As an individual passionate about exploring the intricate relationship between agriculture and economics, this study served as a guide to understanding this aspect of agriculture in Imo State.

This thesis, titled "Economic Analysis of Oil Palm Production Value Chain Actors in Imo State, Nigeria," delves deep into the various components of the oil palm industry, and the profit margin for the key value chain actors. By examining the complexities of this value chain, I aim to gain insights into its socio-economic impact on local communities, as well as its broader implications for rural economic development.

The backdrop against which this research unfolds is Nigeria's diverse agricultural landscape and its position as one of the leading producers of palm oil globally. Imo State, with its rich natural resources and vast agricultural potential, serves as an ideal setting to study the economic intricacies of the oil palm production value chain.

I would like to express my deepest gratitude to my advisors "Dr Titik Ekowati and Prof. Florentina Kusmiyati, for their invaluable guidance, Dr Siwi Gayati for her unwavering patience, and scholarly insights throughout my academic endeavour. Their mentorship has been instrumental in shaping the structure and focus of this research. I would also like to extend my gratitude to the entire team of the University of Diponegoro for the scholarship award, whose dedication to impacting knowledge played a pivotal role in my academic growth.

Additionally, this thesis would not have been possible without the cooperation and support of farmers, processors, traders of oil palm and other stakeholders in the value chain. Their willingness to share their experience helped in providing a comprehensive understanding of the economic dynamics within the oil palm sector.

I am also indebted to my parents, siblings (Ikenna, Chidimma, Ogonna, Chineye), nephews and nieces for their support and unending love. Always believing in my abilities even when I have the least faith. Their belief in my abilities strengthened my academic and professional pursuit.

It is my ambition that this thesis contributes to the existing body of knowledge on oil palm production and serves as a resource for individuals who seek to foster sustainable development and economic growth not only in the state but Nigeria at large.

Dedication

To God Almighty, who made this dream possible and in the memory of my sister, Rita Ifeoma Adikaibe whose absence in my life cannot be replaced.

Abstract

The demand for oil palm products abounds with opportunities and challenges to sustainable economic growth in developing economies like Nigeria. Although discovery of crude oil shifted the focus of Nigeria from agriculture. There has been different government intervention to improve this sector of agriculture in Imo state. There is need for economic diversification and food security for the teeming population. The study took into consideration three key plays in the oil palm value chain which are farmers, processors, and traders. Research questions addressed where the structure of the oil palm value chain, the methods used by the processors, the profit at each stage of the chain assessed and the factors affecting the actors. The objectives of the study were built from the research question and the following were the findings. Structured questionnaires were adopted for data collection, the data were sampled randomly to draw up a sample size. The data collected, were analysed using functional analysis, value chain mapping, descriptive statistics, and multiple regression techniques. The value chain actors were not in their productive age as the mean ages were 57 years, 47 years and 45 years for the farmers, processors and traders respectively. There is gender disintegration as both were found across the value chain. Educational attainment among the actors was till secondary education. The findings revealed that the actors of the value chain were family oriented as 75%, 69% and 65% of the farmers, processors and traders were married. The functions of the value chain actors were categorized into production, marketing, value-addition and consumption. The oil palm processing is dominated by smallholder processors, who still use the traditional method in processing resulting to low production efficiency. The profitability ratio of the value chain actors was 0.30, 0.11, and 0.25 for the farmers, processors and traders respectively, in Imo State. Factors affecting the profit of the farmers was land cost for the farmers had an influence on the profit of the farmers. The transportation cost and energy cost and water for the processors, and purchasing costs had significant influence on the profit of the traders at 5% interval. The identified opportunities in the value chain are job creation, increased demand for the products of oil palm, economic diversification, value chain integration and collaboration with other stakeholders, export potential and Interventions from governments and investors across the globe. The government should reform the land tenure system, ensure continuity in policies, make agriculture an occupation for all, ensure security and minimize the civic unrest. In summary, the study has shown the potential and the limitations faced by the value chain actors of oil palm in Imo State, Nigeria

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CHAPTER I

INTRODUCTION

1.1 Background Study

Agriculture creates employment opportunities for 70% - 75% of the working population and contributes about 20.9% of Nigeria's total gross domestic product (Ajekwe and Ibiamke, 2020). The climatic conditions, rich and fertile soil, high population density and available water resources provides great potentials for cash and food crops productivity in Nigeria. These cash crops include oil palm, cashew nuts, tobacco among others (Olasehinde, 2015). Prior to the Oil boom, Nigeria was considered as the largest global producers of palm oil, but has recently been overtaken by Malaysia and Indonesia as the largest producers in the globe.

Oil palm is a tropical lowland crop that originated in the tropical rain-forest region of West Africa (Zeven, 1965; Agboola, 1979; Hartley, 1988; CTA, 1998). It is a monocotyledonous tree that belongs to the family of *Palmae*, which implies that it has separate inflorescences (male and female flowers) growing on the same plant. The plant adapts very well to all types of soil, provided that they do not restrict movement of water from the soil surface to the roots of the plant. It has a fibrous root system and benefits from deep soils nutrients. This tropical cash crop is important because it has been proven it could serve as a means of livelihood for many rural families (Komolafe *et al.,* 2020).

Every part of Oil palm is economic, and serves as raw materials for industries. The fond is being used in making broom and baskets, the stem serves as source of fuel for the rural households, and in most times, farmers use the dry fonds as a mulching material to prevent weeds. The oil palm fruit is an oval-shaped drupe, 2,5 by 5cm and with a diameter of about 2,5cm (Akinniran *et al.,* 2013). The oil palm (*Elaeis guineensis*) produces palm oil which is a dominant source of vegetable oil consumed in the world (USDA, 2007). Palm oil is the most widely used vegetable oil in the world, accounting for more than 35% of all vegetable oil production, followed by soybean oil (28%), rapeseed oil (12%) and sunflower oil (9%) (FAOSTAT, 2021). On the context of this research, the major focus will be on "Palm oil" as it is a major product of Oil palm that meets the primary need of man.

This vegetable oil is an extract from the mesocarp of Oil palm fruit, hence it is regarded as Palm Oil. It is a vital supplement to most of the Nigerian diet and at the same time, serves as a raw material for manufacturing industries. According to Adebo *et al*. (2015) Palm oil is the main edible vegetable oil produced and consumed in most Nigeria's diet. Oil palm produces up to ten times more oil per unit area than other oilseed crops (Murphy, 2019). It is rich in carotene and serves as a primary raw material in production of soap, detergent, margarine, resin and additives in livestock feed to supplement vitamins. The Oil palm is a significant cash crop in the agricultural sector in Nigeria. The agricultural sector contributes to about 25% of the National Gross Domestic Product (Price Waterhouse Cooper, 2017). Different policies have been implement to improve the agricultural sector in

Nigeria, specifically on food security and sufficiency; however, this sector is still largely underdeveloped and focused on production instead of enhancing value addition across the value chain segments (Price Waterhouse Cooper, 2020).

The Value Chain is a chain of activities where products pass through all activities of the chain in sequence, and at each activity, the product gains some value (Russell & Hanoomanjee, 2012). It entails all the activities required to bring a product or service from the conception stage till it gets to the final consumer. These activities are governed by different actors which includes; Input supplier, producers, processors, wholesalers and retailers performing the following respectively; produce, transform, store, transfer or market the value at each step in the process (Campbell, 2006). In agricultural sector, they are thought to be from "farm to fork".

Value Chain Analysis is a multi-dimensional assessment of the performance of value chains, including the analysis of product flows, information flows and the management and control of the value chain (Taylor, 2005). The purpose of the value chain analysis is to comprehend and describe the various actors and their economic performance at each node of the production chain (Anane-Taabeah *et al.*, 2016; Macfadyen *et al.*, 2012). It has the potential to identify interventions the benefit of the poorest, least power actors (Mitchel and Coles, 2011). Value chain analysis provides a practical framework to analyse the functioning of the chains that link production systems, trading sites, and consumers, with particular attention to the

stakeholders' interactions, practices, and motivations (Kaplinsky and Morris, 2001; Taylor and Rushton, 2011).

1.2 Problem Statement

The rise in demand for oil palm products presents great business opportunities for farmers and other value chain actors and can support broader economic development through employment generation, poverty reduction, food security and nutritional benefits. The sustainable development of this sector can play a significant role in raising the incomes and livelihoods of families who depend on the oil palm business for their livelihood. According to Adebo *et al.* (2015) posited that palm oil processing has brought about improvement in the income and standards of living of rural dwellers in the state where he carried out his research. He incited that over 95% of the respondents depend on this as a means of livelihood.

There are various actors in the oil palm value chain and these actors operate at several stages of the value chain depending on their capacity. The oil palm value chain is characterized by different actors who play significant roles and are linked to other stages in the chain. However, there is still dearth of information on the extent of value addition as well as profit margins in the different palm oil production in the State. The various functions these actors perform and their links in the oil palm value chain, as well as, the distribution of gains within the chain in Imo State

is not yet fully ascertained empirically, because, it is not well understood who actually benefits from the higher prices that consumers pay for oil palm products. It is not known empirically, if it is beneficial for oil palm farmers to produce the palm fruits only, or if they should be encouraged to add value by processing and marketing into other products. Understanding the costs and returns to oil palm production and other stages from production until the final market can help policymakers understand the incentives for production and processing, as well as the incentives for improvement in each stage.

The following research questions will be assessed

1. What is the structure of oil palm value-chain in Imo State?
2. What are the different processing methods adopted by the processors in Imo State?
3. What are the cost and returns associated with each stage of the value-chain in Imo State?
4. What are the factors affecting profit earned by oil palm value chain actors in Imo State?

1.3 Objectives

The broad objective of the study is to analyse the economics of oil palm value chain in Imo State.

The specific objectives of the study are to;

1. Describe the structure of the Oil palm value-chain in Imo State;

2. Identify the different processing method adopted by the processors in Imo State;
3. Analyse the costs and returns associated with each stage of the Oil palm value chain;
4. Analyse the factors affecting profits of the value chain actors in the study area;

1.4 Hypothesis

The study will test the following null hypotheses;

1. The profit earned by the Oil palm farmers in the Oil palm value chain is significantly influenced by price of Land ownership, price of herbicide, price of implements upon depreciation, price of labour, price of transportation.
2. There is a significant difference in the profit earned by the Oil Palm processors in the different processing method adapted;
3. The factors affecting the Oil Palm Traders in the value chain actors do significantly influence the profit generated

1.5 Significance of the study

This study will contribute to literature in three ways. First, the study will stimulate discussion on the need to develop a framework and indicators for inclusive participation of low-income groups in all economic activities specifically the Oil palm unit of the agricultural sector. This will help to bring optimum oil palm production in the study area, as well as distribution of the profits in the value chain.

Secondly, it will provide information on the factors and constraints curtailing the adoption of innovations in the oil palm fruit processing sector in Nigeria and the physicochemical properties of palm oil produced by the small-scale processors. It will translate to higher production scale of the oil palm production in the study area as the potential investors will have blue-prints of the unit taking into consideration the recent changes in the agricultural sector of the economy. The increased agricultural output will result to surplus supply which can decrease the food prices in the study area. Researchers, students and investors will benefit from this research as it will serve as a stepping stone for further studies on Oil Palm production.

And lastly, the study will result to opening a new dimension for value chain actors and policy makers on how to increase their production efficiency after identifying the major cost drivers that affect their profit. The factors identified by the actors as the mitigation to their profit will serve as point of intervention for the actors, and a basis for policy makers that will bring about economic prosperity and growth for the teeming population.

CHAPTER II

LITERATURE REVIEW

2.1 Concept of Oil Palm

2.1.1 Oil Palm

Oil Palm (*Elaeis guineensis Jacq*) is a perennial monocotyledonous plant originated from West Africa, but thrives in tropical and subtropical regions with low land latitudes of 300-400m. It is an un-branched tree that grows up to 20meters high, the leaves are produced in a spiral succession through the meristem. The roots are found in the top 15cm of the soil, with a main concentration near the palm and a secondary concentration 1.5 to 2m from the base (Verheye, 2010). It is known to produce unisexual male and female inflorescences in an alternating cycle (Barcelos *et al.*, 2015). These Inflorescences produced are usually enclosed during their development by spathe, a large bract, which is ruptured just before the maturation of the flower. This Oil Palm can be found in both wild and plantations (Nwaugo *et al.*, 2008; Ohamain and Izah, 2013).

The mature oil palm plant possesses an impressive crown of 30 to 45 green leaves, each 5-9m long at the top of a trunk bearing old leaf bases arranged spirally (Kochhar, 1976; Opeke, 1992; CTA, 2000). It takes about 5 – 6 months from flowering to harvesting of the fruits of the oil palm. The fruit bunch is tightly wedged in the leaf axil of the palm. A bunch of a mature palm contains 1,000 to 4,000 fruits, depending on the tree's age and vigor (Verheye, 2010). Oil palm fruits

are available year-round and have served as semi-wild food resources in traditional societies for > 7000 years (Murphy, Goggin and Paterson, 2021). The palm oil which is a product generated after processing Oil palm fruit is one of the most oil-bearing plants in the world and it has diverse uses (Sylvester and Izal, 2016).

2.1.2 Oil Palm Cultivars

Oil palm is known to be monoecious plant and cross pollinated, individual palms are usually very heterozygous; and vegetatively propagated clonal material cannot be made (Verheye, 2010). Therefore, the classification of oil palm is not based on their botanical features rather on their commercial value and the fruit structure. There are four most common cultivars which are according to Verheye (2010); Pisifera, Dura, Macrocaria, and Tenera.

1. Pisifera: This cultivar has a pre-maturation timing because the flowers rapture off before maturity. It has high commercial value, and is shell-less, with small pea-like kernels in fertile fruits (Verheye, 2010). It is most prevalent for commercial cross-breeding because of this distinctive feature of early maturation.
2. Dura: This is characterized with a thick endocarp of about 2-8mm thickness. Dura cultiva has a medium mesocarp content of about 50% by weight of the fruit size. It takes a longer time to mature and is prevalent to fungal diseases that affect palms (Ekwenye & Okpokwasili, 2006).

3. Macrocaria: This is an extreme wild form of the dura species. It does not have any economic value because the oil-bunch content of the fruit is significantly less than 40%. Macrocaria has an endocarp of about 6-8mm thickness and is commonly found in Nigeria and Sierra Leone (Corley & Tinker, 2003).
4. Tenera: This is a cross-breeding of the dura and Pisifera cultivar. It bears the unique feature of these cultivars. Tenera has high commercial values compared to other cultivars of the oil palm. It has a thin endocarp of about 0.5-3mm thick is about 1 – 32% of the weight of the fruit with a medium to high mesocarp thickness of about 60 – 95% of the weight of the fruit and their kernel weighs about 3 – 15% of the fruit (Alvarado *et al.*, 2007).

2.1.3 Oil Palm Production

According to Hamweete (2012), he identified the following below as the management practices involved in the oil palm production. They are as follows;

1. Land Preparation: Prior to land preparation should be identification of the soil type. The soil suitable for Oil palm production must be loam-sandy soil and acidic. In the Land preparation, it entails cutting down grasses or trees that may obstruct growth, and use the debris as mulching material. Do not till the land, instead dig holes on the spots where the oil palm seedlings will be planted.

2. Transplanting of the seedlings: This is best done during rainy seasons. The seedling spacing should be 9 meters between plants and 8 meters between rows spacing. After transplanting, make 20cm radius basins and increase to 70cm basins in the subsequent years.
3. Post-planting Activities; Herein, it includes fertilizer application, pruning, weed and pest control, and irrigation.
    a. Fertiliser Application: The frequency of fertilizer application varies based on the soil fertility and the farmer's preference. However, the most commonly applied is the NPK for the first three years of the plant life cycle. The fertilizer can be evenly distributed or 20cm radius away from the plant.
    b. Pruning: Although, this has its disadvantages like the plant becomes too tall and produces fruits at greater height. However, its advantage lies in improving water capillary to the health parts of the plant, and pruning also helps to prevent disease infections.
    c. Weed and Pest control: The protection of the plant can be carried out in several ways either using chemicals, biological or adapting cultural method to eliminate and manage pests and weeds that hinders the growth of the plant.
4. Harvesting: The plant starts yielding between the age of 4-7 years depending on the cultivar being grown. The bunches are being harvested using sickles or axes. Averagely, 4 – 5 fruit bunches per palm per cycle for a palm aged

4 to 9 years; 2.2 litres of oil per bunch weighing 10-15kg are further harvested after processing the fruits to oil.

2.2 Oil Palm Development

2.2.1 Oil Palm Development in Nigeria

According to Statista (2017), Nigeria and other West Africa countries have generally been stagnated or subjected to critical fluctuation of palm oil production, which is a major source of income and employment to a substantial proportion of the rural populace in the southern part of the country. Oil Palm is a known means of foreign exchange for majority of the countries where it grows especially Indonesia and Malaysia. The oil palm development in Nigeria has been slow, despite being the world leading producers in the 1960's. With the discovery of crude-oil in 1958, it led to loss of focus on the agricultural sector by the leaders. This has led to the slow growth and development of the agricultural sector as a whole, not narrowed to Oil Palm.

According to WRM (2001), eighty percent (80%) of palm oil production in Nigeria comes from smallholder farmers, who still depend on semi-wild plant and use manual processing technique; which apparently is different from the practice of monoculture and industrial processing technique practiced by the present world leading producers (Malaysia and Indonesia). In a recent research, Biodun *et al.*, (2020) also posited that in Nigeria, over 80 percent of farmers in the Oil palm production unit are small-scale farmers. The Oil Palm can be grown in over 20 states out of the 36 states in the country. These states are suited at the southern path of the country. They are characterized with tropical features required for the plant

to thrive well. The primary product for oil palm production in Nigeria has been the vegetable oil which is considered as an export commodity.

2.2.2 Methods of Oil Palm Processing in Nigeria

Oil palm processing is the extraction of oil and separating other products from the oil palm fruit. It is often a tedious process in Nigeria. During this processing of Oil palm fruit, the major purpose of the processor is to extract the palm oil, and then other products will follow suite. In this paper, the method of processing oil palm will be divided into two categories; which are

1. **Indigenous Method**: This is method is very labourous. Herein, the palm bunches are splatted into quarters, and left for 24hours for easy removal of the nuts from the spikelets. Upon removal, the fruits are boiled for about 50-70minutes, pounded or macerated with feet in a mapped out wooden container. Water is added and well-shoveled up as all nuts are carefully removed using hand. The fibres are well-shaken over in the sludge until oily foam floats to the surface of the sludge. The foams continue to collect in a container until the operation is completed. This is later boiled in pot for about 30-40 minutes. Uguru (1996), observed that delay in the processing of fruits can lead to increase in free fatty acid (FFA) content of palm oil and this causes a drop in quality. The clean edible oil then collects on the surface of the sludge leaving the dirty oil at the bottom of the pot.
2. **Mechanized Method:** This is a modern way of processing oil palm, to separate the different products of oil palm into desirable needs of the

processor or targeted consumer. According to CTA (2000) this modern method of oil palm processing uses simple machineries as pressers to more sophisticated palm oil mill in processing fresh fruit bunch (ffb) into palm oil and other products. The main advantage of increasing mechanization will normally be reduced labour input per unit of land area or unit yield or increased output per man-hour (Ukwuteno, 2011). In this mechanized method, it entails series of operational processes that are technical to arrive at the desired products of the oil palm fruit. The operational processes are listed below according to CTA (2000);

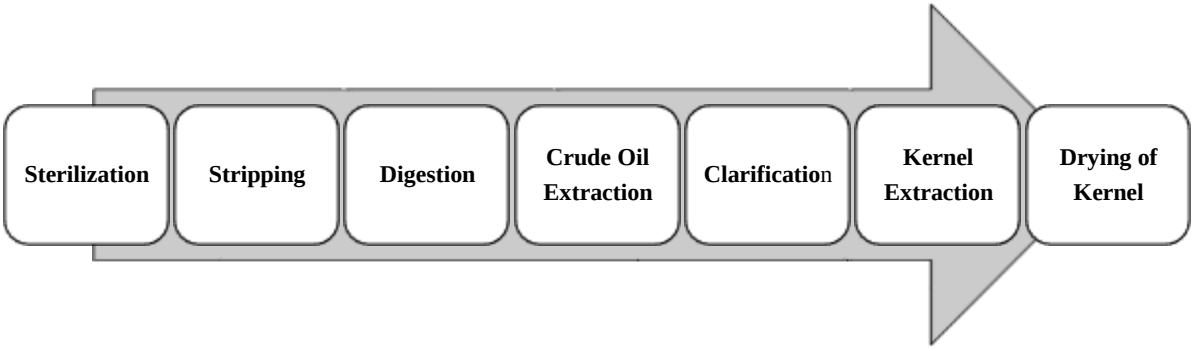


Figure 2.1: Operational Processes for Oil Palm Production

2.3. Palm Oil Marketing

2.3.1 Palm Oil Marketing

Palm oil marketing is concerned with all stages of operation that aid movement of the produce from the producer to the final consumer which include assemblage, storage, transportation, grading and financing (Ezealaji, 2012). It is a major source of income for individuals who are involved in this sub-sector. Pricing is an essential factor to consider during the marketing of Oil Palm. The price of the product is often affected by so many factors incurred during the production of the product. After processing the palm fruits, packaging is done using kegs, tins and drums before the onward transmission to different places and markets within the reach of the final consumers (Ojo, Ojo and Usman, 2014). The major distribution point for oil palm products are the village markets This point for the sales of the product is usually characterized with activities like trading associations or unionism - which does not permit free entry into the business of palm oil marketing. Individuals who are selling the products are being compelled to pay levies, dues and taxes to be members of this unionism or association. This additional cost incurred is being inputted as the total cost of production for the product. Additionally, members of the association tend to fix and determine the prices of the product.

2.3.2 Marketing Margin

Marketing margin can be characterized as a distinction between the price paid by consumers and that got by producers; or as the price of an assortment of marketing administrations that is the result of the demand for and supply of such administrations. It tends to be a valuable descriptive statistic in the event that it is utilized to show how consumers' use is split between market members at various levels of the marketing frameworks (Syeda, 2013). Marketing margin estimates the portion of the final selling price that is caught by a specific specialist in the marketing chain. The size of market margins is to a great extent reliant upon a blend of the quality and quantity of marketing administrations, given the expense of offering such types of assistance, and the effectiveness with which they are attempted and priced. For example, a major margin may bring about next to zero benefit or even a misfortune for the dealer included relying on the marketing costs just as on the selling and purchasing prices. Estimating this margin demonstrates what amount has been paid for the preparing and marketing administrations applied to the product(s) at that specific stage in the marketing interaction (Akwasi *et al.*, 2019).

As indicated by research, marketing margins give just one perspective in the assessment of execution and ought to be contrasted and proportions of benefits procured by marketing firms to decide if or the margins are exorbitant. When there are a few members in the marketing chain, the margin is determined by discovering the price varieties at various fragments and then contrasting them with the final

price with the customer. Shopper price is the base or shared factor for all marketing margins (Tadesse, 2012).

2.4 Financing of Production in Nigeria

Financing oil palm projects is a very capital-intensive investment. It is a process by which funds are set aside to carry out projects that will improve the productivity of palm oil in the nation. The post-independence of Nigeria, has witnessed different financing measures targeted at improving the production of palm oil, which is among the cash crops that contributed and formed the foundation of Nigeria economy before the oil boom in 1958. There have been different developmental plans set aside by the Government since 1950 that have targeted at improving the agricultural productivity with oil palm production in Nigeria.

1. The Plantation, Innovation and Settlements Policies; These policies came into existence between the mid 1950's and 1960's. The plantation policy was adapted for expansion of commodity trading and also to meet the competition of oil palm plantation between Malaysia and Indonesia. The plantation used the good seeds that yielded more fruits than before (Udo, 1965). The innovation of agriculture in Nigeria started in 1960 after independence. The government's vision was to fund agriculture, improve farming and form farm settlements as African socialism (Shehu *et al., 2021*). The settlement scheme was located in the southern part of Nigeria. The plantation, Innovation and Settlements policies scheme was given more

consideration due to oil palm plantation, and its mixture with food crops and rubber (Korieh, 2010). Therein, the government collectively carried the farmers, trained and assisted them with new seedlings to plant so as to overwhelm the farmers' scattering to improve agricultural productivity. There was no doubt about the increased foreign earnings from this policy. However, the government had enough to export, but paid little attention to the native people and farmers that were interested and motivated for the farming and development of the country (Korieh, 2010).

2. Structural Adjustment Programme: This policy came into existence during the military and civil regime in Nigeria. The effects of the civil war between 1967 to 1970 and boom of crude oil degraded the plantation scheme, and settlement scheme that geared towards improved agricultural production. The Palm Oil Marketing Board was abandoned due to the implementation of Structural Adjustment and reduced the government participation and subsidy in the oil palm production (Schoneveld, 2014). The government paid no attention in improving the agricultural sector. However, the structural adjustment programme was introduced which resulted in the devaluation of the Nigeria Naira by over 80% leading to increased cost of living and agricultural products. The civil war in Nigeria caused the decline of the agricultural sector, in particular palm oil (Shehu *et al.,* 2021).
3. Civilian Policies: These policies came into function from 1999 after the democracy in Nigeria till date. Different governments have come up with

different policies all in the bid to improve agricultural productivity for the teeming population in Nigeria. In 1999, due to the military regime transition to civilian rule, privatization policy was introduced from 1999 to 2007 to privatize resources under federal government administration (Shehu *et al*., 2021). This was attained through sanctions on fats and oils import, offered subsidy on fertilizer, and assured free tax for ten years on agriculture. However, Anyanwu *et al.,* (2011) posited that the policy faced challenges of insufficient finance, ineffectiveness, using an old machine to process, lack of frequent power supply, and the road network was very poor. Subsequent Governments have implemented different policies for agricultural productivity as a whole with no specificity on plantation agriculture like the oil palm. However, these developmental plans have not been actualized because of the crude oil discovery, corruption and the one-centred system of economy that is practiced in Nigeria.

2.5 Economic Importance of Oil Palm in Nigeria Economy

The importance of oil palm in economic development and growth in Nigeria cannot be over-emphasized. Oil palm is a tree crop which has both social and economic value (Usoro, 1974; Uguru, 1996; Wakker, 2004). This cash crop has fed millions, employed people and generated billions in dollar income for the private sector including producers, trading companies, financial institutions, wholesalers and retailers in the sector. Oil palm trees in recent times serve aesthetic purposes

and are also planted to help in carbon sequestration as a way of managing climate change.

The value-added products of Oil palm have brought environmental and social impacts in the economy. There has been rapid deforestation in order to establish plantations on a private basis that destroys wildlife, this indirectly contributes to the anthropogenic causes of climate change in the country. Dozens of people have been killed because of land clashes over ownership of plantations, this has been attributed as the environmental impacts of Oil palm in Nigeria. The impact of factory effluent is not being felt in Nigeria, since large-scale palm oil mills are not common.

Every product of oil palm is very useful to man either for direct consumption or for industrial purposes. Palm oil is the major product of oil palm processing. This is one of the commonly used vegetable oils in the world. It contributes to the diet of most Nigerian food. This oil is rich in carotene which makes it a good vitamin, needed by everyone for a clear vision and skin. This palm oil is also used as a primary product in manufacturing industries for soap making, margarine, cream, detergents and many more.

The palm kernel Oil also derived from oil palm is often used in making local cream and can as well, be used for candle and wood polish when mixed with a cohesive substance. Upon extraction of the palm kernel oil, a new product that is being referred to as palm kernel cake is being formed and it is often used as feed additive for livestock feed, considering its richness with fats & oil. The leaves, rachises and petioles of the oil palm are made into thatches for roofing buildings.

The trunk form excellent timber when sawn and are used as rafters in buildings. The brooms for sweeping are made from the leaf midribs and the terminal shoot has some religious relevance in most churches (Corley *et al.,* 1976; Hartley, 1988). The trunk of the oil palm most times serves as a source of cooking fuel for the rural households.

2.6 Concept of Value Chain

The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2001).The production stages involve a blend of actual change and the support of various makers and administrations, and the chain incorporates the product's disposal after use. Instead of the customary restrictive spotlight on production, the concept weighs on the significance of value option at each stage, consequently regarding production as only one of a few value adding parts of the chain (Asem-Bansah *et al.,* 2012). The concept of value chain includes the issues of association and coordination, the procedures and the force relationship of the various entertainers in the chain. The value chain concept was first communicated and clarified by Michael E. Porter in 1985 in his book, 'Competitive Advantage: Creating and Sustaining Superior Performance', in which the key component was the value chain model. As indicated by the model, value is added

at every stage in a chain of interconnected exercises, as every item or administration goes through various interconnected exercises.

A USAID (2006) instructions paper on "The Value Chain Framework" depicts five components in the value chain that remembers every one of the farms for the chain: (1) end markets; (2) business and enabling environment; (3) vertical linkages; (4) horizontal linkages; and (5) supporting markets (Agbehadzi *et al.*, 2019). End markets are customers that decide the value, quality, and amount, and so on of an item. The business and enabling environment, at neighbourhood, public and global levels, incorporates laws and guidelines, and public foundation, for example, streets and power that either work with or prevent the development of an item. Vertical linkages between farms, at various levels of the value chain, guarantee proficient development of an item to the end market, and increment the competitiveness of the whole subsector. Working with mass buying horizontal linkages (like associations), among farms performing comparative capacities, decreases the exchange costs for the purchasers of numerous little providers. Supporting markets that incorporate monetary support services and area explicit services is vital to overhauling the farms. Support services can be given by entertainers in the chain, or by stand-alone specialist organizations (Asem-Bansah *et al.,* 2012).

The value chain portrays the full scope of exercises which are needed to bring a product or administration from origination, through the various periods of creation (including a mix of actual change and the contribution of different maker

administrations), conveyance to conclusive purchasers, and last removal after use. In addition, there are scopes of exercises inside each connection of the chain (Fig 2.2). Support service given by the actors in the chain tends to be implanted, with the end goal that the expense of the assistance is incorporated into the business exchanges. Value chain involves the full scope of exercises, which are needed to get an item administration from conception, through the various periods of creation (including a mix of actual change and the contribution of different maker services), conveyance to definite purchasers, and last disposal after use (FAO, 2004).

2.7 Conceptual Framework

According to Eboh (2009), a concept is an idea, thought or devolution of an abstract system of thoughts, by which science investigates, interprets and understands particular segments of reality or phenomena. Concepts have meaning only within some frame of reference, which is the thought framework within which is placed (Eboh, 2000). The idea and thought about this study lies in the fact that the agricultural sector is very significant in developing the economy, however, the present Nigeria has neglected this sector because of the presence of Oil as a natural resource. The share of oil palm in the contribution of agriculture to the economy of Nigeria averaged about 43 percent of the entire export earnings during the 1960s to early 1970s (WRM, 2001). However, at present time it can only contribute 1 percent of the global demand for palm oil. This sharp drop from 43 per cent to 1 per cent may be attributed to increase in population, the negligence of the government to

agriculture as a result of the oil boom; thereby failing to contribute to research, development and improving of this sector significantly.

Evidently, this economic tree experiences the law of diminishing return. Understanding the value chain structure of Oil Palm, the role of the different actors in the chain and the profitability of each actor in this unit of agriculture in Imo state, Nigeria is paramount. It will help scale up privatization and research for a more innovative approach towards oil palm as an economic tree. The socioeconomic characteristics of the farmers have a significant role in their profit maximization. Also, the socioeconomic characteristics and the method of oil palm processing adapted by the processors affects their profitability.

2.8 Economic Theory

Economic theory of the firm is hinged on the theory of production. The essence of a firm is to buy inputs, convert them to outputs, and sell these outputs to consumers, firms or government. Therefore, a firm is poised between two markets; demands in the factor /input market, and supplies in the market for goods and services. It also adjusts its production to satisfy the demand curve of its customers at profit.

Production theory concerns itself with the problems of combination of various inputs, given the state of technology, in order to produce a stipulated output. The technological relationships between input and output are known as production functions. The production function shows how and to what extent output changes

with variations in inputs during a specified period of time. Stigler (1987) asserts that "the production function is the name given to the relationship between rates of input of productive services and the rate of output of product". The production function is of two types; short-run and long run production function.

- **The Short-Run Production function**

In the short run, the assumption is that conditions of production are rigid so that various inputs are in fixed proportions. However, it is possible to increase quantities of other inputs constantly. This is known as the Law of Variable Proportions. The law states that as the quantity of a variable input is increased, holding the quantities of fixed factors constant, total product will increase, but after a point at a diminishing rate.

- **The Long-Run Production Function**

In the long-run, all inputs are variable. The firm can change its plants or scale of production. In the long-run, it is possible for a firm to change all inputs up or down within its scale. This is referred to as the law of returns to scale. To meet a long run change in demand, the firm increases its scale of production by using more inputs. It makes the following assumptions;

- All factors (inputs) are variable but enterprise fixed.
- Technological changes are absent
- There is perfect competition
- The product is measured in quantities

- A worker works with given tools and implements.

2.9 Empirical Studies

Akinniran *et al.,* (2013) researched on Economic Analysis of Oil Palm Production in Surulere Local Government Area of Oyo State, Nigeria. A multi-stage sampling technique of 125 respondents used a well-structured questionnaire. The primary data collected were used to ascertain the cost and returns of setting up an oil palm plantation, examined the level of technology used in production and identified the determinant factors affecting oil palm output. Also, the study hypothesized that Oil palm production is profitable in the study area. The data collected was analyzed using descriptive and inferential statistics. The budgetary analysis of the research indicated that for every ₦1 spent by the farmers during the production process in Oil palm business, ₦0.66 is gained as a profit.

Adebo *et al.,* (2015) carried out research on Palm Oil Production as a Poverty Alleviation Strategy among Small-scale Farmers in Ekiti State, Nigeria. They adapted a multistage sampling technique using a structure questionnaire as a means of data collection with a sample size of 120 respondents. The objectives were to examine the socio-economic characteristics of palm oil producers, their production technique and how their profitability and the effect it has on their livelihood in the study area. The study was able to find out that the average age of the respondents was between 41-50years of age which fall within the middle age range according

to a United Nations report. It has found out that the majority of the respondents were females, this is evident that the females are major contributors to value addition in agriculture. The findings of the study also indicated that the venture is very profitable, as for every ₦1 spent, ₦0.57 is recovered as the profit. Also, they were able to find out that 97% of the respondents earns their living solely from the proceeds they make in Palm oil processing. This is to say that Palm Oil production is a major contributor to poverty alleviation in the study area.

Chiemela *et al.*, (2021) studied Economics of Palm Oil Production in Nsukka Local Government Area, Enugu State Nigeria. The study determined the socioeconomic characteristics of palm oil producers, different production techniques adopted, costs and return and the constraints that mitigate palm oil production of the farmers in the study area. The data were collected from 50 respondents using a structured questionnaire. The data were analyzed using descriptive statistics and a gross margin model. The findings of the study posited that the adoption of traditional and modern production techniques in the study area, the constraints were inaccessibility of palm fruits, high cost of harvesting, unavailability of human labour, and long duration of processing as the major constraints to palm oil production. The authors also found that the enterprise is highly viable, by indicating the benefit-cost ratios of 3.41 and 1.52 for traditional and modern techniques used in production in the study area.

Evidently with the empirical studies that are related to this proposed study, it has shown that the key actors in Oil palm production were not factored nor

considered during these researches. Even though Value chain has been studied in other crops, it still did not relate to economic trees like Oil Palm. This study will characterize the value chain actors in the oil palm production, map out the oil palm value chain to show the key actors and their functions, identify the optimum processing method adapted by the processors, ascertain the cost and returns of each key actors in the value chain and identify the factor constraining the growth of the oil palm industry. The weak links in the value chain will be identified and recommendations will be proffered for intervention.

2.10.0 Analytical Framework

2.10.1 Value Chain Mapping

While there are a number of published handbooks on value chain research, Kaplinsky and Morris (2001) stress that there is no "definite" method to carry out a value chain analysis. Basically, the method to be applied relies on the research questions that are to be answered. This fact is due to the complexity of value chains. Value chain analysis often starts with linear mapping of activities in the chain (Stamm and Drachenfels, 2011). Value chain mapping is very effective in tracing flows of product and information flows with identified key actors, their relationships with other actors in the chain and measured distribution of their benefits. It is a graphical representation of a value chain as a whole and the environment (enablers) in which it is embedded. Functional analysis involves following a product, in this case oil palm, downstream, through various marketing

and processing channels to the final consumer and on the other hand, to identify, upstream, the principal providers of inputs and services which feed into production. The roles and functions of these agents will be identified and allocated.

The functional analysis shows:

- the principal functions in the chain;
- the agents, (or aspects of agents) carrying out these functions; and
- the principal product of the chain (the various forms into which it is transformed throughout the chain).

According to UNIDO (2009), the mapping diagrams are prepared through an iterative process which can be divided into two stages:

- First, an initial map is drawn which depicts the structure and flow of the chain in logical clusters: the main actors and the activities carried out at the local level, their links to activities at other domestic or foreign locations, the supporting services and their interactions, the links to the final market, and some initial indications of size and importance.
- The second stage is quantifying the value chain. This involves adding detail to the basic maps drawn initially (structure and flow). Depending on the level of detail needed for the research entry point, this exercise may focus on elements such as size and scale of main actors; production volume; number of jobs; sales and export destinations and concentration.

However, it may be erroneous to speak of one final map. In general, the outcome is several maps (to avoid information overload), providing different (but interlinked) chain information. The resulting maps will depend on the scope and objectives of the type of research conducted and its entry point or dimension.

2.10.2 Cost and Returns Analysis

The Costs and Returns analysis is a budgetary analytical tool which has been used extensively by researchers (Obasi *et al.,* 2012; Tchale and Keyser, 2010). Hardwick and Keyser (2010) used the following model in estimating net profit in their study on Quantitative Value Chain Analysis: An Application to Malawi.

NP = R-TC … Eqn 2.3

GM= R- VC …Eqn 2.4

TC= VC + FC … Eqn 2.5

Where;

NP = Net Profit (Naira)
R= Revenue (Naira)
TC = Total Cost (Naira)
GM= Gross Margin (Naira)
FC= Fixed Cost (Naira)
VC= Variable Cost (Naira)

CHAPTER III

RESEARCH METHODOLOGY

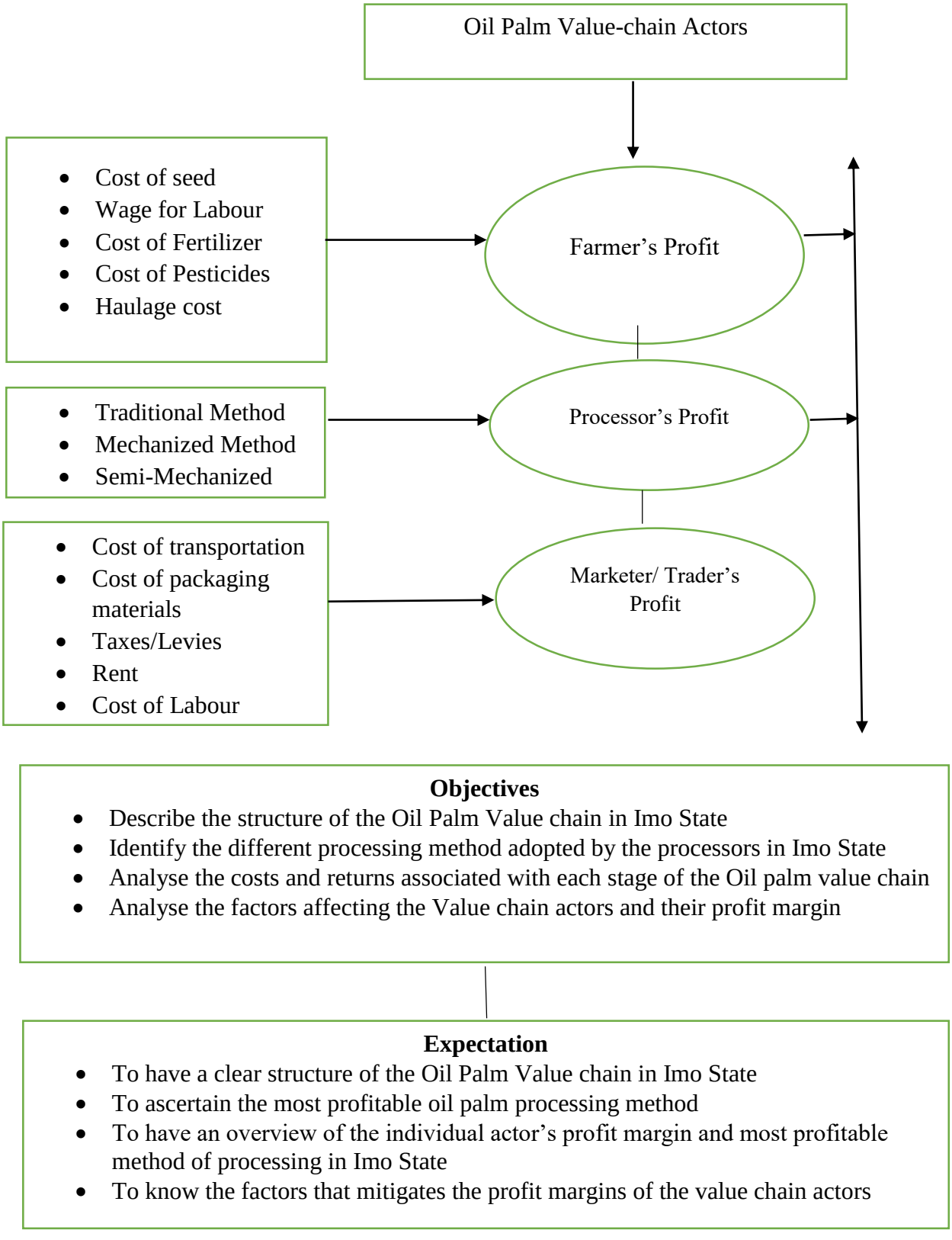
3.1 Theoretical Framework

The Value chain actors are the soul to agribusiness sector in Nigeria. They have succeeded in making agriculture a profitable business venture through enterprising activities carried out by them. There has been in dearth of information on the extent of profitability of the different Value chain actors in the Oil Palm unit of agribusiness in the study area. Which specifically include the profit margin for each of the value chain key actors in the oil palm unit and also, the method adopted by the processors in the value chain that guarantee's maximization of profit based on the study area. The specific functions of the value chain actors have not been understudied in details which has resulted to poor productivity as the actors tend to interfere in every of chains, leading to poor specialization. Also, the relationship between the constraints identified by the Value chain actors and their profit stake for risk management during investment in the enterprise.

This narrows the objective of this study to align with Theory of Production. The essence of enterprise is to buy inputs, convert to output and sell to consumers who are either individuals, firms or Government. The production theory herein, concerns itself with the problems of combination of various inputs and technologies, in order to produce a desired output. The technological relationships between input and output are known as production functions. According to Stigler

(1987), production function is the name given to the relationship between rates of input of productive services and the rate of output.

Fig 3.1: Theoretical Framework



3.2 Study Area

The study was carried out in Imo State, Nigeria. The State is located in the rainforest agro-ecological region of Nigeria and shares common boundaries with Abia State on the east and northeast, Rivers State on the south and Anambra State on the west and northwest (Imo State Agricultural Development Project (Imo-ADP, 2013). The State lies between Latitude $5^0$45' and $6^0$35'North of the equator and Longitude $6^0$35' and $7^0$28' East of the Greenwich Meridian (Chineke *et al*., 2011). It occupies the area between the lower River Niger and the upper and middle Imo State (Imo-ADP, 2013). It is bounded on the east by Abia State, on the west by the River Niger and Delta State and on the north by Anambra State, while River State lies on the south (Imo State Ministry of Land and Survey and Urban Planing, 2013).

Imo State covers an area of about 5,067.20km^2, with a population of 3,934,899 persons with many subsisting farming (Nigerian Population Commission (NPC), 2006 and National Bureau of Statistics (NBC), 2007). It has a population density of about 725km^2 (Imo-ADP, 2013). The state has an average annual temperature of 28^{0}C, an average relative humidity of 80%, average annual rainfall of 2500mm and an altitude of about 100m above sea level (Imo-ADP, 2013). The state has three agricultural zones namely, Orlu, Owerri and Okigwe agricultural zones. The major occupations of households of the area are farming, trading, civil service and teaching.

3.3 Research Design

Herein, it entails the steps that was followed during the research which ranges from the problem statement, methodology, data collection and discussion of the result findings. The field data collection was be done after clearance from the supervisor and the relevant authorities in Imo State like the Ministry of Agriculture, Agricultural Development Programs (ADP). During the empirical research, the researcher will collect both quantitative and qualitative data from Oil Palm farmers, processors and Traders within Imo State. This data collection will be carried out using a detailed, simplified and verified questionnaire for 48 oil palm farmers, 32 processors and 60 traders. The reason for selection of the three aforementioned actors because of their similarity in business objectives which is aimed at profit maximization. The farmers comprise of both smallholder farmers and commercialized farmers in the study area. The processors consist of small-scale and large-scale while the traders will consist of wholesalers and retailers in the oil palm business. During the data collection, where need be the researcher interviewed the respondents and fill in the answers on their behalf specially to bridge the language barrier gap (Igbo and English Language).

3.4. Research Method

3.4.1. Survey Method

This study is solely dependent on the survey method because it is a social science research. Survey is a systematic method for gathering information from (a sample of) entities for the purposes of constructing quantitative descriptors of the attributes of the larger population of which the entities are members (Avedian, 2014). Surveys are capable of obtaining information from large samples of the population (Glasow, 2005). Survey method has been termed to be biased when collecting samples – however, this will be overcome through adaption of a multi-stage sampling technique. The data that will be collected from this research will be based on the questions, that will be asked to the respondents based on their interests and area of demography that suits the objective of the research.

3.4.2. Sampling Technique

A multi-stage sampling procedure was adopted in the selection of the respondents, composed of oil palm farmers, processors and traders of palm oil. These three categories of value chain actors were purposively selected for this study based on their commercial orientation in palm oil production. Imo State was used as the study area because of the high intensity of Oil Palm production in the state.

In the first stage, four Local Government Areas (LGAs) namely; Aboh Mbaise, Ngor-okpala, Njaba, Ikeduru were purposively selected based on the dominance of palm oil production in the LGA's and their dominance in Oil Palm

Plantations and their representation in Agricultural zones of the state. In each of the selected LGAs, four (4) communities were purposively be selected for the same reason to give a total of sixteen (16) communities. List of oil palm farmers' in the communities were obtained from the Agricultural Development Programme (ADP) office in the LGA which will form the sample frame. A random sampling technique was used to select three (3) farmers from each of the sixteen (16) communities to give a sample size of forty-eight (48) Oil palm farmers.

In the second stage, oil processing mills in the four (4) selected LGAs were obtained from the Agricultural Development Programme office in Imo state. In each of the selected Local Government Areas in the study area, four (4) communities were selected randomly to sum up sixteen (16) communities and two (2) processors were selected to make up a sampling size of Thirty-two (32) Oil palm processors.

In the third stage, one major market was identified from each of the four (4) selected Local Government Areas. The list of palm oil traders were drawn from the Markets' Traders Association. This list was merged to form the sampling frame of oil palm traders. Fifteen (15) traders were randomly selected from each of the markets to give 60 palm oil traders for the study. Thus, the sample size was; Forty-eight (48) oil palm farmers, Thirty-two (32) oil palm processors and Sixty (60) palm oil traders from the four (4) selected Local Government Areas in the study area.

3.5 Data Type

3.5.1 Primary data

Primary data is one which is collected for the first time by the researcher (Ajayi, 2017). This type of data will be employed for this study. The data will be collected through the use of structured questionnaire and it will be supplemented with oral interview in places where the respondents could neither read nor write. The questionnaire will contain both open and close ended form of question. Similarly, the questionnaire will be properly subjected to content validity with the help of the researcher' supervisor before administering it to the respondents. The questionnaire will elicit responses on the socio-economic characteristics of the respondents, the processing methods adopted, the profit earned etc.

3.5.2 Secondary Data

Secondary data may include data that has been previously gathered and is under consideration to be reused for new questions, for which the data gathered was not originally intended (Vartanian, 2010). This type of data is those data collected in a primary way and made available for the researcher to use during his/her research. Secondary data refers to data collected from studies, surveys, or observations that have been ran by other individuals or for other research which includes encyclopedia, journals, articles and many more. The secondary information will be obtained from key informant interviews, focus group discussions and personal observation on value chain actors in the State, their

functions as well as highest production of oil palm and oil palm products by Local Governments Areas in the State.

3.6 Data Collection Instrument

The data for this research was collected through different ways in order to achieve an unbiased and authentic finding. The instrument for the data collection included the following;

3.6.1 Questionnaire

According to Boparai, Singh and Kathuria (2018) questionnaire is a commonly used data collection method and is a very crucial part of research especially in quantitative research. It entails set of questions that are geared in collection of information from respondents during field survey. A structured questionnaire will be used during collection of these data from the respondents. Structured questionnaires include pre-coded questions with well-defined skipping patterns to follow the sequence of questions (Acharya, 2010). These questionnaires will be administered to the respondents during the fourth-night training organized by the extension agents for the farmers, during the key market days of individual communities for the traders and at the processing plants for the processors. The questionnaires were collected instantly or at the convenient of the respondents.

3.6.2 Interview

An interview is a conversation involving more than one person for the purpose of gathering information. A research interview involves an interviewer, who coordinates the process of the conversation and asks questions, and an interviewee, who responds to those questions (Easwaramoorthy and Zarinpoush, 2006). Interviewing is an effective system of gathering essential information regarding the personality and character of another person (Slade and Sergent, 2018). This approach to data collection will be used when the respondents are not able to read or write – hence, the researcher asked questions based on the structured questionnaire and fill it on behalf of the respondents.

3.7 Data Analysis

Data were analysed using Value Chain Map, descriptive statistics, farm budgeting techniques and econometrics. Objective 1 was achieved using functional analysis and Value Chain Map. The Value Chain map is a functional analytical tool. The functional analysis shows:

a. the principal functions in the chain;

b. the agents, (or aspects of agents) carrying out these functions; and

c. the principal product of the chain (the various forms into which it is transformed throughout the chain).

Descriptive statistics such as frequencies, and percentages were used for Objective 2. The Costs and returns analysis was used to achieve Objective 3.

The Net Return (NR) model will be used and specified as follows:

$$GM = TR - TVC \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eqn\ 3.2$$

$$NRi = GM - TFC \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eqn\ 3.3$$

$$TCi = TVC + TFC \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eqn\ 3.4$$

Where;

i = 1, 2 and 3

1= The Farmer (Smallholder and Commercialized)

2= Processor (Smallscale and Largescale)

3 = Trader (Wholesaler and Retailer)

GM= Gross Margin (Naira)

TR= Total Returns (Naira)

TVC= Total Variable Cost (Naira)

NR = Net Return (Naira)

TFC= Total Fixed cost (Naira)

FC= Fixed Cost (Naira)

The multiple regression technique was used to achieve objective 4, which is to determine the factors affecting the profits earned by the value chain actors

(Farmers, Processors and Traders) in the study area. The multiple regression technique is an econometric tool that is used to derive estimates of parameters of economic relationships. A regression analysis is aimed at determining factors that cause variation of the dependent variable. The relationship between the explanatory variables and outcome is described by a mathematical model, for example the regression equation that relates the explanatory variables denoted by X's with the outcome denoted by Y. A coefficient of multiple determination R^2 is used to show the percentage of the variation in Y explained by changes in the explanatory variables (Xs'), it is also employed to determine the 'goodness of fit' of the regression line. A number of studies have used the model extensively (Chidiebere-Mark *et al.*, 2014; Orebiyi *et al.*, 2011).

The multiple regression technique to be used for objective 4 was specified explicitly as follows;

$$Yi = f(X1, X2, X3, X4, X5, e) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eqn\ 3.5$$

$$Yi = b0 + bX1i + bX2i + bX3i + bX4i + bX5 + e \ldots\ldots\ldots\ldots\ldots\ldots Eqn\ 3.6$$

Where i = Value chain Actors (Palm oil farmers, Processors, Traders)

Y_i= Profit (Naira)

X_1 = Price of seed (Naira)

X_2= Price of Wage (Naira)

X_3 = Price of Fertiliser (Naira)

X_4 = Price of Pesticide (Naira)

X_5 = Price of Haulage (Naira)

e = error term

The *a priori* expectation is stated mathematically as follows

X1, X2, X3, X5 > 0; X4 < 0

3.8.0 Test of Hypothesis

3.8.1 Test of Hypothesis One

The null hypothesis which states that profit earned by the Oil palm farmers in the Oil palm value chain is significantly influenced by the following prices (Seed, Wage, Fertiliser, Pesticides, Haulage) was tested using t-Values of the variable coefficients to be realized from the multiple regression analysis from Objective 4. The t-Value was produced by fitting multiple regression models to the data at 5 per cent level of significance (0.05) with n-k degrees of freedom using a two-tailed test. Statistically, the hypothesis is stated below as

$H_0 = \mu$

$H_1 \neq \mu$

The implicit form of the regression model will be stated as follows;

$$Yi = f(X1, X2, X3, X4, X5, e) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots Eqn\ 3.7$$

$$Yi = b0 + bX1i + bX2i + bX3i + bX4i + bX5 + e \dots\dots\dots\dots\dots\dots Eqn\ 3.8$$

where,

b0 = Constant

i = palm oil farmers

Y_i= Profit (Naira)

X_1 = Price of seed (Naira)

X_2= Price of Labour (Naira)

X_3 = Price of Fertiliser (Naira)

X_4 = Price of Pesticide (Naira)

X_5 = Price of Haulage (Naira)

e = error term

The *a priori* expectation is stated mathematically as follows

3.8.2 Test of Hypothesis Two

The null hypothesis that there are significant differences in the profit earned by the Oil Palm Processors using the different processing method adopted was tested using the Analysis of Variance (ANOVA). The hypothesis is stated in the form;

$H_0 = \mu$;

$H_1 \neq \mu$.

The ANOVA method is specified as follows;

$$F = \frac{MSSB = SSB/(k-1)}{MSSW = SSW/(N-k)} \qquad \text{Eqn. 3.7}$$

TSS (Total Sum of Square) = SSB + SSW

$$SSB \text{ (Sum of Square between group)} = \frac{\sum_{j=1}^{k} nj\,(Xj - \overline{X})^2}{K-1} \qquad \text{Eqn. 3.8}$$

$$SSW \text{ (Sum of Square within group)} = \frac{\sum_{J=1}^{k} \sum_{i=1}^{nk} (\overline{X_{ji}} - \overline{\overline{X_j}})^2}{N-K} \qquad \text{Eqn. 3.9}$$

Where;

F = Value by which the statistical significance of the mean differences was judged

$\overline{X}$ = Mean profit of Oil palm processors

$\overline{\overline{X}}$ = Grand mean profit of Oil palm processors

SSB = Sum of squared deviations between the levels of profit of the Oil palm processors

SSW = Sum of squared deviations within the levels of profit of the Oil palm processors

N = Sample size of the oil palm processors in Imo State

K = Number of processing method

K – 1 = Numerator of degree of freedom

N – K = Denominator degrees of freedom

Decision Rule: After the test, the F Calculated will be compared with the F-tabulated. If F calculated is greater than F tabulated, the null hypothesis will be rejected. If otherwise, it will be accepted.

3.8.1 Test of Hypothesis Three

The null hypothesis profit earned by the Oil palm traders in the Oil palm value chain is significantly influenced by Cost of transportation, Packaging cost, Taxes/Levies from councils, Rent, and cost of Labour were tested using t- values of the variable coefficients to be realized from the multiple regression analysis in objective 4. The t-Values were produced by fitting multiple regression models to the data at 5 per cent level of significance (0.05) with n-k degrees of freedom using a two-tailed test. The hypothesis is stated below as

$H_0 = \mu$

$H_1 \neq \mu$

The implicit form of the regression model will be stated as follows;

$$Yi = f(X1, X2, X3, X4, X5, e) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eqn\ 3.10$$

$$Yi = f(X1, X2, X3, X4, X5, e) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eqn\ 3.11$$

where,

i = Oil palm traders

Y_i= Profit (Naira)

X_1 = Price of Oil Palm (Naira)

X_2= Price of Packaging materials (Naira)

X_3 = Taxes/Levies from Market council (Naira)

X_4 = Rent (Naira)

X_5 = Price of Labour(Naira)

X_6 = Price of Transportation (Naira)

X_7 = Price of Storage (Naira).

e = error term

The *a priori* expectation is stated mathematically as follows:

$X_1, X_2, X_4, X_5, X_6, X_7 > 0$; $X_3 < 0$.

CHAPTER IV

RESULTS AND DISCUSSIONS

4.1 Socio-economic Characteristics of the Oil Palm Value Chain Actors

The socio-economic characteristics of the oil palm value chain actors are presented and discussed according to their age, sex, marital status, household size and educational qualification.

4.1.1 Distribution of the Oil Palm Value Chain Actors by Age

The distribution of the oil palm value chain actors by age is presented in the table 4.1.

Table 4.1: Distribution of the Oil Palm Value Chain Actors by Age

	Farmers		**Processors**		**Traders**	
	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)
31 - 40	3	6.3	6	18.75	11	18.3
41 - 50	7	14.5	17	53.12	25	41.7
51 - 60	22	45.8	8	25	18	30
61 - 70	16	33.3	1	3.13	6	10
Total	**48**	**100**	**32**	**100**	**60**	**100**
Mean Age	**57 years**		**47.95 years**		**45.63 years**	

Source: *Field survey data, 2023.*

The distribution of the oil palm value chain actors in Imo State has shown that 45.8% of the farmers fall within the age bracket of 51 – 60 years and the mean age of 57 years. This implies that the oil palm farmers in Imo State are not within the

productive age, hence the limited availability of innovation in the oil palm production in Imo State. This is not credence with the findings of the Olajide *et al.* (2022) that oil palm farmers are still in their active age. The mean age of the processors and the traders were revealed as 47.95years and 45.63years respectively. The majority of (53.12%) the processors and (41.70%) the traders fall within the age bracket of 41 – 50years. This indicates that the processors and the traders of oil palm are in their productive age and can take up innovations and rigorous activities involved in the value and promotion activities of oil palm products in Imo State.

4.1.2 Distribution of the Oil Palm Value Chain Actors by Sex

The distribution of the oil palm value chain actors by sex is presented in the table 4.2.

	Farmers		**Processors**		**Traders**	
Sex	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)
Male	29	60.42	13	40.62	21	35
Female	19	39.58	19	59.38	39	65
Total	**48**	**100**	**32**	**100**	**60**	**100**

Source: *Field survey data, 2023.*

The findings of the Table 4.2 have shown the distribution of the oil palm value chain actors by sex. The findings revealed 60.42% of the oil palm farmers in Imo State are males while 59.38% and 65% of the processors and the traders were females respectively. This implies that the farmers of oil palm in Imo State were dominated by males, which can be attributed to the rigorous activities and lack of mechanization involved in the management of oil palm farming. The findings of the female dominance in oil palm processing and trading is expected following the campaign for women in agriculture and the role women play in the value addition of agricultural products to ensure upskilling in their culinary skill sets. The findings on the female dominance in processing and trading is in line with the Ofosu-Budu and Sarpong (2013) who posited that palm oil processing and marketing were dominated by women working as groups or individuals in Ghana. The findings from the sex distribution of the oil palm value chain actors in Imo State is in line with the findings of Adesiji *et al.* (2016), who posited that there is gender disaggregation in the oil palm value chain processes, and implies that gender level of involvement varies in the oil palm value chain paradigm.

4.1.3 Distribution of the Oil Palm Value Chain Actors by Marital Status

The distribution of the oil palm value chain actors by marital status is presented in the table 4.3.

Marital Status	Farmers		Processors		Traders	
	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)
Single	3	6.25	4	12.5	8	13.35
Married	38	79.17	21	65.63	39	65.05
Widowed	7	14.58	7	21.88	13	21.6
Total	**48**	**100**	**32**	**100**	**60**	**100**

Source: *Field survey data, 2023.*

According to the Table 4.3 79.17%, 65.63% and 65.05% of the farmers, processors and the traders were married respectively. This indicates that the value chain actors in Imo State have greater responsibilities that would make them more committed to their agricultural enterprises and at the same time meet the needs accompanied with marital commitment. This is in line with the findings of Adesiji *et al.*, (2016) that majority of the oil palm value chain actors are married.

4.1.4 Distribution of the Oil Palm Value Chain Actors by Household Size

The distribution of the oil palm value chain actors by household size is presented in the table 4.4.

Household Size	Farmers		Processors		Traders	
	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)
1 - 4	9	18.75	6	18.75	11	18.33
5 - 8	26	54.17	18	56.25	35	58.33
9 - 12	13	27.08	8	25	14	23.33
Total	**48**	**100**	**32**	**100**	**60**	**100**
Mean	**6 persons**		**6 persons**		**7 persons**	

Source: *Field survey data, 2023.*

The data from table 4.4 revealed that 54.17%, 56.25% and 58.33 of the oil palm value chain actors which comprises of the farmers, the processors and the traders have household size of 5 – 8 persons respectively. The mean household size of the oil palm value chain actors in Imo State were 6persons for the farmers and the processors respectively and 7 persons for the traders. This implies that majority of the oil palm value chain actors in Imo State have nuclear family and as such spends more on labour as there is unavailability of family labour. This is in credence with the findings of Adesiji et al (2016) that the household size of oil palm value chain actors is moderate.

4.1.5 Distribution of the Oil Palm Value Chain Actors by Educational Qualification

The distribution of the oil palm value chain actors by educational qualification is presented in the table 4.5.

	Farmers		Processors		Traders	
Educational Qualification	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)	Frequency (Years)	Percentage (%)
Primary	19	39.58	9	28.12	12	20
Secondary	27	56.25	19	59.37	41	68.33
Tertiary	2	4.17	4	12.5	7	11.67
Total	**48**	**100**	**32**	**100**	**60**	**100**

Source: *Field survey data, 2023.*

The distribution of the oil palm value chain actors in Imo State by educational qualification have shown that 56.25%, 59.37% and 68.33% of the farmers, the processors and the traders had attained secondary education respectively. This finding implies that the oil palm value chain actors in Imo State are enlightened, and would be receptive in technology and innovation that would improve their production efficiency and profit maximization of the oil palm businesses. This is in line with the findings of Nwankwo and Nwosu (2018) who posited that educational attainment impacts positively on business as it enhances business skills.

4.2 Structure of the Oil Palm Value-Chain in Imo State

The structure of the Oil palm value chain in Imo State includes in the mapping of the value chain actors, their relationship and functions of the identified actors in the oil palm value chain in Imo State. The Figure 4.1 has revealed the oil palm value chain map in Imo state;

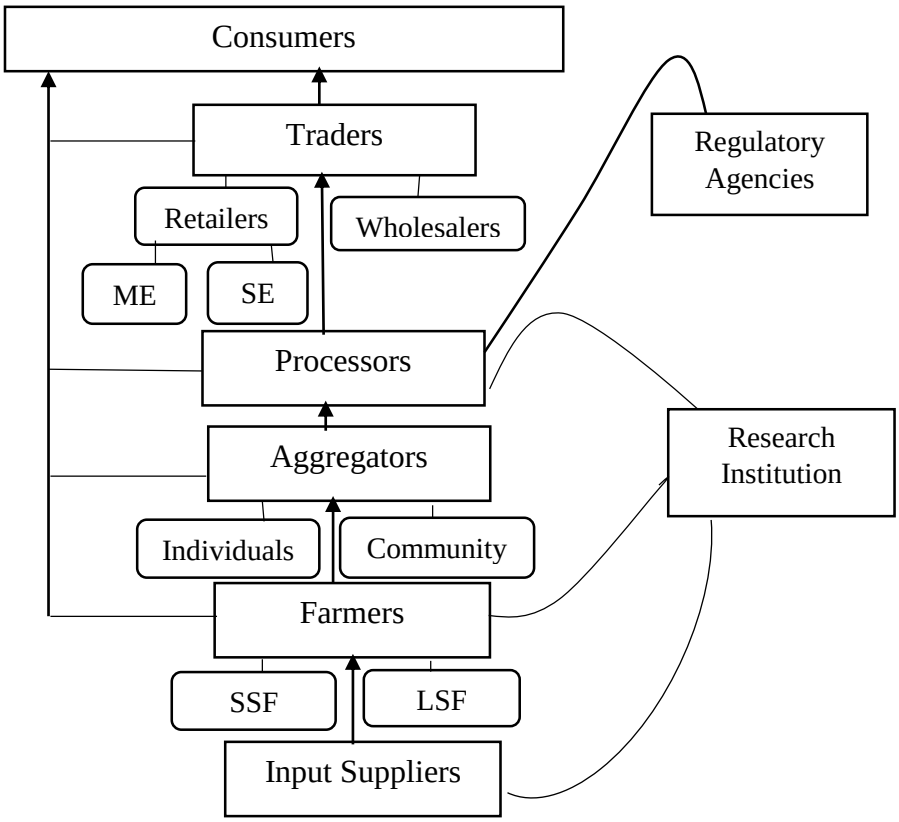


Figure 4.1: Value Chain Map for Oil Palm in Imo State

Source: Field Survey data, 2023

The figure 4.1 is a pictorial representation of the relationship and linkages between oil palm value chain actors in Imo State Nigeria. The relationship between the actors in the value chain are business based mainly for buying and selling with support

from indirect actors (Adetonah *et al.*, 2013). This illustration can be best referred to as the Value Chain Map for Oil Palm Production in Imo State. It shown the three key actors of interest in the study and also other actors that ensures the smooth operation of the oil palm value chain. The map highlighted input supplier, the farmer, the research institution, the aggregator, the processor, the regulatory agency, the traders and the consumers. The agricultural value chain involves everything from the suppliers of inputs and equipment to the final consumers (Klingenberg, Júnior & Müller-Seitz, 2022).

The value chain starts with input suppliers (Owusu-Adjei, Baah-Mintah & Salifu, 2017). They are the responsible for the supply of the seedling, the fertilizers, the herbicides, the nursery materials. The processors have connection with the research institution through which newly improved oil palm seedings are disseminated to the farmers. Although, their impacts are not fully felt by the farmers in Imo State because the farmers are using wild seedling for nursery activity, wood ashes as pest control measures, and animal dump as fertilizer for the oil palm trees when they are grown.

The oil palm farmers in the State are classified into the smallholder farmers (SF) and the Large-scale Farmer (LF). High percentage of oil palm production in Nigeria comes from smallholder farmers (Ogunleye & Kehinde, 2020). In Imo State, over 90% of the oil palm producers are smallholder farmers. These farmers determine their oil palm tree value through the stands on different plots and not unified in a plantation. Measurably, an average smallholder farmer in Imo State owns about 147

stands of oil palm which can seat conveniently on one (1) hectare of land size. They source the oil palm seeds from the wilds, demonstration farms or inherited from their family.

The aggregators are categorized into two; either as individuals or communities. They act as intermediary between the farmers and the processors or the traders. The aggregator streamlines the supply chain in the oil palm. This is in line with (Meliala, Hubeis, Jahroh & Maulana, 2019) that aggregators provide information on production supply agriculture, production processes in agriculture, and the process of marketing agricultural products. They inspect the quality of the FFBs and provide feedback and guidance to the farmers to ensure they handle the fruit properly to meet the quality requirement. Individual aggregators are concerned with profit maximization while community aggregator uses the proceeds from the sales to develop their community like building borehole, electrification and other social amenities they need. The FFBs are benchmarked between ₦1,500 – ₦1,900 per bunch.

The processors are important in the value addition process in oil palm. They are the product developers and determinants. They play role in the price of the product. Their production cost determines, how much the consumer will pay for the product. They work in hand with the research institution to determine the best plant variety and their features for marketing efficiency. In addition, for formalized processors in the chain, they work with the regulatory agencies (NAFDAC, SON) to provide value for the consumers money. However, in Imo State, there is limited number of

formal processors instead they are smallholder processors who still depend on traditional and manual machinery to process the desire oil palm products for the consumers. More than 75% of the crude palm oil produced in Nigeria is still obtained through traditional methods (Gourichon, 2019).

The traders as shown in the map are grouped into retailers and wholesalers. The wholesalers serve as a linkage between the processors and the retailer. They are in charge of storage of the palm oil which is the common product of oil palm in Imo State. The wholesalers of palm oil negotiate contracts with the processors to ensure availability of the product for them during the scarcity period. They handle the logistics cost and in charge of the market dynamics and pricing of the product. The traders play asymmetric role in value chain that can lessen the income of other actors, and limit their opportunities for decent livelihoods (Herr & Muzira, 2009)

4.2.2. Functional Analysis of the Value chain actors in oil palm in Imo State Nigeria

Table 4.6 has revealed the functional analysis of the value chain actors in Imo State Nigeria. It provided an overview of the roles, functions and output of the actors in the oil palm value chain in Imo State Nigeria. In this analysis, additional actors whose role cannot be neglected were taken into consideration and the role they play in the value chain was analysed. These value chain actors play potential roles in assisting farmers to adopt sustainable practices and attain higher incomes is

especially notable in light of Sustainable Development Goal 2 (SDG 2), which aims to end hunger, achieve food and nutrition security and promote sustainable agriculture by 2030 (Liverpool-Tasie *et al.,* 2020). The notable actors in the value chain of palm oil production in Imo State are; the input supplier, the farmers, the aggregators, the processors, the marketer, the logistics, harvesters, regulatory bodies, and the consumers.

i. **Input supplier:** The input suppliers are the foundation for successful operations across all boards of the oil palm production value chain. Their function in the value chain includes; the provision of inputs for the farmers during cultivation, and the provision of inputs to the processors during the value addition process. The input provided for the processors is in the form of credit facilities, machinery, and packaging materials while for the farmers includes seedlings for the planting, fertilizer, and herbicide. Technical support for the actors, especially the farmers on the best agronomical practices to adhere to, product development for input suppliers who have primary interest in the processors. The agents identified in this analysis are University Demonstration farms, Fertilizer and Herbicide companies, Agricultural Development Program (ADP), and Financial Institution that provides credits and manage risks for the actors. The Outputs from this actor are Oil palm seedlings, fertilizer, herbicides, advisory services and credits.

ii. **Farmers**: The farmers play a major role in the value chain; they are primarily responsible for the production of the oil palm which is further

processed for production of other oil palm products. Their acreage is between 1 – 25hectares (PIND, 2011). They have a great influence on the efficiency and profitability of the downstream process in the oil palm value chain in Imo State. They are responsible for the cultivation, management and harvesting of the oil palm major product (Fresh Fruit Bunches). The farmers of oil palm have a direct on the quality and quantity of the FFBs. The outputs as revealed in Table 2 are FFB and palm fonts. The farmers in the study area uses rudimentary tools for their activity.

iii. **Processors**: This value chain actor is typically found in the processing stage of oil palm production. The processors play an important role by transforming raw materials (FFBs) into marketable products. Their primary role is to extract crude palm oil (CPO) and palm kernel oil (PKO) from the fresh fruit bunches (FFBs) obtained from the farmers or the aggregators. Their key functions as shown in Table 2 are extraction of the CPO or PKO, refining the CPO or PKO and fraction to desired end products like cooking oil, feed addictive and others. The processors adhere to industry standards and regulations implemented to measure for quality of products.

iv. **Aggregators**: The aggregators are intermediaries between the farmers and the processors, and they are typically at the collection and consolidation stage of the value chain. The key function of this actor as shown in Table 2 is the collection of the FFBs from multiple farmers and aggregate for sale

to the processors. They streamline the supply chain and optimization of the logistics for FFBs collection. In Imo State, this activity is community-based.

v. **Traders**: The traders are typically found in the marketing and distribution stage. Their function as shown in Table 2 includes consumer segmentation, market insights, storage, distribution and marketing. The key agents for these actors are the retailers, wholesalers, Feed mills, transporters and processors of the products being traded. The outputs are Palm oil, Palm Kernel Cake (PKC), and Freshly Fruit Bunches (FFB).

vi. **Regulatory Agencies**: The regulatory agencies are in the quality compliance and processing stage. They function primarily on the development of regulations, set standards for product quality, routine inspection and ensure adherence of processors to the standards. The agents herein are the National Agency for Food and Drug Administration and Control and Standard Organisation of Nigeria. The output from this actor is certified oil palm products either CPO or PKO.

vii. **Consumers**: The consumers are the end-users of palm oil and palm oil products, utilizing them for various purposes such as cooking, baking, food processing, personal care products, and biofuel. They are found in the consumption stage of the value chain. Their function in the value chain includes; ethical and sustainability consideration, provision of feedback and influencing decisions.

Table 4.6: The Functional Analysis of the Value Chain Actors in Imo State Nigeria

Actors	Stage of Value Chain	Function	Agents	Outputs
Input Supplier	Production	Provide input materials like Fertiliser	Agricultultural Development Programme	Oil palm seedling
		Technical support	Demonstration Farms	Fertiliser
		Product development	Financial Institutions	Advisory services
Farmers	Production	Cultivation	Oil Palm farmers	FFB
		Management	Plantation managers	Fonds
		Harvest/Collection of FFBs		
Aggregators	Marketing and Distribution	Collection of the FFB	Village Youths	Fresh Fruit Bunch
		Logistics	Kindreds	
		Quality maintenance		
Processors	Processing and Marketing	Extract CPO, SPO and PKO	Marketers/Traders	Special Palm Oil
		Refine the CPO and PKO	Small scale processors	Palm Kernel Cake
		Quality regulators and compliance	Largescale processors	Palm Kernel Oil
Traders	Marketing and Distribution	Consumer segmentation	Retailers	Palm Oil
		Storage	Wholesalers	Palm Kernel Cake
		Market insights	Feed mill	FFB
Regulatory Bodies	Processing	Develop regulations	NAFDAC	Certified Palm Oil
		Routine inspection	SON	
Consumer	All Stage	Provision of feedback	Households	Palm Oil
		Information transparency	Eatries/Restaurants	Palm Kernel Oil
		Ethical and sustainability consideration	Industries	Palm Kernel Cake

Source: Field Survey data, 2023

4.3 Different Processing Method Adopted by the Processors of Oil Palm in Imo State

The different processing method adopted by the oil palm processors in Imo State is shown in Table 4.7.

Table 4.7: Processing Method Adopted by the Oil Palm Processors in Imo State

Processing Method	Frequency (Processor)	Percentage (%)
Traditional Method	24	75.00
Semi-mechanized Method	7	21.88
Fully-mechanized Method	1	3.12
Total	**32**	**100**

Source: Field Survey Data, 2023.

According to the table 4.7, there are three processing methods of oil palm in Imo State. The traditional method which accounts for 75% of the processors in the Imo State. This method is entirely manual, using equipment like mortars, pestles and hand or foot operated presses. While 21.88% and 3.12% of the processors in Imo State use semi-mechanized method and fully-mechanized method in processing of FFBs to palm oil and other products. The findings are in lieu with Onu, Ekwe and Onuekwusi (2021) that oil palm processing is dominated by the use of traditional or semi-mechanized methods for oil extraction from the fresh fruit bunch. The reason for the use of this method could be the limited access to operational capital, lack of infrastructure, age, and cultural preference. The implication of this finding is that the oil palm processing is still in the hands of smallholder processors, and there is limitation in production efficiency.

4.4 The Cost and Returns of Each Value Chain Actor in Imo State

The cost and return of the value chain actors are shown in the table 4.3 for the oil palm farmers, table 4.4 for the oil palm processors, and the table 4.5 for the oil palm traders in the Imo State.

4.4.1 The Cost and Returns Analysis of the Oil Palm Farmers in Imo State

Oil palm farming in Imo state is a complex activity as majority of the farmers do not have a plantation but scattered oil palm trees in different farmlands where they practice other crop farming activity and uses oil palm as a secondary means of survive. The cost and return analysis were compiled using the field maintenance approach which is shown in the Table 4.3 that ₦426,000 is the average variable cost of maintaining 1 hectare of oil palm farm per annual. The total fixed cost was ₦180,200 which is from depreciation of the assets and cost of rent.

The wide margin between the variable cost and the fixed cost of the farmers could be attributed to the inability of the farmers to invest in assets for their farms. In addition, 59% of the total cost incurred is attributed to labour costs, this is a clear indication that plantation management is labour-intensive. The average revenue is ₦788,800, which is generated from the sales of the Fresh Fruit Bunches. The average stands of oil palm in the state is 145 stands per hectare, and their production capacity is based at 80% hence why 464bunches is the average harvest per year from the one-hectare farm. The annual net return is ₦182,600 which indicates that the business venture is profitable. The return on investment is revealed as 0.30 which implies that for every ₦1 invested in oil palm farming, ₦0.30 is an expected

return. This is in credence with Akinniran *et al.* (2013) who posited that oil palm production is a very profitable business and has a long economic advantage.

Table 4.8: The Cost and Return Analysis for Oil Palm Farmers on (1) Hectare in Imo State

S/No	Item	Unit	Unit Price	Quantity	Amount
	Revenue				
	FFB	Bunch	₦1,700	464	₦788,800
A	**Total Revenue**				**₦788,800**
	Costs				
	Variable Costs				
i	Herbicides				₦36,000
ii	Transportation				₦30,000
iii	Wages	Annual	₦15,000	2	₦360,000
B	**Total Variable Costs**				**₦426,000**
	Fixed Cost				
	Rent			1Ha	₦150,000
	Farm Implement				₦27,000*
	Storex				₦3,200*
C	**Total Fixed Cost**				**₦180,200**
D	**Total Cost**				**₦606,200**
	Returns				
E	**Gross Return (A – B)**				**₦362,800**
F	**Net Return (A – D)**				**₦182,600**
G	**Profitability (F/D)**				**0.30**

Source: Field Survey Data, 2023
Depreciation was done using straight line method.

4.4.2 The Cost and Returns Analysis of the Oil Palm Processors in Imo State

The Cost and Return Analysis for processing 1000Kg of Oil Palm Fresh Fruit Bunches in Imo State Nigeria is revealed in the Table 4.9.

Table 4.9: Cost and Return Analysis for Processing 1000Kg of Oil Palm Fresh Fruit Bunches

S/No	Item	Unit	Unit Price	Quantity	Amount
	Revenue				
	Palm oil	Litre (L)	₦830	187L	₦151,060
	Palm Kernel	Kilogram	₦80	450Kg	₦36,000
A	**Total Revenue**				**₦187,060**
	Costs				
	Variable Costs				
	Fresh Fruit Bunches	Bunch	₦1,700	72	₦122,240
	Transportation				₦15,000
	Wages		₦10,000	2	₦20,000
	Price of energy	Bundle	₦500	5	₦2,500
	Water				₦300
B	**Total Variable Costs**				**₦160,040**
	Fixed Cost				
	Rent	Annual	₦24,000		₦2,000*
	Machinery				₦5,670*
	Storex				₦800*
C	**Total Fixed Cost**				**₦8,470**
D	**Total Cost**				**₦168,510**
	Returns				
E	**Gross Return (A – B)**				**₦27,020**
F	**Net Return (A – D)**				**₦18,550**
G	**Profitability (F/D)**				**0.11**

Source: Field Survey Data, 2023
Depreciation was done using straight line method.

The findings from the Table 4.8 has shown that oil palm processing is profitable. It revealed that the total revenue was ₦187,060; which is generated from the sales of palm oil and palm kernels. The table revealed that for every 1000 kg of FFBs processed, 18.7% is palm oil and 45% of the FFB are palm kernels and the remaining weight is considered as waste by the processors in Imo State. The total cost incurred during the processing of the FFBs is ₦168,510. The variable cost accounts for over 90% of the total cost incurred by the processors. This is an indication that the processors are still dependent on traditional technology during production. The processors use manual machinery for their activities, ranging from cooking of the oil palm fruits till the oil extraction. This is time consuming, contributes to environmental pollution as there is poor waste management in the mills. This is the reason for low production efficiency in the processing of oil palm in the state. In addition, the cost of the FFBs accounted for 76% of the total variable cost which indicates that it contributed to the least of the returns on investment. There is need to subsidize the input cost in other to reduce the production costs accrued by the processors as value chain actors.

The net return is shown as ₦18,550, although below the minimum wage of ₦30,000 in Nigeria. The Return on investment is 0.11. This implies that the oil palm processing in Imo State is profitable and for every ₦1 invested, ₦0.11 is the estimated return on a monthly basis. This is lieu with the findings of Nwankwo and Nwosu (2018) that oil palm fruit processing is a profitable activity in the Imo State.

Hence, the higher the number of oil palm fruits processed, the more likely the profit to maximize.

4.4.3 The Cost and Returns Analysis of the Oil Palm Traders in Imo State

The cost and returns of trading 100kegs of palm oil as a wholesaler in Imo State Nigeria is shown in the Table 4.10. According to the table 4.4 the total revenue generated from the wholesalers of palm oil in the state is ₦2,600,000 which is the price for 100Kegs of palm oil. A keg is measured as 25litres in the market standard. The standardized wholesale price includes the price of the keg. Palm oil is the common product of oil palm and often used in most Nigerian dishes.

The total cost incurred in the trading of the oil palm is ₦2,067,933. The total variable cost in the business venture accounts for over 95%, this is unarguable as the traders do not need capital assets to stay afloat in the business. The net return has been shown as ₦532,067 which is a clear indication that palm oil trading as a wholesaler in Imo State is profitable. The return on investment is revealed as 0.25, which implies for every ₦1 invested in the business, ₦0.25 profit is expected.

Table 4.10: Cost and Return Analysis for Trading 100 Kegs of Palm Oil in Imo State as Wholesaler

S/No	Item	Unit	Unit Price	Quantity	Amount
	Revenue				
	Palm oil	Keg	₦26,000	100	₦2,600,000
A	**Total Revenue**				**₦2,600,000**
	Costs				
B	Variable Costs				
	Palm Oil	Keg	₦18,000	100	₦1,800,000
	Transportation		₦500	100	₦50,000
	Keg		₦2,000	100	₦200,000
	Labour (Loading)		₦10,000		₦10,000
	Salary		₦25,000		₦25,000
	Total Variable Cost				**₦2,062,500**
C	Fixed Cost				
	Rent	Annual	₦180,000		₦15,000*
	Racks		₦400,000		₦33,333*
	Annual Security due	Annual	₦60,000		₦5,000*
	Annual market levy	Annual	₦12,000		₦1,000*
	Total Fixed Cost				**₦54,333**
D	**Total Cost**				**₦2,067,933**
	Returns				
E	**Gross Return (A – B)**				**₦537,500**
F	**Net Return (A – D)**				**₦532,067**
G	**Profitability (F/D)**				**0.25**

Source: Field Survey Data, 2023
Depreciation was done using straight line method.

4.5 Factors Affecting Profits of the Value Chain Actors in Imo State

The factors affecting the profit of the oil palm value chain actors in Imo State is shown in the Tables 4.11, 4.12 and 4.13 respectively.

Table 4.11: Factors Affecting the Profit of the Oil Palm Farmers in Imo State

Variables	Coefficients	Significance(P)
Constant	Nil	0.000
Price Land Used*	-0.413	0.003
Prices of Herbicide	0.023	0.854
Prices of Labour	0.327	0.528
Prices of Transportation *	-0.082	0.016
Prices of Implement	0.123	0.344
R^2	0.531	
F-change*	4.164	0.004

Source: Field survey data and SPSS analysis, 2023. * 5% significant level.

The findings from the table have revealed the factors affecting the profit of the oil palm farmers in Imo State. The factors measured prices of the land, weed management, the wages to the farm workers, transportation and farm implements owned after depreciation. The data were interpreted using the multiple regression and the linear model revealed that the land cost incurred by the farmers had a negative relationship with their profit. This indicates that the higher the land cost, the lower the profit, which can be attributed to the land tenure system existing in Imo State. The land tenure systems affect agricultural productivity and influences efficient usage of inputs (Sanusi, Madaki, David & Adole, 2021).

In addition, the transportation has an influence on the profit of the farmers in Imo State, this could be as a result of fluctuation in the prices of petrol in the state which is a major energy used in transportation in Nigeria. This is in assertion with Savić, Petrović and Vasiljević (2020) that transportation has significant implication in agribusiness. The coefficient of the multiple determination 0.531 indicates 53.1% of the discrepancy in the profit of the oil palm farmers in Imo State was explained by the joint action of the independent variables in the model which clearly indicates that the model is predictable and reliable. Hence, the hypothesis that states land cost and Transportation cost significantly affect the net profit of the oil palm farmers will be accepted but rejected for the cost of transportation cost, herbicides cost and land cost.

Table 4.12: Factors Affecting the Profit of the Oil Palm Processors in Imo State

Variables	Coefficients	Significance
Constant	Nil	0.000
Price of FFB*	-0.656	0.000
Price of Transportation*	-0.370	0.004
Price of Labour	-0.116	0.264
Price of Energy*	-0.342	0.004
Price of Water*	-0.211	0.037
Price of Rent	-0.081	0.447
Price of Machinery	0.140	0.189
R^2	0.854	
F-Change	20.027	0.000

Source: Field survey data and SPSS analysis, 2023. * 5% significant level.

The result from the Table 4.6 has revealed the factors affecting the profit earned by the oil palm processors were price of the fresh fruit bunches, the transportation cost, the labour cost, the energy used in cooking the FFBs, the water cost used during the processing, the rent cost per month and the machinery cost after depreciation. According to the table, the price of the FFBs, transportation cost, water cost and price of energy significantly influenced the profit earned by the oil palm processors in the state. This indicates the rising cost of energy will lower the profit of the processors. This is in credence with Ma, Zhang, Song & Yu (2022) who posited the rising energy cost will bring higher cost of production and lower income. The adjusted ratio is 0.854 which indicates that 85.4% of the discrepancy in the profit of oil palm processors as value chain actor in Imo State was explained by the joint action of the independent variables in the model which clearly indicates that model

is predictable and reliable. The hypothesis that states transportation, energy and water do have influence on profit of the processors will be accepted.

Table 4.13: Factors Affecting the Profit of the Oil Palm Traders in Imo State

Variables	Coefficients	Significance
Constant		0.000
Price of Oil Palm*	-0.642	0.000
Price of Transportation	-0.105	0.328
Price of Labour	0.023	0.677
Price of Packaging	-0.018	0.881
Market levy	-0.049	0.672
Rent	0.032	0.770
Storage	-0.083	0.442
R^2	0.571	
F-Change	5.776	0.000

Source: Field survey data and SPSS analysis, 2023. * 5% significant level.

According to the results in the Table 4.7, it has identified factors like the price of the oil palm product, the transportation cost, the labour cost, packaging cost, market levy, rent cost and storage as the factors affecting the profit of the oil palm traders. However, the careful analysis using regression method had revealed that price of oil palm has an inverse relationship with the profit earned by the traders. It implies that as the profit earned by the traders increases if the price of the oil palm is lower. Hence, the reason why the traders buy and store during the period of surplus. This in line with the findings of Ojo *et al.*, (2014) that purchase cost has an influence on the profit of the oil palm traders. Other factors identified as limitations do not have any influence on the profit of the traders. Hence, the hypothesis which states that the profit earned by the oil palm traders is significantly influenced by price of palm

oil will be accepted, but reject with regards to the transportation cost, packaging cost, taxes/levies from councils, rent, and cost of labour. The adjusted ratio is 0.571 which indicates that 57% of the discrepancy in the profit of oil palm traders as value chain actor in Imo State was explained by the joint action of the independent variables in the model which clearly indicates that model is predictable and reliable.

CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This work focused on the economic analysis of oil palm production value-chain in Imo state, Nigeria. The study reviewed relevant literatures that are in consonance with the objectives and the research questions. This study was guided by the following objectives: the structure of the oil palm value chain in Imo State, the different processing systems use by the processors of oil palm in Imo State, the cost and returns of the value chain actors in the state, the factors that affect the profits of the value chain actors in Imo State. The study took into consideration three key value chain actors which are the farmers, the processors and the traders.

In identifying the structure of the oil palm value chain in Imo State, all the value chain actors were identified and their individual roles were narrated using the functional analysis technique. The study posited the interrelationship existing among the value chain actors in the oil palm value chain in Imo State considering the supportive roles played by each of the actors to meet the needs of the consumers. The farmers are majorly smallholder farmers who have oil palm scatter across their farmland and stays afloat with the wild varieties whose yield are not of economically efficient. The processors still operate using the traditional method which limits their production efficiency in the state. The traders are categorized into retailers and wholesalers. The wholesalers are known for storage and reselling

during the peak of scarcity to maximize profit at over 25%. The traders are faced with different challenges like pricing dynamics, inflations, government policies and poor market information. Hence, they bear the final risks until the products get to the final consumer.

The factors affecting the profit earned by the actors were analysed using the regression technique; the confidence level was masked at 95% and the null hypothesis were evaluated. The null hypothesis that labour cost affects the profit earned by the farmers was accepted. Also, the null hypothesis that oil palm price affects the profit earned by the traders was accepted in estimating the costs and returns, all the value chain actors maximizes their profit. The profitability of the farmers, processors and traders were revealed as 30%, 11% and 25% respectively. The value chain actors should be able take advantage of the profits at all stages of the value chain by engaging in horizontal integration.

5.2 Recommendation

It is recommended to engage the farmers in the promotion of sustainable farming practices and provide training, and technical support. These initiatives will improve productivity, and enhance their yield, quality and responsible land use and conversation. When the needs of the farmers are met, the other actors in the value chain will be able to create an enabling business environment that will promote and grow the economy through oil palm. In addition to the support to the farmers, a

reform in the present land tenure policy as the present system is not favourable to smallholder farmers in Imo State.

The processors and the traders should be involved in policy formulation as their joint collaboration will give room to improved initiatives, ensuring compliance with the industry standards and regulations on the global market. The collaboration will also facilitate sharing of market insights and trends to maintain a sustainable and traceable supply of Fresh Fruit Bunches.

The government should invest in the value addition unit of oil palm and ensure policy continuity. The activities in the value chain are considered profitable, the government should create an enabling credit facility since lack of finance was identified as one of the constraints by the actors in the chain. In addition to the government support, individual investors are advised to invest in the value chain following the return on investment, the opportunities and the growing demand for the products from oil palm in Nigeria. It is certain that they will be able to maximize profit and investors should adopt a horizontal integration of the chains in the oil palm production.

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APPENDIX

Farmers

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	162430.857	38527.315		4.216	0.000	84679.588	240182.126		
	Land rent	-0.307	0.098	-0.413	-3.149	0.003	-0.505	-0.110	0.927	1.079
	Weed/Pest	0.083	0.451	0.023	0.185	0.854	-0.827	0.993	0.984	1.017
	Haulage	1.330	0.532	-0.327	2.502	0.016	0.257	2.403	0.931	1.075
	Wages	0.046	0.073	0.082	0.637	0.528	-0.101	0.194	0.970	1.031
	Farm Implement	0.436	0.456	0.123	0.958	0.344	-0.483	1.356	0.971	1.030

a. Dependent Variable: Net return

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.576[a]	0.531	0.519	88117.806	0.331	4.164	5	42	0.004	1.932

a. Predictors: (Constant), Farm Implement, Weed/Pest, Wages, Haulage, Land rent

b. Dependent Variable: Net return

Processors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	85024.761	10441.288		8.143	0.000	63475.002	106574.519		
	Cost of FFB	-0.427	0.074	-0.656	-5.771	0.000	-0.580	-0.275	0.471	2.122
	Transportation cost	-1.018	0.316	-0.370	-3.225	0.004	-1.670	-0.366	0.461	2.167
	Labour cost	-0.250	0.218	-0.116	-1.143	0.264	-0.700	0.201	0.596	1.678
	Energy cost	-3.025	0.951	0.342	3.181	0.004	1.062	4.988	0.528	1.893
	Water Cost	-19.845	8.999	-0.211	-2.205	0.037	-38.418	-1.273	0.668	1.496
	Rent Cost	-1.301	1.684	-0.081	-0.773	0.447	-4.777	2.175	0.558	1.792
	Machinery Cost	0.166	0.123	0.140	1.352	0.189	-0.087	0.420	0.565	1.769

a. Dependent Variable: Profit earned

Traders

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	23775101.373	7526541.397		3.159	0.000	8671991.125	38878211.621		
	Price of the Palm Oil	-0.653	0.117	-0.642	-5.604	0.000	-0.887	-0.419	0.825	1.212
	Transportation cost	-3.318	3.362	-0.105	-0.987	0.328	-10.064	3.427	0.961	1.040
	Packaging Cost	-0.502	3.328	-0.018	-0.151	0.881	-7.180	6.176	0.732	1.366
	Labour Cost	0.680	2.281	0.032	0.298	0.677	-3.898	5.258	0.931	1.074
	Market Levy	-850.643	1996.665	-0.049	-0.426	0.672	-4857.244	3155.959	0.828	1.208
	Rentage	5.905	20.131	0.032	0.293	0.770	-34.490	46.300	0.931	1.074
	Storage	-100.442	129.702	-0.083	-0.774	0.442	-360.708	159.823	0.938	1.066

a. Dependent Variable: Profit Earned

FACULTY OF AGRICULTURE AND ANIMAL SCIENCE

DEPARTMENT OF AGRIBUSINESS

University of Diponegoro,

Semarang,

Indonesia.

Dear Sir/ Madam,

I am a Research student of the above university carrying out research on the **"Economic Analysis of Oil Palm Value Chain Actors in Imo State".** You have been specially chosen amongst others to provide the necessary information that would enable me to accomplish this research study effectively. I assure you that information provided by you shall be treated confidential and shall be used strictly for this research purpose.

Thanks for your Co-operation

Paschal Adikaibe
Section A: Identification

State: ----------

LGA: ----------

You are to indicate your response by ticking [√] in the box provided or by writing out the correct response to each question in the space provided. Feel free to specify other relevant information where necessary.

Section B; Socio-economic Characteristics of the Respondents

1. Age: ----------
2. Sex: a Male ☐ b. Female ☐
3. Marital Status: a. Single ☐ b. Married ☐ c. Widowed ☐
4. What is your household size/ family size? ----------
5. How many years of formal education do you have? ----------
6. How long have you been in palm oil value chain? (Years) ----------
7. Are you a member of a social organization? a. Yes ☐ b. No ☐
8. How many times do extension agents visit you in a month? .....
9. What is your monthly income from the chain? (₦).....
10. Do you have access to farm credit? a. Yes ☐ b. No ☐
11. What is your farm size/production capacity? ---------- (Ha)

Section C: Value chain mapping and functions of the Actors

1. What is your role in the palm oil value chain? ……
2. What specific activities do you undertake in the palm oil value chain? …….
3. What is the nature of your business, and how does it contribute to the value chain?
   …….
4. What are the inputs you require for your business, and where do you source them from?.....
5. What are the outputs of your business, and who are your main customers? …….

6. Are there any regulations or policies that affect your business in the palm oil value chain? If "Yes", specify the bodies in charge …….
7. How do different actors in the value chain ensure the quality and safety of oil palm products?
   ……
8. Do you have any partnerships or collaborations with other actors in the palm oil value chain? If "Yes", Kindly specify ……..
9. What are the key relationships between your business and other actors in the palm oil value chain? …….
10. Can you describe the distribution channels for your products? ……
    ….
11. Are there any opportunities for growth or expansion in your business? ……..
12. How do technological advancements and innovations impact the structure of the oil palm value chain?
    ……..

Section D: Cost and Return for Oil Palm Production

i. Farmer

1. What are the specific activities involved in oil palm cultivation, and how do you undertake these activities?
   a. ……..
   b. ……..
   c. …….
2. What are the different sources of revenue for your oil palm processing facility? ……..

3. What are the variable costs associated with oil palm cultivation, such as inputs, labor, and transportation?

Activity	Quantity (Unit)	Amount
Pre-planting 1. Land preparation cost (Wages) 2. Seed selection 3. Soil Testing (If any) 4. Transportation from place of purchase to planting site		
Planting 1. Labour Cost (Wages) 2. Fertilizer cost 3. Pesticide cost		
Post Planting 1. Pruning Cost (Wages) 2. Transportation cost to POS		

4. What are the Fixed costs associated with oil palm cultivation, such as inputs, labor, and equipment?

Equipment	**Year of Purchase**	**Amount of Purchase**
1. Machinery	…….	……
2. Cutlass	…….	……
3. Sickle	…….	……
4. Baskets	……...	……
5. Wheelbarrow	……...	……
6. Malay stick	……	…….

5. How do you determine the prices for your oil palm products?

Produce	Quantity (Units)	Unit Price
1. Fruit Bunch 2. Palm kernel		

6. what factors influence your profitability as a farmer in the value chain?

   a. ……

   b. ……

   c. ……

   d. …….

   e. ……..

7. What are the major challenges you face in oil palm cultivation, and how do you overcome these challenges?
    a. ……...
    b. ……
    c. …….
    d. ……..
    e. ……
8. What are the yield and production levels for your oil palm farm, and how have they changed over time? ……
9. Can you describe your sales and marketing strategies for your oil palm products? ……
10. What are your key customers and markets for your oil palm products? …….
11. How do you ensure the quality and safety of your oil palm products? ……
12. Are there any environmental or social impacts associated with your oil palm farm, and how do you address them? ……..
13. How do you measure the profitability of your oil palm farm, and what metrics do you use? ……..

14. What are the major drivers of profitability in oil palm cultivation, and how do you optimize them?
    …….
15. Are there any opportunities for diversification or expansion in your oil palm farm, and how can they be realized?
    ……..
16. How do technological advancements and innovations impact the profitability of your oil palm farm?
    ……
17. What are your long-term goals and aspirations for your oil palm farm, and how do you plan to achieve them?
    ,……..

ii. Processor

1. What are the various activities involved in processing of oil palm into palm oil?
    a. ……
    b. ……
    c. ……
    d. ……
2. How do you source your oil palm bunch? ……..
3. Kindly specify the variable cost of the associated with the following;
    a. The cost of a bunch of oil palm …….
    b. The cost of transporting the bunches from the point of purchase to processing point…….
    c. Do you have workers? Yes ☐ No ☐
    d. If "Yes", how many are they? ……
    e. How much do you pay them as salary? …….
    f. What is the source of energy use in processing? ……...
    g. How much do you spend on energy? …….
    h. How do you source your water? Borehole ☐ Water ☐ supply

i. How much do you spend on water supply? ……

j. Do you package in different products sizes? Yes ☐ No ☐

k. If "Yes", Kindly specify the different packages available for your products? ……

l. Indicate additional cost incurred like Licensing cost of your products? ……

4. Kindly specify the machineries available in your processing unit, the year of purchase and amount.

Asset	Year of Purchase	Amount

5. What are the different products available for sell in your business?

a. ……..

b. ……..

c. ……..

d. ……..

6. Do you sell the by-products? If yes, how much and what is the unit of measurement for the sales of the by-product?
    a. Kernel ……..
    b. Shafts……..
    c. Bunches…….
7. How much do you sell 25litres of processed oil palm? …….
8. What are the factors affecting your profitability as a processor?
    a. ……
    b. ……
    c. ……
    d. ……
    e. ……
    f. ……

iii. Traders

1. What are your main sources of revenue as a trader in the oil palm value chain?

    a. ……

    b. ……

    c. ……

2. Kindly indicate the costs associated in your business operations as a trader in the Oil palm value chain? Where there is asset, indicate the year of purchase, and the amount.

    a. What is the ownership tenure of your warehouse/store? Owned ☐ Rented ☐

        i. If it is owned, how much and when did you acquire the property? …….

        ii. If it is rented, what is the duration of your tenancy and how much do you pay? ……

    b. Do you have workers? if "yes", what is the source of your workers? Family ☐ Outsourced ☐

    c. How much do you pay your workers as salary per month? ……..

    d. What is the carrying capacity of your warehouse/store? How many Gallons do you procure per trip?

e. How do you source your product? kindly indicate the most suited….

   i. From Oil mill processors ☐

   ii. From other Marketers ☐

   iii. From Farmers who has processed directly ☐

f. Do you package the oil palm in different product differentials? If yes, indicate the volume of each differential? ……

g. How much do you spend in packaging each of the product differential?

h. How much do you spend in transportation of your products from source to place of sales? ……

i. Do you pay market levies? If yes, how much do you pay per month, or annum? ……..

j. Is there additional cost incurred? If "yes" Kindly specify……

k. How do you buy a gallon of oil palm? ……..

l. How many do you buy per purchase? ……

3. What is the income generating services that you render as a marketer of Oil palm?

    a. …….
    b. …….
    c. ……..

4. What determines the pricing of your products?

    a. Market competition ☐
    b. Season of the year ☐
    c. Cost of production ☐

5. How much do you sell a gallon of Oil palm? ……..
6. What are the challenges affecting your profitability as a Marketer of Oil palm in Nigeria?

    a. ……
    b. …….
    c. …….
    d. …….

7. what factors influence your profitability as a trader in the value chain?

    a. ……
    b. ……
    c. ……
    d. ……
    e. ……

8. What are your long-term goals and aspirations for your oil palm farm, and how do you plan to achieve them?
,……

Thank you for your time.

Pictures From Field Survey

Semi-mechanized Processing Facility

Oil Palm Plantation

Processors

BIOGRAPHY

Paschal Chukwunonso Adikaibe holds a bachelor's degree from Agricultural Economics and Extension from Imo State University, Nigeria with First Class Honours and top 1% of class of 2017. Paschal is passionate about sustainable development and has focused his research and professional work on promoting sustainable livelihood and clean energy consumption to enhance energy security and income of rural households. He recognizes the crucial role that sustainability plays in agricultural productivity, livelihood improvement, and overall rural development. Through his research and work experience in the agricultural sector in Nigeria. Paschal has gained valuable insights into the challenges faced by rural communities and agri-entrepreneurs in the sector.

He has actively explored innovative approaches to address these challenges, seeking practical and context-specific strategies that can drive positive changes and improve living conditions for rural populations who are the key drivers of the economy in Nigeria. Paschal has facilitated training sessions, and awareness programs, equipping farmers and entrepreneurs with modern agricultural techniques and financial literacy. He demonstrates a strong commitment to community empowerment and has actively engaged with stakeholders, including farmers, and local authorities to foster collaboration and create sustainable solutions to meet the needs of the rural economy. Paschal is currently working as a Programme Analyst with Sahel Consulting Agriculture and Nutrition in Nigeria.