# VALUE CHAIN OF HIGH-QUALITY CASSAVA FLOUR (HQCF) IN SOUTH WEST NIGERIA

**BY**

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## CERTIFICATION

I certify that this work was carried out by BABATUNDE AdeolaAdefisayo under my supervision in the Department of Agricultural Economics, University of Ibadan. Ibadan.

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# DEDICATION

Dedicated to the

Immortal

The beginning, end of all existence.

The author and The Finisher of Faith.

The Teacher, Guide to all truth

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**ABSTRACT**

Value Chain (VC) of agricultural products impacts on their commercial viability. Despite being the world's largest producer of cassava, Nigeria hardly features in its world trade. Domestic production is mostly used as staple food and not processed into value added products such as High-Quality Cassava Flour (HQCF), which has high industrial demand. There is little information on comparative advantage, competitiveness and effects of policies on HQCF in Nigeria.Therefore, the value chain of HQCF in South West Nigeria was investigated.

A four- stage sampling technique was used. Oyo and Osun states were purposively selected being major producers of cassava. Four Local Government Areas (LGAs) from each state, four villages from each LGA and 320 cassava producers were randomly selected. Complete enumeration of the processors (18) and marketers (26) were utilised. Data were collected with the aid of a structured questionnaire on socioeconomic characteristics of HQCF VC actors (producers, processors and marketers): age, education and farming experience. Secondary data on port charges, import and export tariffs and exchange rates were sourced from Nigerian Ports Authority and Central Bank of Nigeria. Competitiveness was measured using Private Cost Ratio-PCR (PCR >1:non-competitiveness, PCR <1: competitiveness), comparative advantage was measured using Domestic Resource Cost-DRC (DRC >1: no comparative advantage, DCR <1: comparative advantage) and policy effect was measured using Effective Protection Coefficient-EPC (EPC >1: subsidy, EPC <1: negative effect of policy). Data were analysed using descriptive statistics, Net Farm Income (NFI) and ordinary least squares regression at $\alpha_{0.05.}$

The age, years of formal education and farming experience for the cassava producers were 48.3±8.5, 3.0±3.4, 21.0 ±10.8years, respectively; while 47.6±8.1, 15.0 ±0.8 y, 8.4±2.1years, respectively were for HQCF processors and 44.1±6.8, 3.5±1.4, 10.0±1.2 years, respectively were for HQCF marketers. The NFI for the producers, processors and marketers were ₦828,499.28/ha/year,₦ 43,761,365.97/year, and ₦18,249.88/year, respectively. Producers' NFI was influenced positively by labour engaged (β=0.48), size of land cultivated (β=0.11) and cost of inputs per cropping season (β=0.03) and was negatively influenced by the cost of producers' capital assets (β = -0.030). The NFI for the processors was increased by years of experience in HQCF processing (β =0.002) and processors' capital asset (β= 0.040). The NFI was decreased by cost of cassava root used in production (β = -0.050). Marketers' NFI was enhanced by years of experience in marketing (β = 0.001) and cost of transportation (β= 0.001). The HQCF VC actors were competitive with PCR of 0.12 (producers), 0.03 (processors) and 0.39 (marketers). Similarly, the actors had comparative advantagewith DCR of 0.05 (producers), 0.75 (processors) and 0.15 (marketers). However, the actors were negatively affected by government policy with EPC of 0.89 (producers), 0.94 (processors) and 0.07 (marketers).

Actors in the High-Quality Cassava Flour value chain were competitive and had comparative advantage in production. However they were not protected by government policy in South West Nigeria.

**Keywords:**High-quality cassava flour processors, Cassava value chain, Net farm

income

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# CHAPTER ONE
# INTRODUCTION

## 1.1. Background to the study

Cassava, rice and maize are the major sources of carbohydrate, cassava being the third most important abundant carbohydrate nutrient supplier in the tropics, and it is a staple for over 600 million persons (FAO, 2018).Brazil, Thailand, Indonesia, Nigeria, and the Democratic Republic of the Congo account for over half of global cassava production (FAO, 2018). The total worldwide use of cassava is projected to be 277 million tonnes per year (FAO, 2018), meaning there is a clarion call to increase worldwide cassava production. Cassava has a significant social and cultural benefit, and it plays an important role in food stability and sustainability, as well as supporting dietary diversity, economic development, rural environmental sustainability, and sustainable growth (Benfica and Thurlow, 2017). As the world's largest producer, Nigeria produces about 57.12 million tons of cassava per year (FAOSTAT, 2018) and is mainly traditionally grown, depending on precipitation, manual planting and without the use of agrochemicals (fertilizers), with yields ranging from 11 tons/ha for local varieties to 32 tons/ha for enhanced varieties.

In addition to traditional demand, cassava processing into value-added commodities has a significant effect on its commercial viability; for example, the estimated yearly starch usage in the United States is approximately 3 million metric tons, and cassava starch accounts for 1.5 percent of all commercial starch consumed and imported (FAO,2018). Other importers of products based on cassava are China, the current largest producer of biofuel originally derived from grains, which now uses cassava imported into cassava chips and imports cassava chips into Europe for use in livestock feeds (Kray and Wu,2010). In Canada, North America, Japan, India and

China, where it is used in the food industry, high-quality cassava flour is requested (FAO,2018).

Different governmental policies for development of agriculture have been set in motion and more lately, targeting the cassava root sector, in specific the federal government intervention on the Agenda for Cassava and Agricultural Transformation (ATA), the key goal of the development of cassava in the Transformation Agenda was to make Nigeria the largest cassava processor. The goal of this transformation plan is to establish a younger breed of cassava farmers,concentrating on industrial expansion and agriculture as an enterprise.

The new Federal Program for Agricultural Promotion Policy (APP) focuses on addressing key issues at the heart of restricted food production and quality standards delivery. Export markets would also benefit from a positive and efficient balance of payments as domestic productivity rises and food production standards rises. The goal of the APP policy is to close the gap by working closely with private investors across all farming groups and businesses to build end-to-end solutions in the value chain.

Policy on the compulsory replacement in the baking industry of 10% wheat flour with high-quality cassava flour, to enable maximum production of high-quality cassava flour. With Nigeria's rising population, these programs are critical for achieving efficiency in food production and minimizing export dependence. The improvement of the HQCF value chain would not only rely on policies aimed at providing smallholder farmers with agricultural inputs in kind and cash (for farm labor) to boost the production of targeted crops such as cassava (CBN, 2017). These policies prompted the surge in HQCF production in Nigeria.

High-quality cassava flour (HQCF) is a value-added cassava more refined product made from dewatered cassava that has been pulverized and filtered to produce a finer flour that can pass across a 0.25 mm sifter. HQCF is typically greater than ninety percent starch, although HQCF is not like pure starch since it contains grain, traces of protein, and fat. The name HQCF was chosen to set it apart from other flours derivedfrom cassava, the most of which are regular cassava flours. Cassava roots must be of high quality, in good state of health, without signs of rot and must have been harvested 9–12 monthsafter planting (Dziedzoave*et al.,* 2006). Roots older than 12 months reduce yield of flour(Apea-Bah *et al.,* 2011) and fail to meet industrial standards for starch and fiber when usedfor the production of HQCF (Oti*et al.,* 2010). Production of HQCF must be done within 24hrs after harvesting. Cassava varieties used included TMS87164, NR8082, TME419, TMS0581 and TMS98/1632and production of HQCFbegins with sorting and peeling of roots. Subsequent unit operations must follow one another immediately in order to eliminate the likelihood offermentation.

According to Phillips *et al*.(1999), a 10% substitution of HQCF for wheat flour can be tolerated without affecting taste or certain properties, while replacing wheat flour with more than 50% of HQCF will lead to fragileness of the substance. Cassava flour, on the other hand, becomes more readily available as its value rises. (Ferris *et al*. 2002; Gensi*et al*. 2001). In starch-based paperboard adhesives, HQCF may also be used as a full starch substitute (SBA). According to Plan (2006), high-quality cassava flour (HQCF) which is also being used in biscuit and confectionery manufacturing, dextrin (a pre-gelled) starch for sealants, starch and enzymes (hydrolysates) for biopharmaceuticals products, and seasoning made up about 10% of the industrial claims for cassava refined products in Nigeria. Since the export of primary products is no longer in high demand, the emphasis is now shifting to adding value from the raw form to value-added products, which can boost the prices of all agricultural crops. Value chains are the manufacturing processes that encompass a commodity, spanning all inputs supply, mode of transit, conversion and alteration, distribution, merchandising, and retails, all the way to final products and users (Mejabi, 2012).

In order to understand agricultural value chain analysis, many cross-disciplinary views have evolved over time. A value chain can be described as a mechanism through which technology, operations, labour force processes, and hierarchical relationships and frameworks combine to determine market product values from a world- wide paradigm (Trienekens 2011). Value-added output of goods and services along the chain is shared by the use of available resources and facilities even within context of the organizational framework, which determines the relevant possibilities and constraints. Actors, social networks or stakeholder relationships, product and service or supply chain flows, and organizations may all be classified as part of the value chain. The study of the institutional structures linking the different economic actors focuses on another approach (i.e. trust, vertical and horizontal integration organization, and contracts). Value chain creation is not limited to one component; it involves the development of the end of supply and demand and the different ties between them at the same time (Grant *et al*, 2006).

The additional uses of cassava in its value-added form, such as the HQCF, are believed to be central to the growth of the marketing sector and hence the expansion of the market and price stability of cassava farmers, in addition to contributing to the job development strategy that has targeted over a million direct and indirect jobs in the sector (Adeshina, 2014). Without the vertical integration of smallholder cassava farmers into the markets through small-scale processing and the implementation of new marketing strategies, this will, of course, not be possible. However, scaling the current operations from small to medium and large scales will entail commercializing the industry. The possibilities are largely focused on consistent government policies supporting the use of secondary products as well as addressing the unique needs of smallholder farmers and their products' ultimate consumers, taking into account the specific quantity and quality criteria that small holders have difficulties achieving for many reasons, resulting in the adoption of the value chain approach (Ogbe*et al*, 2011).
In value chains, the main objective is the benefits accrued to all stakeholders, the value-generating interdependent processes, and the resulting processes and product flow that are generated. The growth of the value chain has nearly become a golden blueprint for sustainable agricultural investment.

## 1.2 Statement of Research Problem

Cassava production is currently 277 million tonnes per year at the global level (FAO,2018).As the world's largest cassava producer, Nigeria produces about a fifth of the global production of cassava (52,000,000 tonnes per year), led by Thailand, Indonesia, Brazil, Ghana, Congo and others ( Lamboll*et al*, 2018). The leading exporters of cassava products are Thailand and Indonesia, the main players in the international cassava industry. Total exports of 400, 000 tons per year from Africa and Latin America (Elemo, 2013). Besides being the largest global producer, value-added cassava products from Nigeria are rarely seen in international trade. Cassava is grown extensively in Nigeria by smallholder farmers, who cultivate less than 2 hectares in scattered parcels (Elijah, 2014). When compared to the world's two leading cassava producers, Indonesia and Thailand, which have mean yields of 23.4 tonnes and 22.2 tonnes per hectare, respectively, Nigeria's mean yield of 11 metric tons per hectare is extremely low (FAO, 2017).The dilemma faced by the above is how Nigeria, as largest global producer of cassava, will raise the average yield per hectare in order to meet the average yield per hectare of the other leading producerseven with being the world's largest cassava producer. Between 2011 and 2018, the global cassava processing industry grew by 2.6 percent, reaching a production volume of about 253.4 million tonnes in 2018. (Wamba&Akter,2019). In Nigeria, barely 10 percent of cassava is currently processed into flour, sweeteners and industrial goods. Unlike Brazil, where 85 percent of cassava goes to manufacturers, 95 percent in Thailand, the vast majority of production is consumed by humans. (FAOSTAT, 2017). In view of the above, the question is how Nigeria can emerge as the largest global producer of cassavaas one of the globe's foremost export markets of value-added cassava.

A critical look at the value chain of cassava flour indicates, according to Lamboll*et al,* (2018), that cassava is still a subsistent/semi-commercial crop with little or no substantial market share for manufactured products. Understanding how operations and stakeholders involved in moving a commodity from output to consumption are interconnected is the aim of value chain analysis. A value chain map should be created as part of every value chain research. Value chain mapping is a vital aspect of a value chain because it's difficult to see the interdependencies in a complex network or fix structural steps without first mapping them (Stein,2017). It is a constraint to connect cassava farmers to High Quality Cassava Flour (HQCF) processors since farmers typically cultivate less than 2 ha in scattered parcels and the HQCF processors expect large quantities of deliveries, average is 33 mt/delivery. For the country to keep up with global cassava production, both the areas and the yield of cassava will have to increase dramatically.

The ability of an investment to generate returns and also sustain its performance is crucial,according to Lamboll*et al,* (2018) uncertainty is central to the uneven performance of the HQCF value chain, because it discouraged business actors from investing in the growth of the value chain. Uncertainty differs from risk. Whereas with risk the probabilities of a given outcome are, or can be known, uncertainty refers to a situation where outcomes are indeterminate and the odds of a given outcome cannot be known in advance. In these conditions, business actors are much less willing to invest. Second, the business actors in the value chain (growers, HQCF processors, and bakeries) have not devised a viable strategy to adapt to uncertainty and so capture the opportunity presented by HQCF.

In addition the low capacity of people in many African countries to process and preserve foods contributes to food and nutrition insecurity, slow growth of rural-based small-scale food processing enterprises, limited capacity to generate employment in the rural areas, and failure to reduce rural–urban migration (Abass*et al.,*2016). Given the current state of production there is need to increase the potential economic benefits of HQCF (Ogboji, 2016).

Nigeria is experiencing the rapid growth in noodle production shown by the establishment of noodle facilities by virtually all flour mills in the country, according to Elemo (2013), due to the high significant demand for noodles in the country. Moreover, the reduction in food preparation time, the rapid pace of urbanization and the increased demand for processed food also increase the demand for food and agricultural products imported to feed increasing urban populations. For example, imported wheat is used to make 2.2 million tonnes of bread per year, 500,000 tonnes of biscuits/snacks, and 300,000 tonnes of noodles. At a 10% substitution rate, this translates to 220,000 tons of HQCF for bread production, 50,000 tons for biscuit manufacturing, and 30,000 tons for noodle production. The annual national demand for HQCF is projected to be 300,000 tonnes, while the national supply is estimated to be about 50,000 tonnes, indicating that the demand for HQCF replacement and usage is massively inadequate (Plan, 2006).The aim of this thesis is to give answers to the research questions mentioned above.

i. What are the connections/relationships in the value chain of high quality cassava flour (HQCF) between actors, processes and activities?

ii. Is high quality cassava flour production profitable?

iii. Is there a competitive advantage in the processing of high-quality cassava flour (HQCF), and if so, what would that be?

iv. What are the positive and negative consequences of different government policies on the value chain of high-quality cassava flour?

V. What are the challenges/constraints of the study area in the value chain of HQCF production?

**1.2 Objectives of the study**

The study's main objective is to examine the value chain for high-quality cassava flour in southwest Nigeria. The basic goals are to:

i. Map out all the linkages/relationships between stakeholders, processes, including activities in the cassava flour value chain; and ii.

ii. Assess the profitability of the study area's high-quality cassava flour value chain.

iii. Examine the competitiveness and comparative advantage in the manufacture of high-quality cassava flour.

iv. Examine the impact of policy interventions on the value chain of high-quality cassava flour in the study area.

v. Identify the challenges and constraints in the HQCF value chain in the area of study.

**1.4. Justification of the study**

Cassava can be used in a couple of ways. Production of cassava is rising at 3% per year (FAO, 2018), and is amongst the most important cash crops for overcoming the nation's unemployment crisis. Importantly, the geography of cassava defines the mode of usage and thus the stimuli that decide its demand (FAO, 2018). Cassava production and processing will benefit from the expansion of the non-food industry, which will provide a medium to long-term market for diversified alternative products (Daniels *et al.,* 2011). With the advancement of competitive cassava processing and greater quality products, there are numerous growth opportunities in the industrialized use of cassava. The non-food market's expansion would encourage cassava production and processing, in particular by providing a medium- to long-term market for diversified alternative products. Fermented and non-fermented granulated flour based cassava products are the existing types of consumption of cassava, but many countries have launched value-adding initiatives in the cassava food chain, supporting the rural economy and helping to meet dietary needs, including similar steps to encourage added-value cassava at the expense of imported staples (FAO,2018).

Studies have shown that if its various possibilities are properly harnessed,more than almost any other crop, cassava has the capability to industrialize Nigeria. Awoyinka (2009) reported that from the development of cassava and its by-products, Nigeria can earn around US$ 5 billion per year, making it a huge earner of foreign exchange and quite a number of comparative indices appear to place Nigeria in the frontline of cassava production; Firstly, in all agro-ecological areas of Nigeria, cassava is grown, and secondly, cassava, which is typically consumed in processed forms, is a major staple crop in Nigeria. HQCF, in specific, has multiple food and commercial uses and provides smallholder farmers and processors the ability to venture into the supply and processing of raw materials. Potential economic benefits include substitution for economic imports, job formation, growth in thetransportation and manufacturing industries, and higher revenues for small scale cassava farmers. The quantity of HQCF used depends on the degree of inclusion, such as the ability to generate jobs in the HQCFbread making industries because amount of HQCF produced and used by the bread and confectionery industries are inextricably linked.

In 2017, Nigeria spent ₦163 billion on imports of wheat from which a vast quantity of wheat imported was for noddle production, about 3.9 million tonnes of wheat were imported from which 3.3 million tonnes were imported from the US priced at about ₦163 billion, despite the detrimental impact of wheat imports on the Nigerian economy and the total import of ₦886.7 billion in 2017 induced trade deficit, depletion of foreign reserves and unemployment (Lamboll*et al*, 2018), which is an indication of a high prospect of developing local substitutes such as HQCF for partial wheat flour replacement in the flour mill industries. The potential benefits of using HQCF include adequate return on investment due to decreased HQCF costs as compared to wheat, as well as increased product yield, especially biscuits, users noted that when good quality HQCF flour and the correct processing method for their production were used, the quality of pastry products, biscuits and noodles improved, indicating that diversification of cassava into new food and as an import replacement product, therefore have strong potential benefits. The advantages of flour highlighted suggest good prospects for commercial production and use of cassava products (Abass*et al*, 2013). These are strong indications of a high prospect of developing local alternatives for partial wheat flour replacement, such as HQCF. All would benefit from the need to look inwards for import substitution, fix food security problems, and save limited foreign countries.

Poverty levels and other synonymous statistics, including low employment rate and disparity of income are unacceptably high in Nigeria, yet the country continues to procure a large number of manufactured products that can be produced from cassava. Furthermore, urban demand, new consumer preferences, and emerging trends in foreign trade have an effect on rural areas along supply chains, spilling over into marketing and production systems. These rural-urban linkages present challenges, but also mutually beneficial for producers and customers, and can serve as entry and exit points for development through the generation of employment and income, as well as poverty reduction.

In every enterprise, positive net returns are an incentive for the company to survive. Investment continuity in crop processing would be largely dependent on its profitability. Ojowu (2006) noted that "demand-pull" and incentives for benefit make the improvements made to the production of agricultural processing sustainable. The formula for improved results is an increase in earnings (Davidson *et al*, 2009).

In general, profit analysis shows the various channels of profitability, goods, territories or other marketing organizations. Therefore, profit is classified as total revenue minus total cost According to four profit prospects were outlined (Eriksson, *et al* 2004);i. profit is a reward for taking chances in business; (ii) profit benefits from limited resource control; if a citizen owns a resource that others want, others will bid up the price that will then produce profit for the owner; (iii) profits occur because others do not have access to knowledge. Such unique knowledge includes hidden formulas or techniques, exclusive rights to inventions, property rights and patents, etc., guaranteeing the creator's profit; and (iv)profits could occur simply because some organizations are better run than others; their managers are often innovative planners and thinkers with strong organizational skills.

Regression analysis focuses on evaluating how one variable is connected to each other. The main relation in a regression analysis is the regression equation, which includes the regression parameters whose values are to be calculated using data, based on the assertion of the causal or functional relationship between the variables. The parameters determine the association between the totally reliant variable and the explanatory variables repressor and stimulator (Onoja, 2008; Atagher, 2013) some of the requirements for selecting or evaluating a good econometric model as (i) parsimony or simplicity, (ii) recognition, which implies that unique values must be approximate parameters, (iii) fitness quality (high $R^2$), (iv) theoretical coherence (signs of predicted parameters must be consistent with their prior expectations) and (v) predictive power possession. The best regression fit is defined by the level of the determination coefficient ($R^2$), the significance level of the overall equation (F = statistics), the significance level of each coefficient (t = statistics), the right signs and the magnitude of the coefficients relative to their a priori expectations (Koutsoyiannis, 2001; Gujarati, 2006;Atagher, 2013;Onoja,2008).

The primary use of the chi-square test is to examine whether two variables are independent or not, meaning that the two factors are not related. By ruling out independence of the two variables, the chi-square can be used to assess whether two variables are, in fact, dependent or not. More generally, we say that one variable is "not correlated with" or "independent of" the other if an increase in one variable is not associated with an increase in theother.According to Singhal, (2015) if two variables are correlated, their values tend to move together, either in the same or in the opposite direction. The chi-square distribution is actually a series of distributions that vary in shape according to their degrees of freedom.The chi-square test is a hypothesis test designed to test for a statistically significant relationship between nominal and ordinal variables organized in a bivariate table. In other words, it tells us whether two variables are independent of one another

According to Porter (1985), the customer's purchasing power (which is largely a feature of preference) contributes greatly to improving a product's competitiveness. Competitiveness requires the mixture of optimal performance assets and processes and incorporates performance capital by production processes (Momaya, 2001). At the federal level, competitiveness being characterized as a nation citizens' capacity to attain a high and increasing standard of living, as evaluated by increases in aggregate productivity, quality of life, firm saturation of the export market, and foreign investment. The comparative advantage theory advocates trade between entities or countries with a comparative advantage in the development of various goods, resulting in social security and versatility enhancement for the participants. A country has a competitive edge in manufacturing a product if its comparison price is lower than that of other economies. Supply and demand disparities are influenced by competitive advantage, which can be driven by innovation or factor endowment (Costinot, 2009). Established, commercially efficient market-oriented processing of cassava flour and quality measures will require the competitiveness of the Nigerian cassava flour sector in the local and international markets.As a result, it's critical to assess the HQCF value chain's sustainability, taking into account the enormous potential benefits to stakeholders as well as the multiplier effects of industrial and economic growth in particular.

Monke and Pearson (1989) designed the Policy Analysis Matrix (PAM) as an analytical method. It depicts how policies affect farm production and profits, how investment policy decisions influence economic expansion and competitive advantage and how agricultural research policies affect technological change.It's also worth noting that the PAM method helps to estimate the impact of various agricultural production systems, innovations, agro-ecological zones, etc. on private profitability, social profitability and policy transition. It utilizes farm budget data priced at market and social rates for production costs and sales revenues.

Existing studies on value chain of HQCF have focused on efficiency, competitiveness, cassava value chain. Focusing on Technical Efficiency among Small and Medium Scale Entrepreneurs,Cassava value addition chain analysis, Willingness to Utilize High Quality Cassava Flour (HQC), Sustainable Inclusion of Smallholders in the Emerging High Quality Cassava Flour Value Chains, Responding to uncertainty in high quality cassava flour value chains in Nigeria , analysis of the competitiveness of high quality cassava Flour value chain etc. (Ayoola*et al*,2016; Olayimika*et al* ,2015;Adebayo *et al*,2010;Lamboll*et al,* 2018).None of these studies were able to analyze the HQCF value chain objectively and empirically and to provide basic data on development, inputs and outputs, and marketing/sales. This is useful for growing production potential for local, national and foreign markets, where there are tremendous opportunities for developed countries to engage in production. The aim of this study is to supply empirical information about salient relevant activities in the value chain of High Quality Cassava Flour (HQCF) and to fill the current void in the literature caused by the above.

In terms of methodology, using Policy Analysis Matrix (PAM) and the market share analysis, Ogboji (2016) analyzed the competitiveness of HQCF in Imo State. Some HQCF studies used other approaches, such as the study of Pearson Product Moment Correlation (PPMC) (Olayimika*et al*, 2015). This study differs from the studies analyzed in that both Profitability Analysis and Policy Analysis Matrix will be used. This study also provides the functional analysis of all the stakeholders or the actors at each point of the HQCF value chain, analyzes amount and product flow in the value chain of the HQCF, and accesses the profitability of HQCF development and marketing, and shows comparative advantage and competitiveness in the production of HQCF.

### 1.5 Plan of the Thesis

The remainder of the study is organized as follows: Chapter Two discusses the theories on which the thesis is focused, reviews the methodology and empirical analysis, and concludes with the study's conceptual framework. The research methodology is presented in Chapter 3, which includes the scope of the analysis, data type and source, analytical techniques, and study limitations. In chapter four, the outcomes are discussed, and in chapter five, the study concludes with a review of conclusions, conclusion, and policy recommendations.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Theoretical framework

This chapter brings in view the theoretical context for the study, as well as concepts and reviews, such as comparative advantage theory, competitive theory, and social network theory, as well as the concept of value chain, which is the driving force behind economic, environmental, and social initiatives to enhance efficiency, competitiveness, entrepreneurial activities, and small-to-medium sized business expansion.

### 2.1.1. Theory of comparative advantage

The concept of comparative advantage advocates trading between two or more parties or countries that have specialized expertise in the manufacture of specialized products. This contributes to the development of knowledge and wellbeing among the participants. If the cost of that good is low in comparison to other goods as compared to other nations, a country is said to have competitive edge or advantage in the manufacture of a specific good.Comparative advantage law refers to an entity's (person, organization, or nation) capacity to manufacture a particular commodity or function at a lesser additional cost and relative value than another party. Even if both goods can be created with less resources than the other, the competitive advantage demonstrates how trade can generate profit for both parties. Profits are the net returns from such an outcome. A country's competitive advantage in a commodity typically benefits from utter dominance in the product's necessary resource endowments. It places the country in an advantageous position to be an expert in commodity development (Oluyole 2015).

### 2.1.2. The Ricardian model

A country must export the consumer goods or facilities with which it has the highest significant edge and import others in which it has the least significant edge according to the basic premise of comparative advantage (Ricardo, 1817).

The word"comparative" refers to something that is contextual rather than definite. The following assumptions underpin the Ricardian model:

(1) There are fixed resource endowments.

(2) Production factors can be fully transferred between alternative uses within a region,

(3) Production factors are externally entirely immobile,

(4) In the model, a labor theory of value 1 is used,

(5) For both countries, the technology standard is fixed,

(6) The unit output costs are stable,

(7) There is a full employment standard,

(8) A perfect rivalry exists,

(9) No government-imposed barriers to economic activity exist,

(10) There are zero internal and external transportation costs.

In static terms, Ricardo's comparative advantage theory was a dynamic principle of comparative advantage. Economic resources, technology, demand trends, concentration, marketing practices, and public policies are some of the predictors of comparative advantage that can cause a country's comparative advantage in a commodity to evolve over time.

David Ricardo's theory of comparative advantage was presented in terms of technological superiority, a definition that is sufficiently general to cover a variety of circumstances when articulated in terms of contrasting opportunity costs or relative prices of goods and services between countries.

### 2.1.3. The Heckscher – Ohlin (H - O) theory

The theory of Heckscher-Ohlin notes that countries have a competitive advantage in products that use their relatively abundant variables intensively. On the premise of comparative advantage in terms of the factor abundance of nations and the factor strength of resources, the H-O model clarified. The abundance factor is the resource buoyancy of nations. In a two-factor model, where the factors are capital and labour, a nation's wealth factor is determined by its proportional endowment of capital to labor as compared to another nation or nations. For two reasons, the Heckscher-Ohlin theory differs from the classical economists: The Heckscher-Ohlin (H-O) theorem describes rather than assuming the reasons for the disparities in relative product prices and competitive advantage (as was the case for classical economists); the theory of Heckscher-Ohlin explores the impact of foreign exchange on the earnings of production factors and the disparities in earnings globally.

Assumptions of the Theory of Heckscher-Ohlin (H - O)

The Heckscher-Ohlin (H - O) theory's conclusions are set out below:

1. Assumption of the presence of two production variables: labor and capital
2. The amount of labor and capital is in fixed supply, but it can differ across nations.
3. Labor and resources can be freely transferred through industries.
4. Only two commodities are necessary for production and consumption: food and clothing.
5. The combination of labor and capital creates food and clothes.
6. Food production technology is more capital-intensive than clothe production technology.
7. Compatibility and sustainability in all markets
8. The focus is on a two-country model with international and domestic.

The Heckscher-Ohlin theory illustrated in Figure 2.1, P1P1, and P2P2 is the curve/border of development possibility for country A and country B with product quantity (C) on the x axis and product quantity (W) on the y axis. Product C is considered to be capital intensive, and product W is labor intensive in comparable nations. Both nations are believed to be using the same technologies. Country A's output choice curve is distorted along the y axis since commodity W is labor-intensive and country A has a relative labor abundance. Country B's output potential curve is distorted along the x axis since commodity B is capital-intensive and country B has a relative surplus of capital. Since these two nations have equal tastes, they are facing the same curve of indifference, IC1, which is common to both. The indifference curve, IC1, is the highest curve of indifference in both countries. It can be done in isolation prior to trade. Points A and U are equilibrium points of output and consumption, respectively, in the absence of national exchange.

The tangency of the indifference curve, IC1 at points A and U, does not signify the countries' trade or independence, respectively. The W and C prices of both countries at points A and U respectively are calculated by Slope P2 and P1. Country A generates and consumes W at point A on the indifference curve IC1 with Pc/Pw = PA in country A in the absence of exchange, at point U, B generates and consumes IC1 with Pc/Pw = PU in country B on the same indifference curve. As the price of C(Pc) is lower at point U (point U lies on the curve of output possibility, PUPU in country B), country B. Country A has a comparative edge in the producing of commodity C, and country A too has a comparative edge in the producing of commodity W. As the price of W in country A is cheap, A specializes in producing W. W's price is cheap because labor is cheap in country A; labor is cheap in country A because country A is a labor-rich country (same also apply to country B)

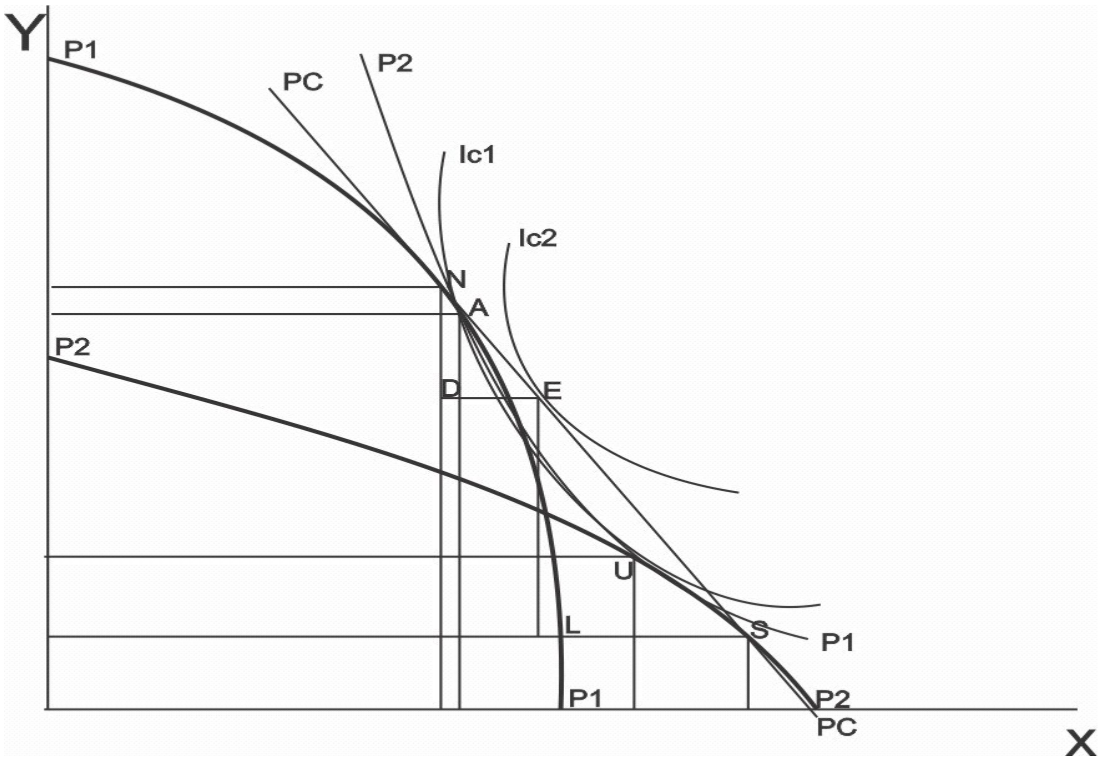


Figure 2.1: The Heckscher – Ohlin (H - O) model

According to a large body of international trade and policy literature, there are four reasons why a nation might have an edge in export of a product to some other nation: (1) technical dominance, (2) resource bequest, (3) market dynamics, and (4) economic stratagem, Engelen, (2015). All these factors making the nation's competitive gain can be seen as a context, Figure 2.2. Obviously, businesses specializing in industries with a comparative advantage are on a much better footing in creating standardized or differentiated goods within the sector to derive a competitive advantage. New technologies, resources, demand, and policies to promote trade are all discussed in this context as four factors affecting a nation's competitive advantage in a commodity/service over other countries. In these powers, dynamic elements affecting competitive gain are also included.

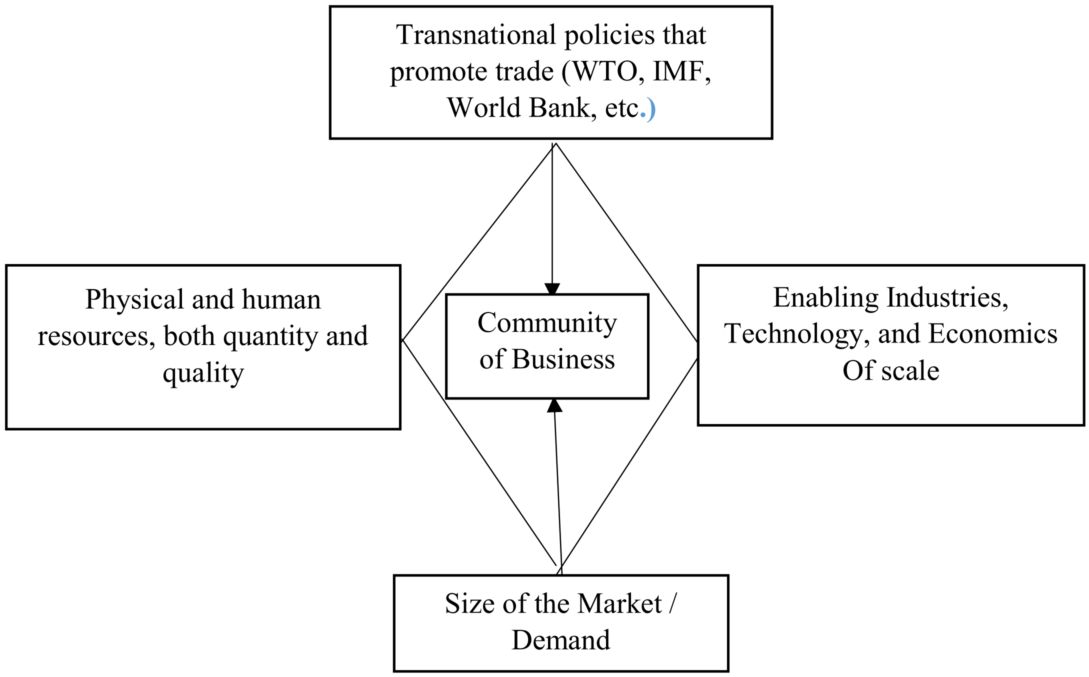


**Figure 2. 2: A diagrammatic concept for Comparative Advantage**

### 2.1.4. Theory of competitiveness

The set of systems, regulations, and components that determine a country's productivity levels is referred to as competitiveness (Porter and Schwab, 2008). Therefore, it is not possible to overemphasize the value of competition in the development of HQCF, sincecompetitiveness is the central characteristic in national, geographic, and international economies. More dynamic economies, in other words, strive to generate higher levels of returns for their people.Competition allows agriculture products producers to produce enhanced goods, reduce costs in comparison to competing products, and agree on a product or service line that meets customer needs, satisfy local market demands while maintaining quality and food safety standards, and export dynamism (Adegbite*et al* 2014). Competitive advantage can be gained when a firm expands or acquires a collection of characteristics (or execution actions) that enable it to edge over its competitors (Brandt *et al*., 2017). In other terms, a competitive advantage exists when a company's activities are more efficient in the market than those of its rivals, or when they are more profitable in terms of other significant outcomes (Eden*et al*, 2009), such as market share, product quality, or technological advancement.

In general, the competitiveness of companies can be substantiated by their ability to manufacture goods and/or services in such a way as to ensure for themselves a "normal" (i.e. not less than average) level of the aggregate share of net profit, as well as a retained or increasing share of the market in question (Szentes ,2012). In order to prosper and compete in a market, businesses must meet two conditions: they must provide what customers want, and they must withstand competition. The difference between the value delivered to clients and the expense of producing that value is what gives a company its overall competitive edge. In terms of commodity and services, there are two ways to gain a competitive edge. The first is the advantage of a special deal or distinction. Consumers are more willing to pay a premium price for a superior product or service than they are for competing deals if they believe the product or service is superior.The latter is a limited profit that customers get when the company's overall costs are lower than those of their traditional rival. Property and location ownership is a competitive benefit. To achieve and retain a competitive edge, a company or industry must invest in innovation. Strategic management theories have a competitive advantage by illustrating the organization's performance and capacity, as well as describing how the company is led in the right direction.

Competitiveness is a dynamic term used to assess success at the business, regional, and federal levels. Economists are concerned with the sectors that will make the greatest contribution economic development of a country most, and they mostly use the principle of competition to do so (Latruffe, 2010). Competitiveness drives productivity growth, and prioritizing customer preferences leads to a more competitive market (Khazanchin*et al,* 2007).Competitiveness refers to a company's, an industry's, a region's, or a country's ability to produce more when dealing with foreign competitors, comparatively high sales, and job factors on a long-term basis. It is characterized as a steady increase in a nation's or territory's living standards with the least amount of unemployment in the economy possible (Stajano,2008).The capability to market products to meet customer requirement in terms of cost, quantity, together with quality whilst still allowing the company to profit from overtime gains. The agricultural sector's competitiveness is safeguarded in the developing world (Latruffe, 2010). According to Blunck (2006), each company defines competition differently; for businesses, the ability to reach or surpass consumer standards is more competitive and profitable than other competitors. This refers to the ability to achieve long-term success in foreign markets without relying on government security or tax incentives in the context of trade. This entails higher earnings as a result of higher productivity.

Firm efficiency, the export score of companies (trade divided by production), the region's market share, and the performance of international markets are all factors that influence commercial competitiveness. The ability of national companies to make sustained gains without protection or subsidy against foreign competition, which is a better measure of a nation's economic health than the success of a single corporation, that may be due to monopoly, is the degree of competitiveness of the industry.National competitiveness refers to a country's people's capacity to attain a high and increasing standard of living, as measured by rises in gross productivity ,standard of living, company ability to enter the export market, and foreign direct investment.

Porter (1990) conjectured that a country's wealth is created rather than inherited; it does not emerge from a country's natural endowments, labor force, monetary policy, or price movement, as classical economics claims. The capacity of a country's industries to evolve and improve, according to the author, is critical to its competitiveness. A competitive advantage is generated by combining information and other important resources so as to achieve a greater portion out of the global emporium for a specific product. The ability of companies in the sector to develop and enhance their technologies and a competitive environment contribute to achieving a competitive advantage (Oluyole, 2015).

According to this study, competitiveness refers to a company's or a nation's ability to thrive profitably and sustainably both domestically and internationally. Competitiveness may also be determined by a nation's comparative edge in the manufacture of specific goods and services; that is the greater the comparative advantage or expertise, the higher the competitiveness.

**2.1.4.1. Components of competitive advantage**

a. Technology and innovations for competitive advantage: Innovation is crucial to a country's economic growth because creative businesses create fresh and previously uncreated value and profit from a significant portion of that value through the commercialization of their research and development performance. They build wealth mainly for themselves, their own nation, and the international community in this way. Innovating entails both product / process reorganization. Brand restructuring is a product that is considered by either the manufacturer or the consumer to be new; both end-users and distributors are interested in the latter. The restructuring of processes refers to new processes that either reduce production costs or enable new products to be produced. The more high-yielding a nation's enterprises, the more effectively the nation uses its capital (Knight, 2007).

b. Human capital for competitive advantage: Human resources refers to the people who make up an organization's workforce in labor economics, but it may also refer to industry sectors or even whole countries. Companies can only gain a competitive edge by creating value in a way that is impossible to duplicate by competitors. Traditional competitive advantages including financial and natural resources, technology, and economies of scale can all be used to create value. On the other hand, the resource-based argument is that these sources are becoming increasingly open and easy to replicate. They are therefore less important for competitiveness in relation to a comprehensive social system, such as a work environment.Human resource strategies and practices may be an extremely effective determinant of high competitive edge if this is the case (Jackson and Schuler, 1995).

c. Organizational structure for competitive advantage:The term "organization" refers to a type of structured group. Depending on its objectives, an organization may be classified in a variety of ways. An organization's structure can reveal how it functions and performs. Organizational structure enables the ability to articulately assign responsibility for various positions and procedures to different departments such as the sections, units, work-team, and staff.Individuals typically work in a company under time-restricted job contracts or task instructions, or permanent employment arrangements or programme guidelines increased competitive demand pushes companies to retain a competitive edge, redrawing the lines between what determines and sustains their competitive advantage.

Price, cost of competition, cost of productivity, innovation, technical development, efficient management of organizational activities, brand, product and service quality and human resources are the components of competitiveness prospects (Martin *et al,* 2009). The efficiency of a nation's industries in general of substantial and sustained exports and/or foreign investment must be demonstrated in order for it to have a competitive advantage. Innovations/ inventions plays a central role in granting an enterprise or organization in having a competitive strength. Four characteristics of a nation depend on why certain firms are more capable of effective inventions, Figure 2.3.Market dynamics, related and supporting sectors, as well as firm policy, framework, and rivalry are all factors to consider.

Factors generally are not really conventional resources like land, manpower, resources, or natural resources, but rather those that are created and upgraded over time, such as professionally qualified workers and international research organizations that are ideally tailored to industry's needs. The demand dynamics are the characteristics of demand from the home market—sophisticated and demanding customers who can predict future demand trends and pressure businesses to innovate faster than competitors abroad. Competitive advantage is more likely to be generated by linked and supporting sectors that are globally competitive and, in particular, actively engaged in innovation and upgrading. Firm tactics, structure, and competition relate to the existence of managerial and operational competing forces/challenges from other companies inside of the industry. Though managerial/organizational modalities must be adaptable to other causes of competitive advantage, domestic animus as well as an integrative force in the diamond are considered necessary which enables the “diamond|” to work as a method of achieving and maintaining a competitive advantage Figure 2.3 shows Porter's depiction of these powers as a "diamond."

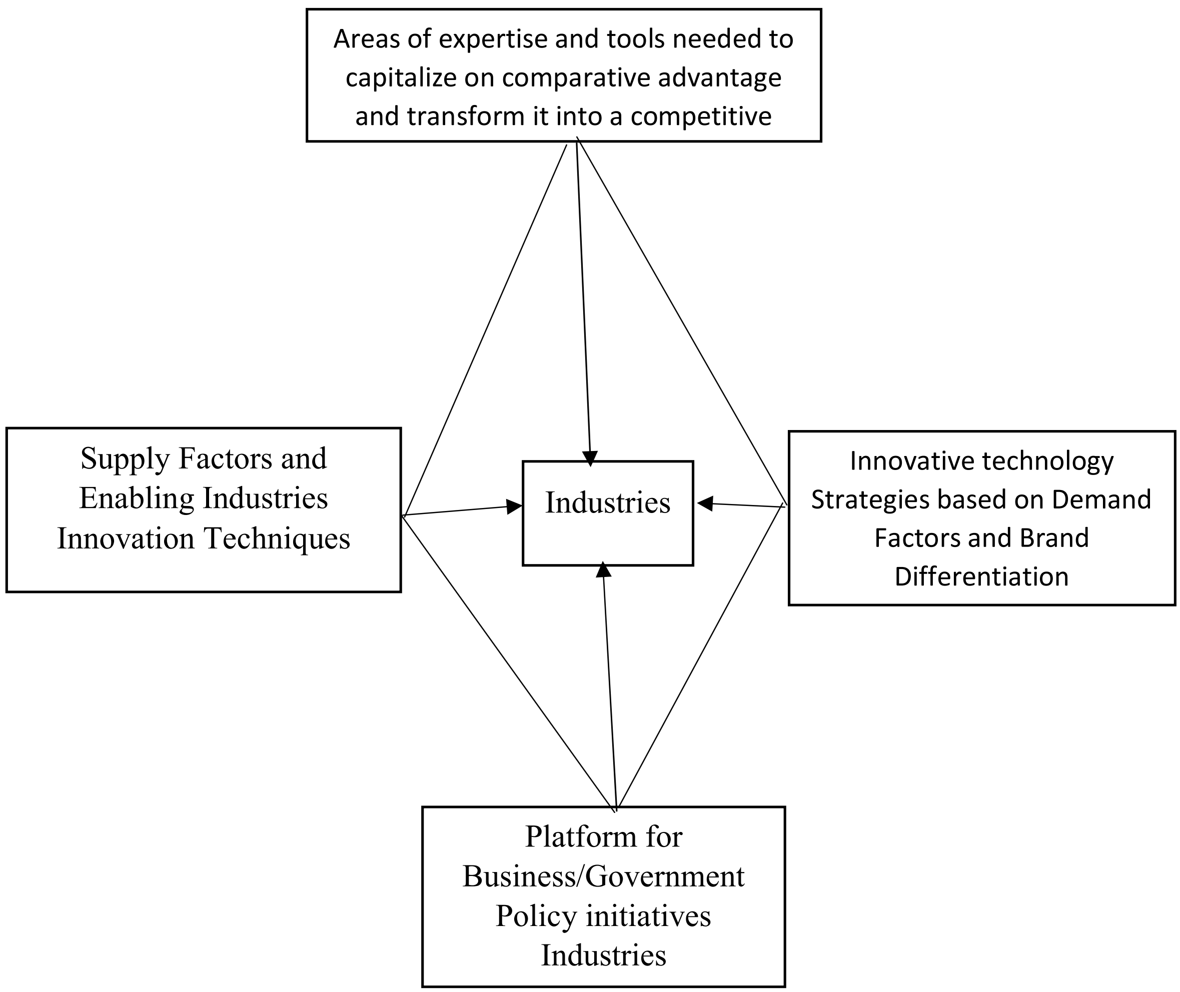


**Figure 2.3: Determinants of National Competitive Advantage**

### 2.1.5. Social Network Theory

According to the social network theory, firms are rooted in a web of horizontally, vertically, and business-supporting alliances and associations, as well as organizations that provide tools and systems (such asadvisory facilities, finance facilitators, and transportation services). Other principles such as trust, integrity, and influence have a major effect on the nature and length of inter-company interactions, according to network theory (Uzzi, 1997). SNA is a branch of sociology that looks at individual collections and their connections. SNA postulates a functional network model that links network qualities to network outcome measurements, as well as a data collection and analysis framework for preparing and monitoring network changes. Network simulations based on graph theory which provide important tools to network administrators and analysts, such as(i) flow charts,(ii) quantitative measures identifying network-related characteristics of individual network members, and (iii)quantitative and qualitative measures of the entire system. A social network is made up of a finite number of actors, each with their own set of established relationships. Five components of a social networking model:

(i)A cast of N characters;

(ii) An L interaction or partnership between two actors that reflects their ordered relationships.

(iii) Geodesic distance, a sociograph with nodes representing actors and led or undirected lines representing actor interaction;

(iv)Asociomatrix or adjacency matrix A with as many rows and columns as there are actors, and elements xi, j that measure the relationships among actors i and j; and

(v.) A character characteristic C matrix containing as many rows as actors and as many columns as significant attributes.

Only the adjacency matrix is used by some academics to characterize networks. "Statistically, a network can be characterized by a matrix called the adjacency matrix A, which in its most basic form is an n symmetric matrix, where n is the number of vertices in the network, continues. If there is an edge between vertices i and j, $A_{ij} = 1$; if it was in the adjacency matrix, $A_{ij} = 0$. The matrix is symmetric so if there is an edge between i and j, there must be an edge between j and i as well. As a result, $A_{ij} = A_{ji}$."

a. Actors in social network

Actors N in a social network could be everything that the nodes can define in a graph. Suppliers, processors, transporters, retailers, regulatory authorities, and certification agencies, for example, may all be stakeholders in a supply network.

b. Links in social network

In a social network, the set L of links or relations reflects whatever binds pairs of actors. This may include flow of materials, money flows, commodity information flows, transaction details, or contextual-information needed for supply system synchronization. Links may represent relationships that are unrelated to the network's core functions, such as financial partnerships, in addition to representing simple flows in a distribution system. A network's actors may have a number of relationships, but graph theory's ability to model them is minimal. Links can be simple, implying only that there is some kind of relationship between the actors. Valued or weighted ties also show a relationship's strength or frequency. Finally, several relationships can bind actors, each requiring a separate connection.

c. Sociograph or network drawings

Drawing a line is a natural illustration. Network actors are represented as nodes or points in a network diagram, while relationships are represented as borders or lines, according to paradigm. In some network images, the dots' size, color, or coloring encode actor characteristics. Valued links are represented by lines with numbers attached, while directed links are represented by arrows. Measurements aren't used in network sketches. As a consequence, the node locations in a network drawing are unrestricted by coordinates, and the distances between dots and angles between lines in a network drawing are meaningless.

d. Adjacency matrices

The network's adjacency matrix A is a quadratic matrix with just as many rows and columns as there will be actors in the network, and the aij elements of this matrix represent the actors' relationships or connections. Conventionally, most elements on an adjacency matrix's main diagonal are set to aii = 0.0. Symmetric adjacency matrices with elements aij = 0, 1 are generated by networks with random and undervalued connections. Models that have directed edges or arcs, such as merchandise flows or data, are common extensions of the most basic network models. Digraph adjacency matrices are not symmetrical since they include elements for which aij is true. The elements in networks with measured or valued relations may be any real number: aij R. It is not possible to represent networks with multiple link types using a single adjacency matrix; instead, each link type requires its own matrix.

e. Actor characteristics matrix

The focus of social network research is on actor interactions, with actor characteristics rather than those related to the network being a secondary concern. Network administrators and researchers, on the other hand, may be interested in correlating the actor's network attributes, which can be obtained from the adjacency matrix, with the actor's other characteristics. The information on these characteristics can then be compiled into an actor characteristics matrix C, which has as many rows as there are actors in the network and a column for each actor characteristic. The scale at which the characteristics are evaluated determines the values of the cij entries in this matrix; they may be either binary or cij = {0, 1} or real valued cij$\in\mathfrak{R}$.

f. Affiliation networks

One-mode networks and two-mode networks are differentiated in SNA. One-mode networks model only one type of agent and do not take into account variations between them. "Events" and "agents" are the two types of nodes in two-mode networks. Since the agents are linked to the events and the events are linked to the agents, these networks are referred to as association networks. To use supply networks as an example, certain members of a supply chain might be enrolled in one form of certification program while others have opted for a different one. The credential schemes will come after the "events" connecting agent subsets. Similarly, certain working agents who are members of many schemes will connect the qualification schemes to one another. If there are n actors and m events, and if agent working i is a part of event j, and fij = 0 otherwise, an affiliation matrix F with elements fij = 1 is generated. Pre- or post-multiplying F with its transpose F'yields the adjacency matrices A for the agents and events. Network partnerships can help a company's "social capital" grow by lowering transaction costs and improving market access by making it relatively easy to access information, technical know-how, and financial assistance (Coleman, 1990) and fostering knowledge transfer between key stake holders. In the field of territorial groupings extensive studies have been published showing how intra-cluster vertical and horizontal relationships can increase the effectiveness and productivity of business networks (Giuliani *et al,* 2005).SNA provides a workable network model that maps network attributes to product flow measurements, which is useful for planning and tracking in the HQCF value chain.

### 2.1.6. Value Chain

The value chain concept is critical because it distinguishes between beneficial activities that help the business gain a competitive edge as a whole and unproductive activities that prevent the company from gaining a market lead (Porter, 1985). There are three types of value-chain terminology:

- Value chain as a set of business

When it comes to activities, different manuals have different definitions. According to the World Bank (2010), the term "value chain" refers to "the broad spectrum of value-adding processes needed to carry a product or service through the various stages of development, including the purchasing of raw materials and other inputs." FAO (2007) and Herr (2006) both suggest definitions that are identical or related.

- Value chain as a set of actors.

The entire cast of characters engaged in the operation of adding value to a given crop or commodity, as well as their productive activities). Other guides rely on actors to define themselves. A value chain, for example, is described as "actors linked through a sequenced collection of activities along a chain that creates, transforms, and brings products and services to end consumers," according to UNIDO (2011).

- Value chain as a strategic network.

Rather than existing in a specific space, value chains are designed to better respond to customer demand in this situation. Value chains are described by Hobbs *et al*, (2000) and CIAT (2007) as a structural network among a spectrum of independent business organizations in which network members collaborate extensively. "A market system is a multi-player, multi-functional system that consists of three main sets of functions (foundation, regulations, and assistance) carried out by various participants in which trade develops, emerges, adjusts, and expands," according to DFID (2008).

#### 2.1.6.1. Concepts of Value Chain

a. Porter's definition of value chain

The value chain is clearly defined by Porter as a collection of main and facilitating activities. The most critical obstacles are inbound logistical challenges (getting the material in by putting value to it), operations (all factory procedures), outbound (delivering to the retail locations), marketing and distribution (selling, branding, and marketing it), and service (which ensures the product's usability after it has been sold). Company infrastructure, human resources, procurement to buy/source goods at the best price, and technology are support functions that feed into all of the primary functions. These enable the business to charge a profit derived in part from the value added by the main and supporting functions, and in part from the profit derived from the value addition's contact with the consumer (brand name, confidence, trust, and so on) (Porter,1985). In his value chain model, Michael Porter identified nine activities that generate value and cost in a specific business (Fig. 2.4). The primary tasks are getting materials into the enterprise (inbound logistics), transforming them into goods (operations), shipping final items

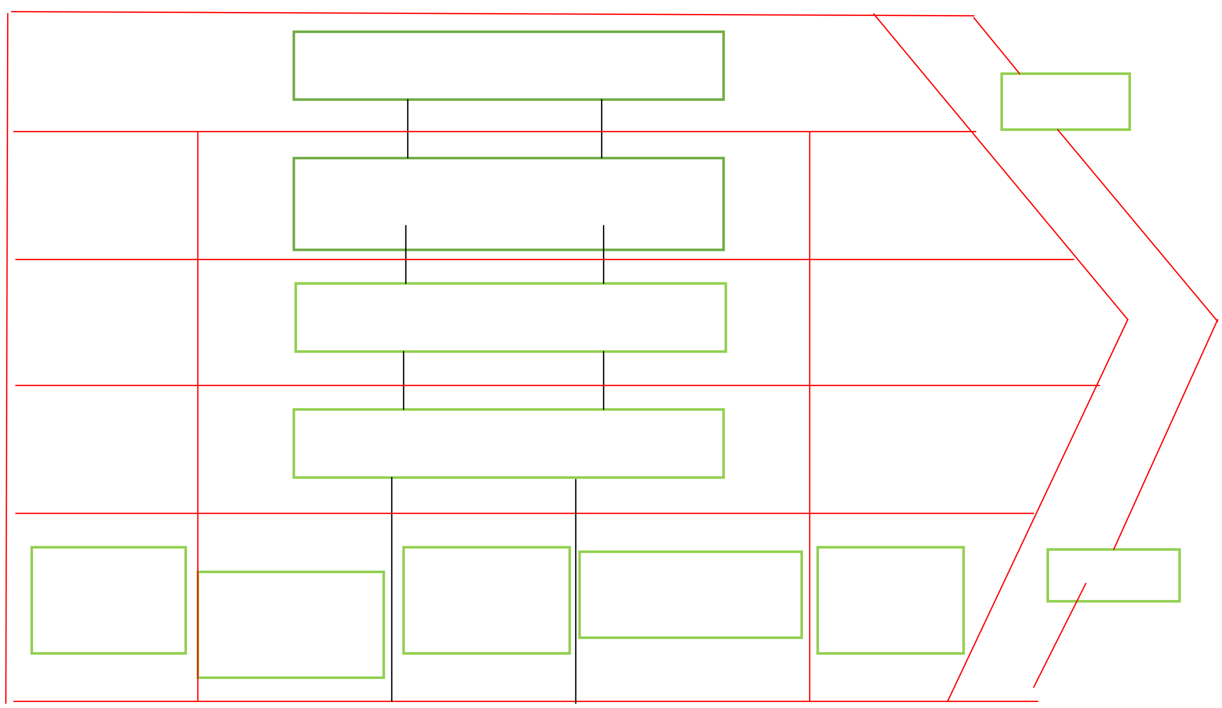

Figure 2.4: The value chain model of Michael E Porter. (Kotler and Keller, 2006)

(outbound logistics), and selling and servicing them (selling and advertising). Enterprise facilities, human capital management, technological innovation, and purchasing are examples of support functions. The value chain in agriculture is the process of adding value to farm products by integrating them with other resources (example tools, human capital, expertise, capability and other resources). If the product progresses through the supply chain, its value increases (Herr, 2007). The optimization of the supply chain is a critical method for the food processing industry's growth. Within a single organization, a single geographic region, or across various countries, value chain operations can be found (Herr, 2006). Chain constraints in agricultural processing firms are posed in three sequences: productivity capture and cost control; risk mitigation (quality, quantity and food safety); and response to market attribute requirements.

b. Filière

Different theoretical perspectives and scientific methods are involved in the approach to 'filière' (filière means string, chain). The method was first used to study the agricultural systems of developing countries during the French colonial era. The research was primarily used to examine how agricultural production systems (particularly those for rubber, cotton, coffee, and cocoa) were organized in developing countries. The 'filière concept' was postulated as an analytical method for scientific agricultural research in the 1960s at the Institute National de la Recherché Agronomique (INRA) and the Centre Internationale en Recherché Agronomique pour le Développement (CIRAD). The idea was born out of a desire to learn more about the economic processes that exist in agricultural commodity production and distribution systems (Raikes *et al,* 2000).The filière method has two primary components that share those viewpoints with the value chain study: -

- Filières' economic and financial assessment, which focuses on the commodity chain's output and distribution of profits, disaggregating costs and incomes between locally and internationally traded components and examining the chain's effect on the national economy and contribution to GDP.

-The market's strategy-focused filieres analysis, which offers an empirical context for commodity organization, chains (mapping, individual and collective strategies and their price and revenue generation results, and traders' specialization versus diversification strategies.

c. The Global Approach

In this approach, the value chain model is used to investigate how firms and countries are internationally intertwined, as well as to determine the factors that influence global wealth distribution. As a consequence of concentration at all points along the value chain, as well as the widening reach and complexities of food safety standards, especially those relating to food quality global agricultural markets have become increasingly complex. To fully grasp the potential benefits of agricultural export growth for poverty reduction, a thorough examination of global market patterns and policies that will unlock development and poverty reduction potential is needed.

The Global Value Chain (GVC) research examines the patterns of physical and intellectual value-adding operations from idea to implementation, both " top - down " (for example, analyzing how leading companies "govern" their global partner and supplier networks) and bottom up (for example, analyzing how leading companies "control" their global partner and supplier networks) (for example, asking how these enterprise resolutions impact economically and socially "upgrading" or "downgrading" trajectory in particular countries and regions).The GVC methodology has four basic dimensions:

(1) An input-output arrangement that specifies how raw materials are transformed into finished goods.

(2) It's a regional problem

(3) A governance framework describing how the value chain is regulated.

(4) A systemic structure within which the supply chain of industry is incorporated (Gereffi, 1995).Gereffi (1999) contributed to the creation of an extensive research function known as upgrading, which studies how producers pass through various stages of the value chain in order to explain the complex movement within the value chain.There are four key components to the global supply chain analysis:

1. Input-Output Structure

a. Major objectives in a global supply chain include diagnostic technique and designing, inputs, production, marketing and promotion, and sales, as well as, in some cases, product after-use recycle. Both products and services, and also a number of related industries, are included in this input-output process. The input-output structure is usually represented as a set of value chain boxes linked by arrows that depict the flows of extrinsic and intrinsic products and services that are important for mapping the value added at different stages of the chain and combining information of particular interest to the researcher(Gereffi*et al*., 2005).

b.Determine the scope of each value chain segment and the position of organizations within it. Each one of the segments identified in the prior step has its own set of attributes and complexities, such as preferred vendors or entrepreneurial endeavor (Gereffi, 1999). For example, the inputs for the 'processing' portion of the fruits and vegetables value chain could come from fruits that were intended for export but didn't meet quality requirements, or from products made specifically for processing. It is necessary to specify the types of businesses involved in the industry, as well as their primary characteristics: foreign or domestic; public or private; international or domestic; large, medium, or small etc., determining the companies that make up the chain will help to clarify its governance structure.

2. Geographic Scope

Industry globalization has been aided by the growth of transportation and telecommunications infrastructure, which has been fuelled by pressure for the most appealing inputs in each value chain segment(Gereffi*et al*., 2005). Many operations are normally carried out in various locations in today's supply chains, which are spread throughout the globe. Nations engage in global industries by leveraging their strategic advantages in land. Labor costs and raw materials are typically low in developing countries, while research and development and product design are handled by rich countries with highly trained experts. Geographic research is first based on identifying the lead companies in each segment of the value chain. Secondary firm data sources, specialist industry journals, and industry expert interviews are the primary sources of this information.As a result, a range of these leading corporations' presence in specific countries shows the chain's country-level positions. It is then possible to assess the contributions of the various countries within the chain by analyzing country-level data, such as industry exports and the categories in which those exports are concentrated.

3. Governance

Since some actors in the chain have more clout than others, governance analysis will aid in understanding how the chain is governed and structured. Governance is described by Gereffi (1995) as the control and influence relationships that govern the distribution and flow of monetary, resource, and human capital within a chain. In the global context of commodity chains, governance was initially defined in terms of "buyer-driven" or "producer-driven" chains (Gereffi, 1995). Despite the fact that they have little to no manufacturing capability, supply chains are governed by requiring suppliers to follow certain specifications and protocols. Understanding governance and how a supply chain is regulated makes it easier for businesses to enter and grow in global markets. The GVC literature has established a more detailed typology of five governance frameworks: markets, modular, relational, captive, and hierarchy. Three variables that determine and decide these structures are the complexity of information between actors in the chain, how to codify information for processing, and the level of competence of the supplier. (Frederick &Gereffi, 2009; Gereffi*et al*., 2005). From the context of GVC, global agribusiness trends and their consequences for poverty eradication strategies based on increasing export growth are investigated (Humphrey *et al*, 2006). This point of view examines inter-company relationships in global agribusiness, situating agricultural production and processing within the dynamics of global agribusiness and agri-food systems in developing countries.

**2.1.6.2. Value chain mapping**

Identifying the interconnectedness in a complex system or addressing systemic interventions without first mapping them is challenging, mapping a value chain is an important part of a VCA. Mapping a value chain, with all of its components, linkages, and actors, would aid in facilitating a thorough discussion about the opportunities and challenges that producers and other actors face, as well as what can be done to address them. According to (Humphrey and Navas-Alemán 2010), the idea of a chain is a connectedness metaphor at the heart of value chain research. It demonstrates how most products and services are the product of a series of complex and simultaneous operations. Many value chain evaluations include the development of a value chain map as a key component (VCA). A variety of approaches to value chain analysis are available. Value chain mapping is the most basic method and the basis of all research (Springer-Heinze 2007). "Mapping a chain," according to the International Labour Organization, means "generating a graphic illustration of the relationships between firms in value chains as well as other market players" Herr (2006). It's just a flow diagram in its most basic form (showing the value chain's main transactions). The following are some of the implications for the value chain mapping:

- The process through which a service passes through multiple stages before reaching the end user is understood and highlighted (i.e. the main transactions). It's also important to understand the various layers of a supply chain in order to spot bottlenecks that impede those objectives from being met.

- (ii) Identifying and classifying major market participants. These value chain maps (or stocks) were used in projects to host market participants to various seminars and events, schedule interviews with them, and form guiding groups comprised of core market participants.
- Value chain maps may also be used to identify other supporting institutions (government, non-governmental organizations, associations, and so on) and the levels of the value chain on which they concentrate their services.
- Value chain maps will display different market channels by which products and services meet the final customer in order to explore business opportunities and provide further perspectives into the position of individual market channels and the nature of the relationships (e.g. number of competitors, size of market, number of workers, value chain governance, etc.)
- (viii) A value chain map may assist emerging market investors in determining key stakeholders, potential supply chains or marketing networks, rivals, and chain vulnerabilities.
- (vi) A value chain map, which typically includes (1) actions, (2) stakeholders, (3) interconnections, and (4) position. These elements are all included in a value chain diagram, so they can assist in determining what to map in which way.

Figure 2.5 depicts the essential components and empirical parameters for value chain mapping and evaluation as well as a standardized background that can help in the mapping process' course.

1. Value chain operations include all facets of a commodity's life cycle, including production, distribution, and waste management. Related resources, outputs, selection, refining, trade, export, distribution, promotion, advertisement, and consumption are all activities in an agricultural value chain.

2. Value chain actors: Actors in the value chain include all value chain-related individuals or organizations, corporations, and government agencies, and are therefore essential to understanding the value chain's function and performance. They are often, but not always, related to unique value chain processes. For analytical purposes, it's also helpful to distinguish between chain actors and supportive actors. Those that are particularly present and active in value chain activities are referred to as value chain actors. Manufacturers, wholesalers, and retailers are common in agriculture. They all have one common factor: at some point during the VC, they are holders of the (raw, quasi, or finished) product. If supporting actors (or service providers) are beneficial, they do not contribute greatly to value chain activities. A capacity-building extension service provider or a non-governmental organization (NGO) is a common example.

3. Value chain linkages are the networks or associations that connect the numerous operations of the value chain and enable a product to progress from the planning stage to the consumption stage. It is possible to differentiate between vertical and horizontal linkages. Vertical linkages connect input suppliers, producers, processors, wholesalers, dealers, exporters, and other value chain actors all the way to the end consumer. Vertical and horizontal linkages can be distinguished.Vertical linkages connect all players in the supply chain, including input suppliers, processors, producers, suppliers, retailers, export markets, and so on, all the way to the consumer. Company relationships that help a commodity move up the supply chain are known as vertical connections. Horizontal connections connect actors in the value chain who are performing the same task. Horizontal connections will be illustrated by producer classes. Horizontal connections enable farmers to gain more cost-effective access to inputs, facilities, and knowledge, as well as mobilize them to lobby for reform.

4. Value chain context: It can be considered external to the value chain because it is not actually 'managed' by chain actors, despite their attempts to control it. This wider background can "include public and private regulation, financial efficiency, community organizations' influence, political forces, supporting sectors (e.g. financing and transport infrastructure), facilities, resources tenure system, and other factors," according to Bolwig*et al,* (2010). Environmental factors that affect farmers' production systems, such as land and water availability, should be considered as part of the value chain.

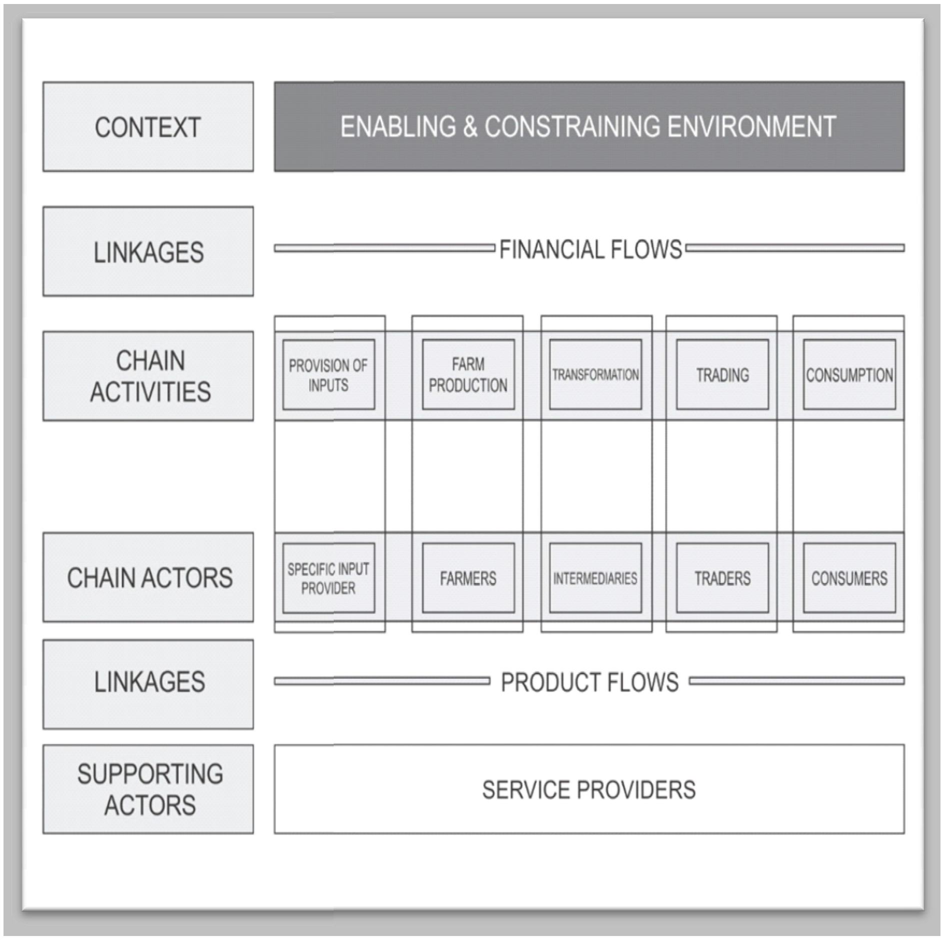


**Figure 2.5** Structured platform for mapping process**:**

## 2.2. Methodological Review.

The reviews of the various research-related methodologies, the methodologies and methodological studies associated with this study and its goals, which are profitability analysis, linear function model, competitiveness and comparative models and statistical tools, are presented here.

### 2.2.1. Profitability analysis

Value added is generated at varying stages and through various actors and stakeholders in the value chain, and it can be related to value, prices, order status, delivery versatility, creativity, and so on. A farm's value-added potential is defined by a variety of variables, including customer characteristics (market volume and variability), as well as the technical competency of the actors. Furthermore, customer intelligence on product and operation requirements is essential for delivering the right value to the right market and contributing to the company's profitability (Porter, 1985). All other goals are secondary to profit maximization in Olayide and Heady's multi-dimensional and/or multivariate motives, according to Olayide and Heady, (1982). Profitability refers to the ability of a given investment to make more money. While profitability is closely linked to profit, profitability is the measure used to assess the magnitude of a company's profit in accordance with market size. In comparison to an alternative investment, profitability can also be described as a company's ability to generate a return on an investment based on its resources. As the market becomes more competitive, profit margins are eroding, and profitability ratios are becoming more critical in deciding an organization's profitability.The potential of a company to gain more than it has invested is referred to as profitability. A profit is what remains of a corporation's profits after all expenditures directly related to the creation of sales, such as the production of a product and other expenses related to the management of business operations (Olaniyan,2015).

The capacity of a given investment to generate a profit from its use is known as profitability. The ability to determine market performance and overall efficacy is determined by profitability (Harward*et al*, 1965).

Kaplinsky (2000) divides profitability into the following categories: science and technology rents (related to unsymmetrical command over technologies), institutional (management skills), social (related to cross – organizational, networks, groups, and partnerships), advertising (related to brand name power and influence), and also related (related to cross-company systems, bodies and alliances). To gain access to higher income activities with high added value, involvement in global value chains targeted at markets needing high-added-value products is required. There are several approaches for determining profitability. Profitability ratios are a way to assess a company's ability to generate profit in relation to its expenditures.

The Gross Margin (GM) is a measure of how much money a company makes. The gross margin ratio relates a company's gross margin to its net sales. The profitability of a company's inventory or goods is determined by this ratio. The variance between the Total Value of Output (Total Revenue) and Total Variable Cost (TVC) of production is known as the Total Variable Cost (TVC). Since it calculates farm firm income by sales, the gross margin ratio only includes the cost of products sold in its estimate. It's a poor tool for doing comparative analysis and making strategic decisions, Collison and Jack (2007). The Net Profit Analysis is a systematic profit measuring analytical instrument that measures the bottom line net profits. After running, interest, royalties, and preferred stock dividends have been deducted from a farm firm's overall revenue, it is the percentage of revenue that remains. The major disadvantages of using analytical measures as the basis for profitability assessment, according to Bernard (2003) and Ogboji (2016), are that it does not indicate the perceived importance of each of the assets in production; it is environment restricted and limited in appropriateness due to its use of money as the general system of measurement and the prevalent price of the estimates.

The word "profitability" is a combination of the terms "profit" and "ability." Profit is the bottom line of a financial statement, and its definition varies depending on the intent and application of statistics. Although the term capacity refers to a company's ability to produce profits. The term "ability" may also apply to the investment's earning power or operating output. Profitability is not the same as profit. The term "benefit" refers to the total amount of money made. Profitability is a term that describes a person's capacity to make more money. Profitability is a relative metric that shows which choice is the most profitable. Benefit, on the other hand, is an absolute measure that indicates the total profit produced by a transaction. Many of the above metrics (gross margin, net farm analysis) and other measurements in relation to revenue or expenditure are used in a profitability analysis. These include: Rate of Return on Investment (RRTI), Rate of Return on Fixed Costs (RRFC), Rate of Return on Variable Costs (RRVC), Benefit-Cost Ratio (BCR or B/C), Internal Rate of Return (IRR), and Marketing Margin (MM).

The formula are

(a) $GM = TR - TVC$ …………………………………………………………………….. 2.1

(b) $NI = GM - TFC$ ……………………………………………………………….…… 2.2

(c) Profitability Index or Return on Sale (PI): $PI = NI \div TR$ ………………………….2.3

(d) Rate of Return on Investment (%) (RRI): $RRI = (NI \div TC)\ x100$ …..…………….2.4

(e) Rate of Return on Variable Cost (%) (RRVC): $RRVC = (TR - TFC) \div TVC x10$ ….2.5

(f) Operating Ratio $= TVC \div TR$ ………………………………………………….2.6

Where: (i) GM = Gross Margin; (ii) TVC = Total Variable Cost; (iii) PI = Profitability Index; (ii) TC =Total Cost; (iv) TR = Total Return; (v) NI = Total Fixed Cost

### 2.2.2. Linear Regression Analysis model

Regression analysis is a geometrical method for determining the association between two or more variations (Bowerman*et al*., 1990). The primary objective is to develop a statistical equation that connects predictable and unpredictable variables It is concerned with the cause-and-effect relationship (Madala, 1992). Multiple linear regressions define a linear equation between the observed dates to model the relationship between two or more regressor variables and the regressand variable. To each value of the independent variable x, a value of the dependent variable y is assigned. Within the linear regression $x_1$, $x_2$,,…..xn, the specific values of the registered explanatory variables are described as

$\Upsilon = f(X_1, X_2, X_3 \ldots Xn, U)$ or explicitly as:

$$\gamma = \beta_o + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \cdots \beta_n\chi_n + \mu \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2.7$$

Y is the regressand variable in the model, while Xs are regressor variables that are calculated outside of the models. The parameters b0, b1, b2, b3,...bn are the simple descriptive indicators of population or expected value. The elasticity of Y with relation to X is measured by b's coefficient: the percentage difference in Y for a given (small) percentage shift in X (Gujarati, 1992). The coefficient b is price elasticity if the expected function is a log-linear demand supply function; however, if the predicted function is a linear demand or supply function, the coefficient b is a part of the elasticity (Koutsoyiannis, 1977). The functional relationship, or how the Xs are converted into Ys, is denoted by the letter "F." The letter U stands for an error word. In order to account for the influence of different errors, the Error term U is inserted into the model. Errors of this kind are chaotic (random) human behavior (Koutsoyannis, 1977). Many scholars, according to Walter (1969), have resorted to regression because of its attractive properties and long-term viability.

(i) Linearity, unbiasedness, and the smallest possible variance.

(ii) It is easy to comprehend;

(iii) The calculation process is straightforward; and

(iv) It's been used on a wide range of econometric relationships, with mostly good results.

(v) It is a prerequisite for most other econometric techniques.

Regression models are divided into three categories. The Variable-based Degree-Day Model (VBDD), the Linear Regression Model, and the Change-Point Models are the three. To evaluate the model coefficients, they all use generalized least squares regression,Anghelache and Sacala(2013).

**ii. The Chi-square test of contingency/ independence**

The Chi-square test of contingency/ independence is used to determine if there is a significant relationship between two nominal (categorical) variables. The frequency of each category for one compared across the categories of the second nominal variable. The data can be displayed in a contingency table where each row represents a category for one variable and each column represents a category for the other variableUnlike most statistics, the Chi-square ($\chi^2$) can provide information not only on the significance of any observed differences, but also provides detailed information on exactly which categories account for any differences found. Additionally, the $\chi^2$ is a significance test, and should always be coupled with an appropriate test of strength.

The chi-square equation:

$$x^2 = \sum_{i=1}^{n} \sum_{j=1}^{m} \frac{\left(o_i - e_i\right)}{e_i}$$

Where

*χ2* = the chi-square statistic
*Oi*= the observed frequency
*Ei*= the expected frequency
*i* = the number of the cell (cell 1, cell 2, etc.)

The assumptions of the Chi-square include:

i. The data in the cells should be frequencies, or counts of cases rather than percentages or some other transformation of the data.

ii. The levels (or categories) of the variables are mutually exclusive. That is, a particular subject fits into one and only one level of each of the variables.

iii. Each subject may contribute data to one and only one cell in the $\chi^2$. If, for example, the same subjects are tested over time such that the comparisons are of the same subjects at Time 1, Time 2, Time 3, etc., then $\chi^2$ may not be used.

iv. The study groups must be independent. This means that a different test must be used if the two groups are related

v. There are 2 variables, and both are measured as categories, usually at the nominal level. However, data may be ordinal data. Interval or ratio data that have been collapsed into ordinal categories may also be used. While Chi-square has no rule about limiting the number of cells (by limiting the number of categories for each variable), a very large number of cells (over 20) can make it difficult to meet assumption vi below, and to interpret the meaning of the results.

**vi.** The value of the cell expected should be 5 or more in at least 80% of the cells, and no cell should have an expected of less than one. This assumption is most likely to be met if the sample size equals at least the number of cells multiplied by 5. Essentially, this assumption specifies the number of cases (sample size) needed to use the $\chi^2$ for any number of cells in that $\chi^2$. (McHugh, (2013);Yekinni, (2015);Ugege,2017)

**2.2.3. Method of analysis for estimating competitiveness and comparative advantage in the value chain.**

The Policy Analysis Matrix (PAM) is a quantitative tool for measuring productivity, input consumption efficiency in performance, comparative advantage, and the degree of government interference introduced by Monke and Pearson (1989) and expanded by Masters and Winter-Nelson (1995). The Policy Analysis Matrix (PAM) can be used to analyze three different types of economic data: I the impact of regulations on primary commodities system competitiveness; (ii) the importance of investment regulations on economic effectiveness and (iii) comparative advantages and the influence of agricultural research policy on guiding technical progress mechanisms in desired outcomes.

PAM is a dual-accounting scheme that combines budgetary statistics from both production and post-production activities. It is statistically reliable and derives from economics' social cost-benefit analysis and international economic theory, despite its clarity Defining the product scheme, putting together representative budgets with each process in the system, measuring social values, integrating budgetary data into a matrix, evaluating the matrix, and simulating regulatory adjustments are the basic steps in using the PAM method. The formula's foundation is Profit = Revenue – Costs. The costs are differentiated into inputs traded on foreign markets and those that are not (fertilizers, pesticides, hybrid seeds) that are not traded internationally for reasons that will become clear soon.

PAM is based on two types of prices: private and social, each of which must be defined when dealing with PAM. The value of a crop, the price of cuttings, chemical fertilizer, compost manures, insecticides, and the going minimum wage are examples of private values, which are rates at which products and services were actually traded and used in budgets. These are also known as financial or commodity rates. In the absence of policy fluctuations (such as taxes or transfer payments) or market negative externalities, social ideals are the prices that will prevail (such as monopolies). These were the concepts used in economic analysis when the aim was to increase national income, and they reflected the value to society as a whole rather than to private individuals. These costs are referred to as "shadow rates," "performance values," and "opportunity costs." The determination of social values is one of the most important tasks for economists, as these values offer the best example of how to optimize wealth and social welfare. Working out social prices for domestic reasons, which are not exchanged on foreign markets, would be difficult, and one way would be to mentally deduct the effect of policy. World prices [Free on Board (FOB) for exports and Cost Insurance and Freight (CIF) for imports] were used for globally traded commodities, and working out social prices for domestic reasons, which are not traded on foreign markets, would be complicated, and one method would be to mentally deduct the influence of policy.

Two identities will emerge once all private ideals were matched with their social equivalents:

Private benefit = Private revenue – Private cost of tradable inputs – Private cost of domestic factors.

Social benefit = Social revenue – Social cost of tradable inputs – Social cost of domestic factors.

The Policy Analysis Matrix allows for the assessment of transfers among core interested parties such as agricultural producers, food customers and government budget allocation stakeholders, and also the calculation of policy effects on producer earnings.

**a. Measurement of competitiveness**

Private profits, Private Benefit-Cost Ratio (PBCR), and Private Cost-benefit Ratio are all indicators of private profitability in PAM (PCR).

i. Private profits: The variance between private income (A) and private expense (B+C) is referred to as private benefit.

Profits from the private sector A - (B + C) = D ............................................ 2.10

D > 0 indicates competition, D = 0 indicates a break-even condition, and D 0 indicates a non-competitive situation.

ii. Private Benefit-Cost Ratio (PBCR): is defined as the proportion of private revenues to private costs, mathematically presented as PBCR = A/ (B+C). ......................2.11

When the PBCR is greater than one, it indicates competitiveness; when the PBCR is equal to one, it indicates a break-even situation; and when the PBCR is less than one, it indicates non-competitiveness.

ii. Private Cost-Benefit Ratio (PCR): the proportion of domestic factor costs (C) to the value added in private prices (A - B). It's written in the form of an equation.

Private Cost-Benefit Ratio (PCR) = C/ (A - B)...................... 2.12 -

When PCR is greater than 1 indicates not competitiveness, PCR is equal to 1 indicates a break even condition, and PCR less than 1 indicates a competitive situation.

**b. Measurement of Comparative Advantage**

Social Profits (H), Domestic Resource Cost (DRC), Social Cost-Benefit Ratio (SCBR), and Social Benefit-Cost Ratio are the metrics of comparative advantage in the PAM system (SBCR).

i. Profits from Social Activities: The disparity between income and costs in social prices is what this term refers to. It's written as an equation below.

Income from Social Activities (H) = E – (F + G) .....................................................2.13

A positive social benefit value of (H) implies that there exist a positive social valuation, meaning that there is a competitive advantage orefficiency.

ii. DRC (domestic resource cost): As shown in equation, this is expressed as the proportion of domestic resource (G) in social prices to value added (E-F) in social prices.

G/DRC = (E - F) ........................................................................................ 2.14

As DRC 1 shows that producing a marginal unit of foreign exchange costs less in domestic capital. This means that making a product locally is less costly for the country than importing it. This is a strong indication that the country has a competitive edge in the manufacture of that particular product.

iii. Social Benefit-Cost Ratio (SBCR): This is a PAM indicator that calculates how much every unit of investment generates. It's known as the proportion of social revenues to social costs, and it's useful for comparing systems that aren't similar. It's written as an equation below.

SBCR = E/(F + G)........................................................................... 2.15

SBCR > 1 denotes a profitable operation, SBCR = 1 denotes break even, and SBCR 1 denotes a non-profitable activity.

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**c. Measurement of Government Protection**

The Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), Profitability Coefficient (PC), Net Transfer, and Subsidy Ratio to Producers are the PAM indices for policy and government effects/interventions (SRP).

The Nominal Protection Coefficient (NPC) is a metric that assesses how well producers are shielded from negative externality. Both the input and output approaches are used in this calculation. Equations describe the NPC on tradable outputs (NPCO) and NPC on inputs (NPCI).

NPCO = A/E..................................................................................2.16

NPCI = B/F...................................................................................2.17

When NPCO is less than 1 indicates the existence of a taxing effect on production, NPCO greater than 1 indicates the presence of subsidies, and NPCO is equal to 1 (in the absence of market shortfalls) indicates the absence of regulations, but when NPCI less than 1 indicates the presence of a subsidy, NPCI greater 1 indicates the presence of a tax.

ii. Effective Protection Coefficient (EPC): This is also expressed in the equation below as the proportion of value added in private prices to value added in social prices.

*EPC* = i.e. (A – B) (E – F) ………………………………………………2.18

When the EPC ratio is less than one, the policy has a negative effect (tax), and when the EPC ratio is greater than one, the policy has a positive effect (subsidy).

iii. Profitability Coefficient (PC): This is expressed in the equation below as the proportion of private benefit (D) to social profit (H).

Profitability Coefficient (PC) = D/H................................................................ 2.19

While the PC ratio is less than one, the system is being distorted by regulation or market shortfalls; when the PC ratio is greater than one, the system is being subsidized.

iv. Net Transfer (L): This PAM metric for policy/government interference impact is measured as private benefit D minus social profit H.

H. I - (J+K) or Net Transfer (L) = D/H .................................................. 2.20

When Net Transfer (L) is less than zero, it indicates a distorting policy or market shortfalls; when L is greater than zero, it indicates a subsidy; and when L is zero in the absence of market failure, it indicates no influence of regulations.

v. Subsidy Ratio to Producer (SRP): SRP, which is described as the proportion of net policy transfer (L) to social revenues (E), is one of the other measures of policy and government intervention impact.

Subsidy Ratio to Producer (SRP) = L/E.................................................................... 2.21

While the SRP is greater than zero, it indicates the existence of a subsidy, and when it is less than zero, it indicates the negative impact of taxes.

As a result, the PAM findings serve as a data baseline for tracking and assessing policy impacts, as well as determining the research requirements that are important to policy (Camara*et al*, 2001, Oluyole, 2017).

### 2.3 Empirical Review

This section details some of the empirical literatures that are relevant to the research. Competitiveness and comparative advantage have been studied using a variety of models. Market share, turnover, product cost, gross margin, returns on assets, net profits, unit cost ratio, and total factor productivity financial performance (profit, sales growth, returns of investment), non-financial performance (customer satisfaction, employees growth ) and benchmarking, balanced scorecard are only a few examples employed to measure competitiveness (Jabara and Thompson, 1980; Du Toit*et al*.,2010; Kiel *et al,*, 2014; Sachitra, 2016); simulation –based models(Johnson *et al.,*2013) and the policy analysis matrix(Liverpool *et al*, (2009).,Ogbe*et al*.,2011,Oluyole (2017).

#### 2.3.1. Empirical reviews on HQCF value chain

According to Ogboji's (2016) study on the competitiveness of the High Quality Cassava Flour Value Chain in Imo State, Nigeria, earnings for HQCF processing are positive, and the systems are protected. However, considering available capital, they are unable to manufacture for export. Sex, collateral, knowledgemembership of a cooperative community, and financial lending organisations, and interest rate are all significant factors affecting access to credit in the HQCF value chain, according to logistic regression analysis. Size of the household, age, education, and proximity to a credit institution were not found to be important predictors. The analysis also revealed that three stages of the chain-production, processing, and marketing-were profitable, with gross margins of ₦127,742.39, ₦200,105.07, and₦20,365.46, respectively, net returns of ₦120,243.95, ₦162,345.07, and ₦16,755.46, and RRTI of 77.19%, 54.29%, and 11.98%, respectively. The distribution of gross value-added in the producing of cassava, agbelima, gari, high quality cassava flour, and cassava starch shows that the manufacture of high quality cassava flour generates the highest gross value-added of 36 percent, according to Manu's (2017) report on cassava value chains analysis and economic impacts on actors in

Southern Ghana. In addition, the distribution of net value-added in the cassava value chains shows that the manufacture of high-quality cassava flour produces the highest overall value-added (43%) for cassava in the value chain. The research also found that income in the cassava value chain were not distributed fairly, cassava flour of good quality yields the highest benefit of fifty-eight per-cent.

The High Quality Cassava Flour Value Chain is a well-organized system of trade that commenced from manufacturing to consuming with the goal of rising quality and competitiveness. It's also a vertically aligned network of businesses collaborating to achieve greater market access. It covers the entire spectrum of activities and resources needed to carry the HQCF from conception to completion. There have been few research on value chain analysis. HQCF focuses on cassava production or cassava processing into other goods such as garri, cassava flour, and starch in most of the empirical studies under review. Oladeebo and Oluwaranti (2012), Kaine (2011), Ogundari and Brummer (2011), Adeyemo and Akinola (2010), Okoye*et al*, (2007), Edeh and Awoke (2009), used stochastic frontier in investigating Profit Efficiency among cassava producers in South Western Nigeria; Investigating factors affecting technical inefficiency of Akpu processing in Delta State, Nigeria; Estimating technical efficiency and input substitution of cassava farms in Nigeria; Technical Efficiency Analysis of Improved Cassava Farmers in Abakaliki Local Government Area of Ebonyi State. However, this study investigated the value chain of HQCF.

### 2.3.2. Review on profitability studies

In most Nigerian families, particularly in rural areas, cassava is a typical staple food crop because it is available all year and can be processed into a variety of items (Balogun*et al,* 2009).

Oduntan*et al*, (2012) used gross margin techniques to calculate the profit levels of cassava production in Akure, Ondo state. They discovered that the total revenue per hectare obtained was ₦213,238.09, the total variable cost per hectare expended by cassava producers in the study area was ₦52,476.05, and the gross margin per hectare was ₦160,762.04, as well as the Net Revenue (NR) per hectare obtained ₦144,534.67. As a consequence, cassava production tends to be profitable in the study area. Production, processing, and marketing of HQCF according to Ogboji (2016), were profitable with gross margins of ₦127,742.39, ₦200,105.07, and ₦20,365.46, respectively, net returns of ₦120,243.95, ₦162,345.07, and ₦16,755.46, and RRTI of 77.19%, 54.29%, and 11.98%.

Women engaged in cassava processing had a fixed cost of ₦928.89 per ton of cassava refined and marketed, a variable cost of ₦140,574.56, and overall revenue of N217, 125.80 per ton of cassava processed and sold, according to the findings ofOladejo (2017), on the profit making capacity and marketing performance of women cassava processors in Oyo state. As a consequence, a processor received ₦76,551.24 in gross margin and ₦75,622.35 in profit per ton of cassava manufactured and marketed. In the study region, the BCR ratio was 1.5, indicating that the cassava processing business is profitable,

### 2.3.3. Review on value chains studies using policy analysis matrix (PAM)

PAM results showed that earnings were positive for HQCF processing and the systems enjoy security, but that they are not currently in a position to produce for export provided available resources, according to Ogboji, (2016) study High Quality Cassava Flour Value Chain on the competitiveness in Imo State, Nigeria. In their study food crop production system Competitiveness in Nigeria: A policy analysis matrix approach, Adesiyan*et al*, (2018) discovered that yam, rice, and cassava production generate positive private and social profit, with cassava production being the highest and yam production being the lowest. Similarly, government policies have had a negative impact on yam, corn, and cassava rates, which have fallen by 20%, 75%, and 17%, respectively, below world prices. The study concluded that if value is added to the food production system in Nigeria, it is competitive and therefore profitable under the current policy structure. The Effective Protection and the Nominal Protection on Input and Output The existence of tax was implied by the coefficients for the two production systems, and the producers were not covered by regulation.

Akande and Ogundele (2007) used PAM to investigate yam production in Nigeria, finding that it was profitable in the region, that government intervention improved efficiency, and that yam production had a comparative advantage.

Also according Oguntade (2011), the overall value added in transforming paddy rice into basic milled rice was ₦20,000, or 20% of the actual output, while the gross value added in refining basic milled rice into value-added rice was ₦21,500, or 17% of the actual output. The profit margin for transforming paddy rice into basic milled rice was ₦1,660 per ton of basic milled rice, while the profit margin for refining basic milled rice into value-added rice was ₦1,660 per ton of value-added rice. The margin on value-added rice was ₦7,667 per metric ton of value-added rice.

Liverpool *et al*,(2009) used PAM to show that national and state - wide demand for Nigerian farmers' maize and cassava roots provides a viable business, resulting in a comparative edge in rice production in the country but no comparative edge in exporting these commodities. Groundnuts are by far the most competitive crop, according to Sukume*et al*, (2000), while sunflower and Virginia tobacco are becoming more competitive in drier ecological zones. Despite having the majority of cultivated land, maize was only competitive in two ecological regions, where it ranked last in terms of domestic resource output. Eliminating maize subsidies, according to the results, would boost crop production.

Adegbite*et al,* (2014) used the PAM system to evaluate the competitiveness of producing pineapple in Osun state, Nigeria. The techniques of pineapple crown also with pineapple sucker production were found to be privately profitable at ₦550, 438/ha and ₦679,138/ha, respectively, and socially profitable at ₦730,228/ha and ₦841, 828/ha, with pineapple sucker production being more productive. For the two production systems, the existence of tax revealed nominal input and output protection, as well as effective protection coefficients. In the light of, this study differs from the majority of previous studies in terms of the crop type enterprise, and product produces. However, using the PAM system, this study examined the competitive and comparative advantage of the HQCF value chain in South Western Nigeria.

### 2.3.4. High Quality Cassava Flour production in Nigeria.

The high cost of wheat nearly put bakers out of business after the naira collapsed in the 1990s, forcing them to look for another option. The International Institute of Tropical Agriculture (IITA) designed a convenient, easy and efficient method for production of High Quality Cassava Flour (HQCF) for baking in order to overcome these challenges. This has been tested in the bakery and confectionary industries and has been found to be competitive and cost-effective (Sanni*et al*, 2008). In order to transform cassava into a cash crop, the Nigerian Federal Government started the Presidential Initiative on Cassava in 2002, and later a regulation was enacted requiring the inclusion of 10% high quality cassava flour (HQCF) in wheat flour for use in Nigeria.As a direct result of the policy, Nigerian flour milling industries needed 300,000 tonnesof HQCF per year. To meet this demand, federation members raised awareness and encouraged the establishment of cassava SMEs, which began mass-producing HQCF in their factories. Regulatory bodies and other stakeholders developed specifications.

Government and non-government, academic institutions conducted seminars and workshops to educate prospective and current SMEs and staff on how to make HQCF that met the requisite quality requirements and specifications for use in wheat flour for loaf and confectioneries. Flour millers demand cassava flour made to a particular standard that meets performance criteria (the HQCF standard set by the Standard Organization of Nigeria, SON), as well as daily delivery of appropriate quantities of consistently high quality flour at a reasonable price. The necessity, however, is not being met.Significant quality issues affect HQCF production, posing a threat to HQCF demand and profit margins (associated with pricing). Fresh cassava tubers must be treated and processed within 24 hours in order to obtain HQCF; this study discovered that the 24-hour timeframe is indeed a significant limitation for producers and assemblers in the area, as they must accumulate additional costs for harvesting and delivering the roots to the processing plants in order to reach this deadline, raising overall HQCF production costs.

Thai farms and Dutch Agricultural Development and Trading Company, (DATCO) are two of Nigeria's largest HQCF processors, each with a capability of greater than 10,000 tonnes of flour per year (greater than 50 tonnes daily). They each have their own supply chain model. Thai Farm International buys cassava roots directly from about 1,000 farmers who supply surplus cassava roots to their factory in Ogun State, which has a generation capacity of 60 tonnes of HQCF per day (18,000 tons per year).

HQCF normally contains greater than 90% starch, although it is not pure starch since it also contains a small amount of fiber, as well as traces of protein and fat. HQCF is completely unique from the many conventional cassava flours, which are otherwise usually near white in color, has aftertaste fermented odour, and are not smoothly ground. In order to produce a finished product with desirable qualities, strict adherence to good manufacturing practices is required. The cassava roots must be of good quality, stable, and corrupt-free, and they should have been extracted 9–12 months after planting for this method to work. When used to make HQCF, roots older than 12 months produce less flour and fall short industrial white starch and fiber requirements (ApeaBah*et al.*, 2011; Oti*et al.,* 2010). Unfermented, virtually free of unwanted extra material and foreign matter, odorless and flavorless, and with a particle size of 250 to 500 microns, HQCF must have the color of the cassava variety used for processing. The effective properties of flour along with the consistency of the final products it is used for are affected by particle size, which is determined by cell structure and degree of processing. HQCF production must begin within 24 hours of cassava root harvesting and begins with root sorting and peeling. To avoid the risk of fermentation, production methods must be performed in a sequential order.

HQCF is used to make a variety of products which include:

a. Composite flour for bread: To make a composite flour, HQCF and wheat flour is mixed in a 1:4 ratio to make a composite flour with 20% HQCF and 80% wheat flour. Dairy or evaporated milk, sweetener, egg, ghee, spices, cinnamon, baking soda, and other components were incorporated in the same way they would be in a standard wheat bread recipe.

b. Pastries: In cakes, HQCF will use 75% wheat flour, 50% wheat flour in cheese desserts, 25% wheat flour in donuts and pasta, and 20% wheat flour in pies.

c. Spaghetti: HQCF can replace up to 50% of the rice starch in noodles, making them stronger and more flexible. Instead of costly wheat flour, topically produced High Quality Cassava Flour (HQCF) can be used to make macaroni and spaghetti.

(d) Glucose syrup: In order to increase the use of HQCF, a technique for processing glucose syrup using HQCF and rice malt was enhanced and developed. The method was found to be successful in replacing imported glucose syrup with a local supply source. The glucose syrup, which is made up of 95% starch, can be converted into sugars like industrial glucose and sugar substitute sorbitol, which is used in mouthwash, bubble gum, and cough medicines.

e. HQCF cassava cake is a significant cost-effective substitute for foreign glucose syrup and barley starch in the brewing industry.

f. The use of HQCF as a food binding agent: HQCF is an adhesive for food and other commercial applications, and its use in the manufacture of seasoning cooking cubes (both consisting of approximately 20 per cent starch) and extends market opportunities.

g. Commercial alcohol production

The production of ethanol and methanol from HQCF has been demonstrated as a promising option of increasing cassava flour utilization. The technology for extracting alcohols from cassava is fermentation of flour syrup from cassava into a sugar solution, which would then be distilled into alcohol. A high yield of alcohol is produced mostly during fermentation of cassava flour hydrolysate. Sugar to alcohol conversion efficiency in HQCF hydrolysate has been found to be high (Ocloo and Ayernor, 2010).

h. Paperboard adhesives

In laboratory and factory trials, locally produced HQCF has been shown to substitute 50 %to 100 % of maize starch in starch-based glues. Cassava starch also reduces the amount of sodium hydroxide (gelatinization modifier) and borax (viscosity enhancer) needed to make a suitable adhesive for paperboard manufacturing, reducing costs even further.

**2.3.5. HQCF production process**

The HQCF formation process includes steps such as collecting, washing, crushing, heating, pulverising, and finishing.

- Reception: After being harvested, cassava roots are transported to the processing plant and weighed to determine the dry matter content using the simple gravity method, which can also be used to determine the production yield. Excess impurities such as bonded sand, rootlets, and the zygomatic arch are removed after the cassava roots are put in a feeding trough that leads to a revolving sand trap.
- Washing:The roots are washed in a wash machine, which consists of a horizontal circular cylinder with holes and uses pressurized water to wash them for around 5 minutes. Water and friction between the roots and the inner walls of the drum are used to eliminate impurities and the thin outer peel. To improve the microbiological quality of cassava flour, a disinfectant solution of sodium hypochlorite is used.
- Crushing: The dimension of cassava roots is decreased in this section to improve thermal area and speed up the drying process. A machine with a vertical disc spinning at 1200 rpm and several fluted trapezoidal blades crush the roots. A standard cassava crusher is a rectangular piece with a cross section area of about 0, 5 cm2 and a length of 3 cm, with a moisture content of 58-70 percent. The amount of time it takes for cassava chips to dry is determined by their size.
- Drying: To prevent fermentation or microbial contamination of the flour, the drying process must be standardized. Sun-dried cassava chips or artificial dryers are used to minimize moisture content (mc) to 10-12 percent.
- Pulverising, and finishing: Dried cassava chips are pulverized in an extended-wire hammer press, which removes tiny materials like relatively thin peel and fibrous

fragments from the flour. The substance that flows through the screen is pulled through a spherical mill-sieve and transferred to a pair of cyclones by a centrifugal fan. Depending on the refinement specifications, the processing operating conditions may be modified to obtain either refined flour or whole flour. The HQCF flour is then sealed in plastic bags and stored on wooden pallets in a dry environment.

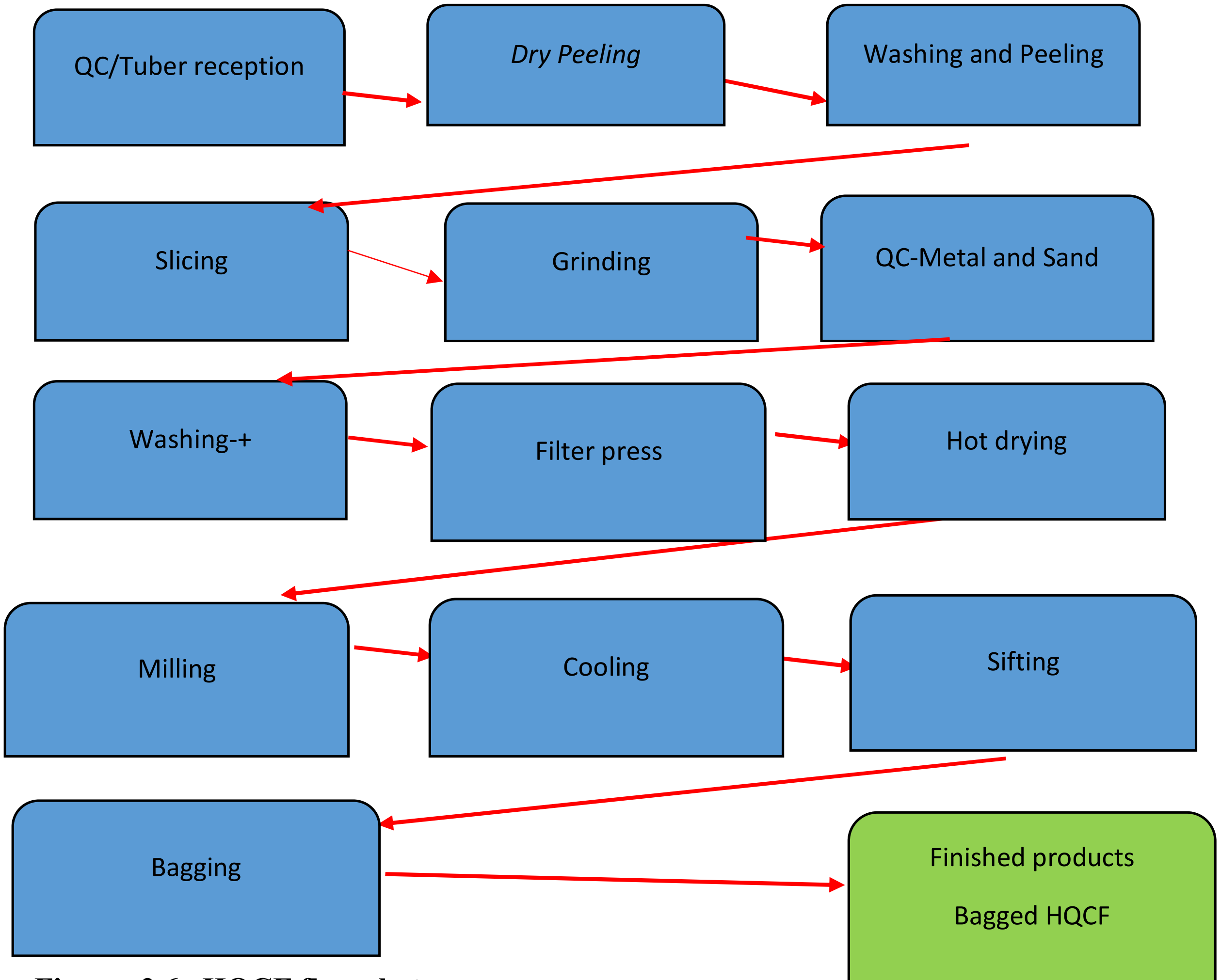


**Figure: 2.6 HQCF flow chat**

**2.4. Conceptual Framework.**

Gorton *et al*, (2013) created a conceptual structure, which this study adapted and updated, enterprises, regulation, customer, and the linkages between the three components constitute the value chains for agri-long-term food's competitiveness.

**a. Sphere of enterprise:** Profitability, efficiency, and return on assets, welfare and incentives are the key metrics for this domain. The actors includes input suppliers, cassava farmers/processors, HQCF millers/ processors, and all marketing and retailing operations. These indicators may be measured for individual units (such as farmstead and businesses) or aggregated for review at the state and region level.

**b. Policy context:** This will involve effect of trade, regulations trends. The key trade-based competitiveness metrics in the primary and food processing sectors are disclose comparative strength, protections, efficiency, internal resource cost ratios, cross trade, and gross value added. Effective policy research necessitates a more thorough examination of the beneficiaries and non-beneficiaries of assistance programs.

**c. Customers:** Client satisfaction for available products, established quality, prices, and food standards are all factors that contribute to the long-term competitiveness of the product chain. International retail price comparisons, client satisfaction / quality service scales, and farm gate – wholesale price spreads are all important indicators. A research like this might look at food safety and the availability of healthy food alternatives.

**d.Components of Relationships:**This is concerned with the interaction of the first three. Global value chains research Gereffi*et al*, (2005), examines the relationships between actors in supply chains. It focuses on the following principal types of supply supply chain regulation: enterprise, flexible, interactional, capture, as well as hierarchical supply chain governance (Gereffi, 2013). Upgrade possibilities are given special consideration (Countries, territories, and businesses use a range of methodologies to retain or strengthen their roles within a supply chain.). Profits, value added, and markups at each stage of the supply chain have been the primary metrics used (Gereffi, *et al*, 2001), though developing a rigorous set of value chain metrics is still a must-do. (Lall*et al*, 2009).

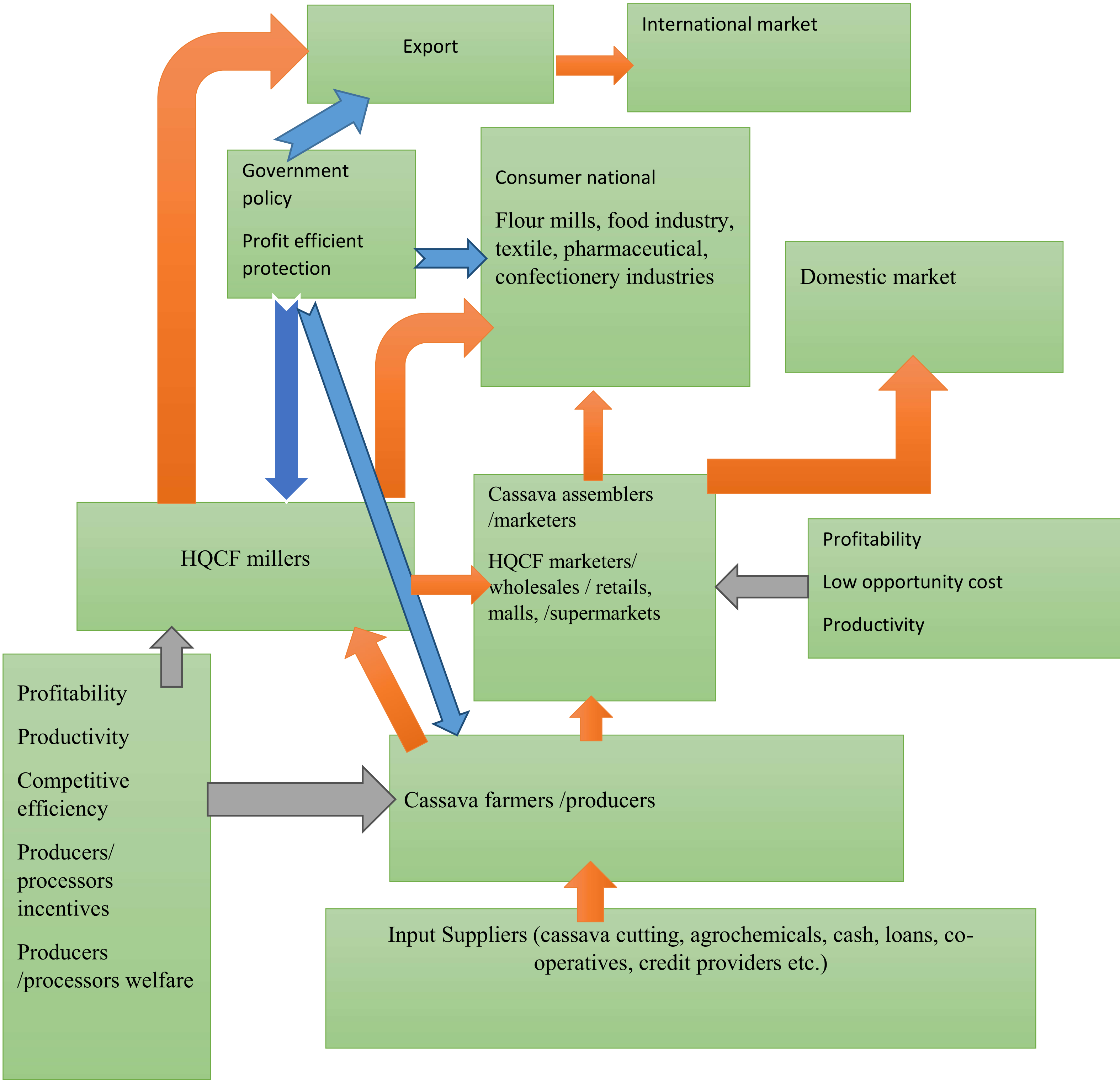


Figure 2.7: Conceptual framework on HQCF value chain adapted from Gorton *et al.* (2013)

# CHAPTER THREE

# METHODOLOGY

## 3.1 Study Area

The study was conducted in the south-western part of Nigeria, which is made up of six states: Oyo, Osun, Ogun, Ondo, Lagos, and Ekiti. Many of the largest cassava-producing regions, as well as the majority of cassava-processing companies that manufacture High Quality Cassava Flour, are located in the south west Figure 3.1. At a latitude of 6 degrees north and 4 degrees south, the south-west is located. Longitudes of 4 0 to the west and 6 0 to the east characterize it. It is bordered on the north by the states of Kogi and Kwara, on the east by the states of Edo and Delta, on the south by the Atlantic Ocean, and on the west by the Republic of Benin. The three main types of vegetation found in southwestern Nigeria are mangrove forest, tropical rain forest, and guinea savanna. The tropical rain forest can be found mostly in the states of Ogun, Ondo, and Ekiti, as well as parts of Oyo, while the mangrove forest can be found in Lagos. Savannas vegetation,both guinea and derived are primarily found in Osun, as well as parts of Oyo and Ogun. Arable land, water, natural resources, wood, and agricultural raw materials are among the region's natural resources, that are being used to produce a wide range of agricultural and forest products. Plantains, cacao, kolanut, varieties of citrus fruits, and palm products are all important cash crops in the area. In the savanna region of the country, tubers and root crops, grain crops are grown, while fish abound in the waterside areas. Both of these resources have been used to aid in the development of the zone. The population is 38,257,260 people (NPC, 2017).Agriculture is the region's mainstay of the economy and primary generator of employment providing people with employment opportunities and income. Cassava, cowpea, and yam are some of the region's most important food crops.

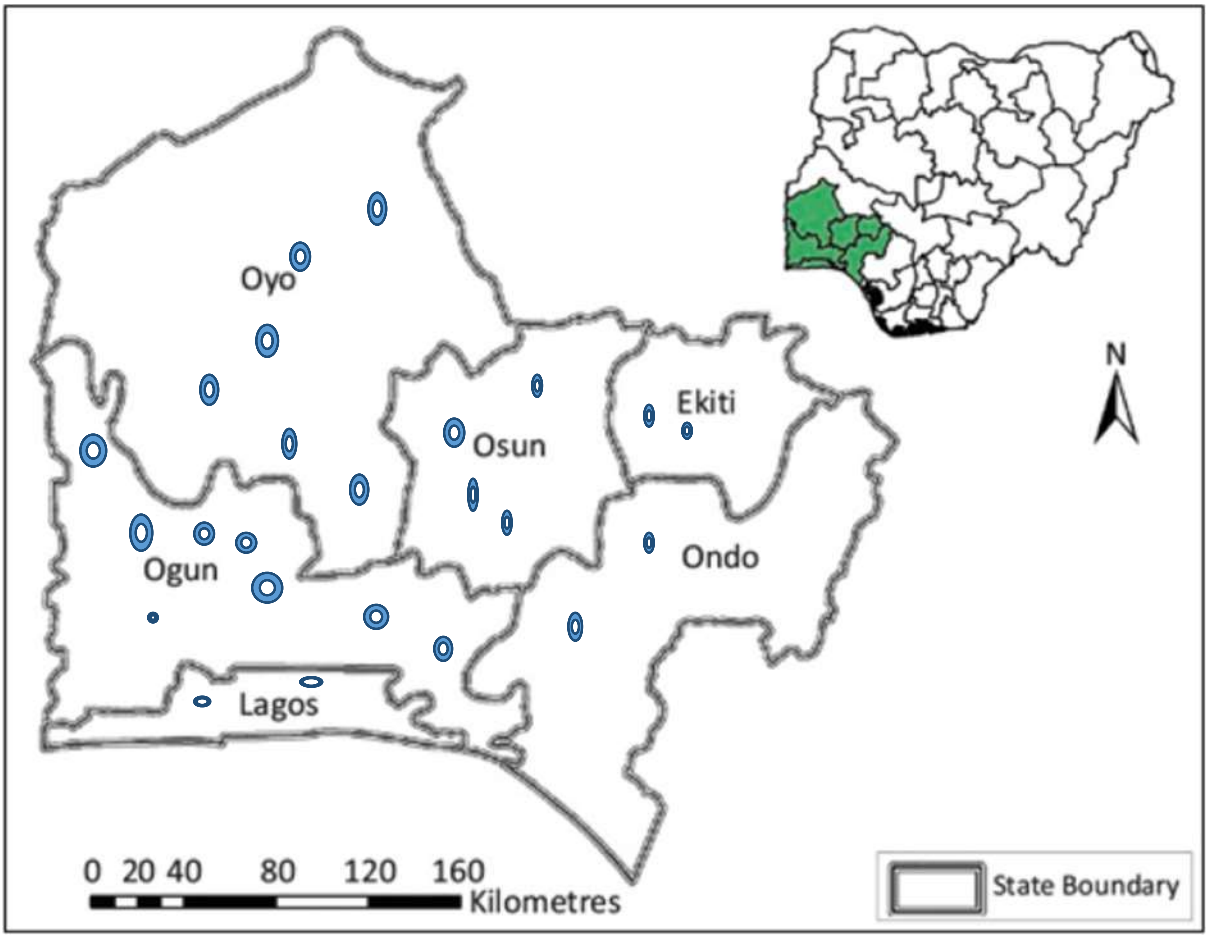


Figure 3.1: High Quality Cassava Flour,production locations inSouth- Nigeria.

Source: Abass*et al* 2011

### 3.2 Source and type of data.

In the analysis both primary and secondary data were used in the study. The primary data for this analysis were collected using a structured and concise questionnaire. Value chain actors such as cassava producers, HQCF processors (flour millers), and HQCF marketers made available primary data. Primary data included yields, inputs parameters, market prices for inputs as well as outputs, transport costs, and cost associated with storage, while secondary data included production subsidy from International Trade Statistics port charges, import and export tariffs from Nigeria Port Authority, and exchange rate from the Central Bank of Nigeria.

### 3.3 Sampling Procedure and Sample Size

In the study, cassava farmers were chosen using a multistage sampling method. The very first stage included the purposive selection of Oyo and Osun, two principal producers of cassava in South West Nigeria. The stage two included a random selection of four local government areas (LGAs) from each state, out of a total of 33 LGAs and 30 LGAs (plus an area office) in each state. In the third stage, four villages from each Local Government Area were chosen at random. The final stage involved selection of 10 cassava farmers at random from each village, for a total of 320 cassava farmers.Mapping survey for all the areas of production, marketing and processing of HQCF in the study area were done and the total number of available HQCF processors (18) were utilized. List of marketers were obtained from the processors/millers. The three important relevant actors in the HQCF value chain were the focus of the study. A total of 381 valid responses (311cassava producers, 18 processors and 26 marketers) were used.

### 3.4. Analytical Techniques and Models

In analyzing the stated objectives; the following analytical tools were used.

**3.4.1. Descriptive Statistics:** The socio- demographic, environmental, and institutional attributes of cassava farmers, HQCF processors, and HQCF marketers were defined using descriptive statistics involving the use of measures of central tendencies and measures of dispersion such as frequency tables, means, percentages, and standard deviations.

**3.4.2. Functional analysis:** This was used to analyze the fundamental processes, stakeholders involved, movement and quantity of the product in the value chain, as defined by Brown *et al*, 2010; Adeoye*et al*, 2013.

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

Price x amount of final product sold = total sales value.

The mathematical expression for Value Added (V) is:

$V = PiQi - \sum_{i-1}^{n} ri\, X_i i$.......................................3.1

Where; PQ=value of output $r\,X$ = raw materials and intermediate products prices

**3.4.3. Profitability Analysis.**

The Net Farm Income (NFI), as well as other profitability budgeting techniques and financial analysis, were used to assess the profit levels of cassava production. NFI for production is thus expressed as follows:

$NFI = GFI - TC$..............................................3.2

Where, NFI = Net Farm Income, GFI = Gross Farm Income, TC= Total Variable Cost.

- **Profitability index (PI):** Profitability index (PI) is the total farm income per unit of overall revenue. .

  $PI = \frac{NFI}{GR}$ ..........................................................3.3

Where, P1 = Profitability index, NFI = Net farm income, GR = Gross Revenue

- Rate of Return on Investment (ROI):The rate of return on investment (ROI) is a criterion for assessing the performance of an investment or to compare the efficiency of various investments. The rate of return on investment is calculated by dividing net farm income by total investment cost, and is usually expressed as a percentage or ratio**.** It is expressed as follows:

  $RRI = \frac{NFI}{TC} \times 100\%$.........................................3.4

Where, RRI = Rate of Return on investment NFI = Net farm Income TC = Total cost.

- **Capital Turnover Ratio (CTO):** Total revenue divided by total cost is known as the revenue-to-cost ratio which is called capital turnover (CTO). In general, it assesses a company's efficiency and provides data on its ability to generate a return on investment per naira. The following is a formula for calculating capital turnover:

$$CTO = \frac{TR}{TC} \qquad \text{3.5}$$

Where, CTO = Capital Turnover TR = Total Revenue TC = Total Cost.

### 3.4.4. Multiple Regression

This was employed to figure out what factors influence cassava output returns in the study field. Following Obayelu (2014,) Eze and Nwibo (2014), andItam*et al*, (2018), various functional forms were fitted and the best-fit equation was chosen on the basis of the value of modified R2, t-value, and signs on the coefficients.

The regression model stated as follows;

$$\gamma = \beta_o + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \cdots \beta_n\chi_n + \mu \qquad \text{3.6}$$

Where Y =Net farm income (in ₦). $X_1$= Total cost of labour (in ₦)

$X_2$ = Land size (in Ha), $X_3$ = Farming experience (in years)

$X_4$ = Total cost of inputs (in ₦), $X_5$= Cost of capital assets (in ₦)

$X_6$= Household Size (in numbers),

β0, constant and Ui is the error term.

Three functional forms were stated;

Linear: $\gamma = \beta_o + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \cdots \beta_n\chi_n + \mu$

Semi-Log: $\gamma = \beta_o + \beta_1\log\chi_1 + \beta_2\log\chi_2 + \beta_3\log\chi_3 + \cdots \beta_n\log\chi_n + \mu$

Double Log: $\log\gamma = \beta_o + \beta_1\log\chi_1 + \beta_2\log\chi_2 + \beta_3\log\chi_3 + \cdots \beta_n\log\chi_n + \mu$

### 3.4.5. The Chi-square test of contingency/ independence

The chi-square statistic is used to show whether or not there is a relationship between two categorical variables. It can also be used to test whether or not a number of outcomes are occurring in equal frequencies or not, or conform to a known distribution.

The chi-square equation:

$$x^2 = \sum_{i=1}^{n} \sum_{j=1}^{m} \frac{\left(o_i - e_i\right)}{e_i}$$

where

$\chi 2$ = the chi-square statistic
$Oi$= the observed frequency
$Ei$= the expected frequency
$i$ = the number of the cell (cell 1, cell 2, etc.)
The HQCF processors and HQCF marketers were grouped into two groups each respectively. Large scale processors are those whoproduces greater than 15,000 tonnes per year, while the small medium scale processors produces less than 15,000 tonnes per year. The HQCF marketers were also grouped into large scale marketers (invested more than ₦2,000,000) and small scale marketers(less than₦2,000,000) based on their capital investments into the business.

### 3.4.6. Policy Analysis Matrix (PAM)

The policy analysis matrix is made up of two accounting specifications: one that describes profit margins as the difference among sales and costs, and another that calculates the impact of divergences (obfuscating policies and market imperfections) as the variance among observable parameters or those who would occur if the divergences were eliminated. Filling in the elements of the PAM for an agricultural system allows you to measure the amount of transfers caused by the policies that want to operate on the system, as well as the system's inherent economic performance.

The gap between overall (or each unit) sales revenues and production costs is known as profit. This definition creates the accounting matrix's first identity. As shown in Table 3.1, profitability in the PAM is calculated diagonally through the matrix's row. Subtracting costs (in the two middle rows) from earnings (in the left-hand row) yields gains (in the right-hand row). As a result, each column entry is part of the income identity—revenues minus costs equal profits.

Each PAM contains two cost rows: one for tradable inputs and one for domestic factors. Intermediate costs are divided into four groups using this form of disaggregation: tradable inputs, domestic causes, transfers (taxes or subsidies set aside in social evaluations), and non-tradable inputs (which themselves have to be further disaggregated so that ultimately all component costs are classified as tradable inputs, domestic factors, or transfers).The Policy Analysis Matrix was used to assess the HQCF value chain's productivity and competitive advantage, as well as the effect of policy intervention. Ogbe*et al*, (2011).

**Table 3.1: Policy Analyses Matrix**

| Item | Revenues | Cost of tradable inputs | Domestic Factors | Profits |
|---|---|---|---|---|
| **Private prices** | A=$Y_i^p$ $P_i^p$ | B=Σa$_{ij}P_j^p$ | C= Σa$_{ij}P_k^p$ | D=A-B-C |
| **Social prices** | E=$Y_i^s P_i^s$ | F=Σa$_{ij}P_j^s$ | G= Σa$_{ij}P_k^s$ | H=E-F-G |
| **Effects of policy and other** | I=A-E | J=B-F | K=C-G | L=D-H=I-J-K |

Source: Monke and Pearson (1989)

A= Revenues in private, B=Cost of tradable inputs=Cost of domestic factors

D=Measures private profits, E=Measures revenue in social prices, F=Cost of tradable input

G=Cost of domestic factor in social prices, H=Social profit, I=Output transfers

J=Input transfers, K=Factor transfers, L=Net policy transfers

Table-1's first row contains an indicator that measures private profitability (D), or competitiveness. Despite current technology, input and production costs, policy actions, and market failures, private profitability demonstrates the agricultural system's competitiveness. The second row of the matrix is used to calculate social profitability (H). The agricultural system's economic efficiency/comparative advantage is calculated by social profitability. The divergence between private and social valuation is then used to determine the effect of policy. Domestic resource cost (DRC) ratio, the Private Cost ratio (PCR), the Social Cost Benefit (SCB) ratio, the Profitability coefficient (PC), the Nominal Protection Coefficient (NPC), the Effective Protection Coefficient (EPC), the Producer Subsidy Estimate (PSE), and the Subsidy Ratio to Producer (SRP) are useful in analyzing Competitiveness, Comparative Advantage, and the Effect of Poverty. Masters and Winter-Nelson (1995); Monke and Pearson (1989).

In this study, the US (Gulf) Free on Board (FOB) price were employed as the international reference prices for wheat grain, wheat and cassava flour and tradable inputs These world prices have been changed to account for shipping costs in order to be equivalent to farm gate prices. The social price at the farm gate was calculated by adding transportation costs, port charges, and tariffs to the respective Cost in Freight (CIF) price, which was calculated by adding current freight charges to FOB rates in the local currency (Naira) at a rate of one US dollar to (₦300) 300 Naira. The opportunity costs were used to value domestic factors including property. The opportunity cost of land was taken as the net return or profit accruing to the farmer if the land was used in cultivating alternative crop such as Yam. The social cost of labour was valued following the studies of Ogbe*et al* (2011); Mamza*et al* (2014) and Osawe and Salman (2016). The social cost of labor was calculated by dividing labor into peak and off-peak season components. The peak season wage rate is equal to the opportunity cost of labor at current market rates for the period under consideration, whereas the off-peak season wage rate is half of the prevailing wage rate. After that, the social price of labor for this analysis is calculated using the formula proposed by Yao and cited by Ogbe*et al,* (2011).

$$PL = \frac{WP\ +\ 0.5WO}{2}$$

Where; PL = Social price of labour

Wp = in peak season, the going wage rate

Wo = during off peak season, the going wage rate

**3.4.7.Measurement of Competitiveness**

Predictors of competitiveness in PAM entails private profits, Private Cost-benefit Ratio (PCR) and Private Benefit-Cost Ratio (PBCR).

- **Private Profitability**

Private profitability refers to observable revenues and costs in the agricultural system that represent real market prices earned or charged by producers, retailers, or processors. The basic economic costs and valuations, as well as the effects of all policies and market failures, are all factored into private, or actual, market prices. The difference between revenue (A) and costs (B + C) in Table 3.1 is called private profits, and all four top-row entries are calculated in observed values. The first step in the calculation is to create various budgets for planting, marketing, and manufacturing.In agricultural systems, farmers and merchants can earn or pay real market rates, which are referred to as private revenues and costs. Private, or actual, market prices include the underlying economic costs and valuations, as well as the results of both policies and market failures. The difference between sales (A) and costs (B + C) in Table 3.1 is measured as private income, D, and all four entries in the top row are calculated using observed values.The first phase in the equation contributes to system expansion in the future, whether the agricultural area cannot be expanded or substitute crops are more privately profitable. To compare processes that generate the same outputs, private profits are used. Under current policies, D = (A - B - C) indicates competition.

Private Profit (D) =$p_i^p\ q_i^p$ - ($\Sigma a_j\ p_j^p q_j^p +\ \Sigma b_k p_k^p q_k^p$) = A – (B+C) …...3.9

D > 0 strongly suggests competitiveness, D = 0 strongly suggests break-even, and D < 0 strongly suggests non-competitiveness.

Private profit< 0 = Operators earn a subnormal rate of return, Private profit = 0 = Operators earn normal income, Private profit > 0 = Operators earn supernormal returns, and this could result in system expansion.

**Private Cost-Benefit Ratio (PCR):**

To allow comparisons between systems producing different goods, a ratio must be constructed. Direct analysis of data for personal benefit is inadequate. In comparisons of private income of structures generating various goods with different capital intensities, this uncertainty is inherent. The problem is solved by calculating the private cost ratio (PCR), which is also the ratio of domestic factor costs (C) to private price value added (A - B) (A - B).The deviation between both the value of output and the costs of tradable inputs is known as value added, and it shows how much the system can compensate domestic factors (including a normal return on capital) while remaining competitive—that is, breaking even after earning normal income, where (A - B - C) = D = 0. Business entrepreneurs have a tendency to make disproportionate profits (D > 0), which they can do if their private factor costs (C) are lower than their value added in private prices (A - B). They strive to keep factor and tradable input costs as low as possible in order to increase surplus income by lowering the private cost ratio.

$$\text{Private Cost-benefit Ratio (PCR)} = \frac{\Sigma b_k p_k^p q_k^p}{p_i^p\, q_i^p \; -(\Sigma a_j\, p_j^p\, q_j^p} = \text{C/ (A - B)}\ldots\ldots\ldots 3.9$$

When PCR > 1 signifies no-competitiveness, when PCR = 1 signifies a breaking even condition, and when PCR< 1 indicates competitiveness

a. **Private Benefit-Cost Ratio (PBCR):**

The ratios of private revenues to private costs, which is described as the fraction of private revenues to private costs, is another indicator of PAM's competitiveness. It is written as follows:

Private Benefit-Cost Ratio (PBCR) = $\frac{p_i^p \, q_i^p}{(\Sigma a_j \, p_j^p q_j^p \, + \, \Sigma b_k p_k^p q_k^p \,)}$ = A/ (B+C)……...3.10

When PBCR is >1, an indicator of competitiveness, PBCR =1, there exist a breakeven situation, when PBCR is <1, non- competitiveness is evident.

### 3.4.7.Measurement of comparative advantage

Measurements of comparative advantage in PAM include indicators such as Social Profits (H), Domestic Resource Cost (DRC), Social Cost-Benefit Ratio (SCBR) and Social Benefit-Cost Ratio (SBCR).

- **Social Profitability**

As seen in Table 3.1, the second row of the accounting matrix employs social prices. In the agricultural product method, these valuations are used to assess comparative advantage or quality. Productive results are achieved when an economy's resources are geared toward initiatives that give the highest levels of productivity and revenue. Since outputs, E, and inputs, F + G, are priced in prices that represent scarcity values or social opportunity costs, social income, H, is an efficiency measure. Social profits, like private gains, are the disparity among revenue and expenditures, which are both calculated in social prices H = (E - F - G). For globally exchanged outputs (E) and inputs (I), world rates—cif import prices for finished products or services or fob export prices for exportable—provide economically relevant social valuations (F). The social value of additional domestic production is therefore the foreign exchange saved by reducing imports, exports, and manufacturing; world prices reflect the government's decision to allow consumers and producers to import, export, or manufacture products and services domestically; world prices reflect the government's decision to allow consumers and producers to import, export, or manufacture products and services domestically; world prices reflect the government's decision to allow consumers and producers to import, export, or manufacture products and services domestically (for each unit of production, the cif import or fob export price). The related world prices which vary from those in place during the study's base year because of global demand fluctuations or foreign policy. The net income lost as a result of the factor not being used in its best alternative use is used to calculate the social benefit of each factor operation. The product structures under consideration must be excluded from the measurement of social factor prices using this approach. For social valuation of domestic factors, the variance among mobile and fixed factors of development is the starting point. Mobile considerations are those that can transfer from agriculture to other sectors of the economy, including manufacturing, utilities, and electricity.

Prices are calculated by cumulative supply and demand forces for mobile variables. Since capital and labor have other uses in the economy, their social values are calculated at a national level rather than only inside the agricultural sector. As a result, a broad variety of policies influence actual labor wage rates and rates of return on capital expenditure, some of which can explicitly distort factor prices. For example, a mandated minimum wage raises market wages to what they would be in the absence of legislation, allowing observed wages to surpass the social opportunity cost of labor. On the other hand, indirect effects may be important. As a result of price distortions, changing demand, and prices for mobile domestic factors, various activities expand or contract. Within a specific sector of the economy, the private or social opportunity costs of fixed, or immobile, factors of production are calculated. Agricultural land, for example, is frequently valued solely for its ability to grow alternative crops.Land is unaffected by events in the manufacturing and service sectors of the economy because it is immobile. Calculating the social opportunity cost of agriculture, on the other hand, can be difficult. In any agro climatic field, total specialization in the most productive crop is uncommon. Rotational or intercropping systems are preferred by farmers because they reduce the risk of losing money due to price fluctuations, yield losses, and pest and disease infestation.As a result, the social opportunity cost of land is measured by a weighted average of the social benefits accruing from a series of crops planted, rather than the cumulative profitability of an absolutely best alternative crop. Since the correct weights and social profits associated with each crop in the collection are often uncertain, reinterpreting crop profits as land leases and other fixed variables (such as management and risk tolerance) can aid in evaluating farming activities. This reinterpretation, which is part of D, includes private (and social) returns to property (and H). Profitability per hectare is the ability of a farming activity to recover its long-run variable costs, either in private or social prices, or as a return to fixed factors like land, organizational capacity and water sources.

Social prices-H = = E – $p_i^s q_i^s$ – ( $a_j p_j^s q_j^s$ + $\Sigma b_k p_k^s q_k^s$)= (F + G)……………3.11

**b. Domestic Resource Cost (DRC)**

The domestic resource cost (DRC) is a computation that determines the comparable output of domestic production by relating the opportunity cost of domestic production to the product's value (Tsakok, 1990). In terms of social costs associated with domestic wealth, the ratio was used to compare various economic activities. The indicator is determined by multiplying the cost of domestic capital and non-traded inputs by the amount of net foreign exchange obtained or saved by manufacturing the good in the country. It is described as follows in the PAM analysis**:**

$$\text{DRC}=\frac{\Sigma b_k p_k^s q_k^s}{p_i^s q_i^s - \Sigma a_j p_j^s q_j^s} = \frac{G}{E - F} \quad \text{………………………3.12}$$

Where: $\Sigma b_k p_k^s q_k^s$ = domestic factors cost of social prices; $p_i^s q_i^s$ = social prices of Revenue; $\Sigma a_j p_j^s q_j^s$= tradable inputs cost of social prices.

DRC < 1 denotes domestic production efficiency, while DRC >1 denotes incompetence in domestic production.A DRC of one means that the country is in equilibrium, with no gains or losses in export earnings due to domestic output.

**c. Social Benefit Cost Ratio (SBCR)**

The amount of money produced per unit of investment is another PAM indicator for calculating comparative advantage. It's the quotient of social benefits to social costs, and it's useful for comparing services that are not exactly the same.

$$\text{SBCR} = \frac{p_i^s q_i^s}{\Sigma a_j p_j^s q_j^s + \Sigma b_k p_k^s q_k^s} = E/\,(F + G) \text{ ………………3.13}$$

ASBCR greater than 1 connotes a profitable enterprise, SBCR equals to 1 connotes break even, and SBCR less than1 connotes a non-profitable activity.

**d. Social Cost Benefit Ratio (SCBR).**

Although this accounts for all costs and eliminates misclassifications in the DRC equation, the social cost-benefit ratio (SCB) is a viable substitute to the DRC in the PAM study (Masters and Winter-Nelson 1995). Although DRC may favor activities that rely heavily on locally non-traded factors like land and labor, Social Cost/Benefit (SCB) takes into account all costs (Fang and Beghin, 2000)

$$\text{SCBR} = \frac{\Sigma a_j p_j^s q_j^s + \Sigma b_k p_k^s q_k^s}{p_i^s q_i^s} = \frac{F+G}{E} \text{………………………………3.14}$$

### 3.4.8. Effects of divergences

The contrast between both the private and social valuations of sales, expenses, and income is the accounting matrix's second identity. Any difference among the observed private (actual demand) price and the projected social (effectiveness) price for each entry in the matrix-measured vertically-must be expound by policy effects or negative externalities. The divergence and transition effects of policies are measured in the third (bottom) row of the PAM matrix. To estimate divergence, l, J, K, and L are calculated. The concept of social prices directly leads to this crucial relationship. The consequences of distorting policies—policies that contribute to excessive resource use—are compensated for by social prices. These policies are commonly enforced because politicians are able to recognize certain shortfalls (and therefore lower overall revenue) in order to achieve antiefficiency targets such as redistributing wealth or food production. In this case, weighing the tradeoffs between performance and non-efficiency targets becomes a critical component of policy analysis. Not all wealth distribution methods, however, are created equal. When market forces (seller or customer control over market prices), externalities (costs or advantages for which the imposer is not compensated), or factor market imperfections (inadequate establishment of organizations to provide competitive services and complete information) obstruct production, such policies are introduced explicitly to increase productivity.As a result, it's critical to differentiate between distorting policies that cause economic losses and productive policies that reduce the impact of market shortcomings and generate more revenue. Successful measures minimize the inequalities between private and social valuations by correcting divergences.

### 3.4.9. Measurement of Government protection (transfer effect of policies)

The Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), Profitability Coefficient (PC), and Subsidy Ratio to Producers (SRP) are the most prominent protection coefficients in PAM.

**a. Nominal Protection Coefficient (NPC)**

The NPC is an assessment of how well domestic price policy safeguards domestic producers or customers from direct inputs or outputs from international trade, pertaining to the PAM analysis. An input-output approach is used. NPC is divided into two types: NPC on tradable outputs (NPCO) and NPC on tradable inputs (NPI) (NPCI). The NPC is determined by dividing the domestic price by the border price.

$$\text{NPCO} = \frac{p_i^p\, q_i^p}{p_i^s q_i^s} = \text{A/E} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.14$$

$$\text{NPCI} = \frac{\Sigma a_j\, p_j^p q_j^p}{\Sigma a_j p_j^s q_j^s} = \text{B/F} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots ...3.15$$

When NPCO is greater than1 indicates the presence of a tax (tariff) on production, NPCO lessthan 1 indicates the presence of a subsidy, and NPCO equals to 1 (in the absence of market failures) indicates the absence of interference, but NPCI that is greater than1 indicates the presence of a subsidy, NPCI less than 1 indicates the presence of a tax (tariff) on output,

**b. Effective Protection Coefficient (EPC)**

The EPC is an indicator in PAM for assessing policy and government interventions. It goes a step further by accounting for tradable inputs and calculating the ratio of value added at domestic prices (A - B) to value added at world reference prices (E - F), or the proportion of value added in private prices to value added in social prices. This fraction can be expressed mathematically:

$$\text{EPC} = (p_i^p\, q_i^p \quad - (\Sigma a_j\, p_j^p q_j^p) - (p_i^s q_i^s - \Sigma a_j p_j^s q_j^s) = (A - B)\ (E - F) \ldots\ldots\ldots\ldots 3.16$$

When EPC is less than 1, the policy (tax) has a negative effect, and when EPC is greater than one, the policy (tax) has a positive effect.

**c. Profitability coefficient (PC)**

The profitability coefficient (PC) depicts how all earnings are affected by all transfers. The index is based on a ratio of private benefit to public benefit. The profitability coefficient (PC), the ratio of private and social earnings, or PC = (A – B – C)/ (E – F – G), or D/H, is a factor transfer variant of the EPC. Since L = PC, the PC measures all policies' incentive effects and thus acts as a proxy for net policy transfer (D - H). If private or social profits are negative, its usefulness is limited because the sign of both entries must be understood to enable clear understanding. It demonstrates how private benefits outnumber public benefits.

$$\text{PC} = \frac{p_i^p\, q_i^p \quad - (\Sigma a_j\, p_j^p q_j^p + \Sigma b_k p_k^p q_k^p) \quad = \quad A - (B+C)}{p_i^s q_i^s - (\Sigma a_j p_j^s q_j^s + \Sigma b_k p_k^s q_k^s) = E - (F + G).} = \text{D/H} \ldots\ldots\ldots\ldots\ldots\ldots 3.17$$

When PC is less than one, it indicates a policy or market shortfall affecting the system, and when PC is greater than one, it indicates a subsidy infusion into the system.

**d. Net Transfer (L):**

This is a PAM metric used to determine the impact of policies/government interventions being private benefit D minus social profit H.

$$\text{Net Transfer (L)}=\frac{p_i^p\, q_i^p \;\; -\left(\Sigma a_j\, p_j^p q_j^p + \Sigma b_k p_k^p q_k^p\right)}{p_i^s q_i^s - \left(\Sigma a_j p_j^s q_j^s + \Sigma b_k p_k^s q_k^s\right)}=\text{D/H}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..3.18$$

When L is less than zero, it indicates a grossly distorted policy or market distortion; when L is greater than 0, it indicates the presence of a subsidy; and when L is equal to zero, it indicates that there is no market distortion and no interference.

**e. Subsidy Ratio to Producers (SRP)**

The subsidy ratio to producer (SRP), or net policy transfer as a proportion of total social revenues (SRP = L/E = (D - H)/E), is the last simulative measure. If both product and monetary policy is replaced by a single subsidy or taxation, the SRP reflects the proportion of revenues expected in global pricing The SRP allows for a comparison of how much each policy subsidizes agricultural structures The SRP could also be broken down into part transfers to demonstrate how different performance and factor policies affect the overall structures. The SRP shows how much the income of a system has increased or decreased as a result of policy. When the SRP is low, the agricultural system is less skewed. In a nutshell, it's the proportion of total policy transfer (L) to social revenues (E).

$$\text{SRP} =\frac{\left(p_i^p\, q_i^p \;\; -\left(\Sigma a_j\, p_j^p q_j^p + \Sigma b_k p_k^p q_k^p\right)\right)- p_i^s q_i^s - \left(\Sigma a_j p_j^s q_j^s + \Sigma b_k p_k^s q_k^s\right)}{p_i^s q_i^s}=\text{L/E}\ldots 3.20$$

A SRP ratio of > 0 means presence of subsidy and SRP ratio that is < 0 implies taxation.

### 3.4.10. Sensitivity Analysis

Owing to the fixed (static) identity of the policy analysis matrix, sensitivity analysis was used to determine the investment's earning potential as a function of changes in variables such as yield, exchange rate, and transportation costs. Sensitivity analysis is a technique for calculating the effect of changes in critical variables on both private and public benefit

(Monke and Pearson 1989). The impact on private and social profit, as well as policy indicators, is evaluated.

### 3.5. Limitation of study

The research work was not without its difficulties, the most important of which was some actors in the HQCF value chain's unwillingness to share information about their companies, especially the actual cost and return elements. Another difficulty was obtaining cost and revenue at world prices, given that the HQCF as a research field is still relatively new, especially in the state. With adequate consultation, the researcher was able to resolve all of these barriers.

# CHAPTER FOUR

## RESULTS AND DISCUSSIONS

### 4.0. Results and discussions.

This chapter presents and discusses the results of the various analyses on the characteristics of the HQCF value chain actors, (producers,processors and marketers). The stages, activities and the flow of outputs along the chain, the functional analysis as well as the mapping of the HQCF value chain. The cost and profit analysis of all the actors and the factors influencing the profit level. It further presented the competitiveness and comparative advantage level, as well as the effective of government policy in the HQCF value chain

### 4.1. Mapping out actors, stages and activities along HQCF value chains.

This aim was to map out the links/relationships among stakeholders, mechanisms, and operations along the cassava value chain, identify the produce movement, identify the actors, and market the products, as well as analyze the actors' socio-economic statuses.

#### 4.1.1 Socio-economic characteristics of actors along HQCF value chains.

#### 4.1.2. Age of actors in the HQCF value Chain

Farmers' age has a considerable impacts on crop productiveness and aids in proper farming operation management. The ages of the participants in the HQCF value chain are shown in Table 4.1.In accordance to the table, the median age of cassava farmers was 48.29 years. About 17.36 % of the farmers were younger than the average age of 48.29 years, while 33.44 percent of the cassava farmers were older. Cassava farmers under the age of 30 were in the minority (2.57 %) the majority (63.99 %) being within the ages of 30 and 50.The findings were consistent with those of Okunade*et al*, (2005) and Awerije, (2014), who found that cassava farmers were mainly between the ages of 36 and 56, and that the median age ofcassava producing farmers in Delta state was 42 years. This meant that the significant proportion of them were of working - age population and could comfortably participate in field crop production to help support themselves and their families, Enimu*et al*, (2016). The median age of HQCF processors was 47.61 years, and the median age of HQCF marketers was 44.12 years. Processors between the ages of 41 and 50 were found to be more interested in the establishment of HQCF processing businesses. This may be due to the high financial investment needed to start the HQCF enterprise. The majority of the HQCF processors were between the ages of 45 and 54, according to Ugwu*et al*, (2014) and Ogboji, (2016).

### 4.1.3 Gender of actors in HQCF value chain

Male farmers, processors, and marketers accounted for 78.14 %, 96.15 %, and 70.45 % of the total, respectively, indicating that there were more male farmers, processors, and marketers than female actors in Table 4.1. The majority of HQCF processors (96.15 %) were male, while 3.85 % were female, meaning that there were more males involved in HQCF processing than females. This is likely due to the fact that male processors are more able to endure the rigorous demands of HQCF processing, such as system operation, maintenance, and personnel management, they could take financial risks than their female counterparts**.**

### 4.1.4 Marital status of actors in HQCF value chain

The marital status distribution of the actors, 84.57 %of cassava producers, 65.38 % of HQCF processors, and 90.91 % of HQCF marketers were married, according to Table 4.1. This meant that in the study region, there were more married people working in the HQCF flour value chain. The high percentage of married people meant that family labor would be available for actors in the HQCF value chain, decreasing the amount spent on hired labor. Mebratie*et al*, (2015) found that married people participated in the cassava flour value chain to include their families in farming activities.

**Table 4.1:Some socio economic characteristics of the actors in the HQCF value chain**

| Characteristics | Cassava producers (n=311) | | HQCF Processors (n=18) | | HQCF Marketers (n=26) | |
|---|---|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| **Age** | 8 | 2.5 | | 0 | 0 | 1 |
| ≤30 | 46 | 14.79 | | 2 | 11.11 | 4 |
| 31-40 | 153 | 49.20 | | 11 | 61.12 | 14 |
| 41-50 | 66 | 21.22 | | 1 | 5.55 | 3 |
| 51-60 | 38 | 12.22 | | 4 | 22.22 | 4 |
| >60 | 38 | 12.22 | | 4 | 22.22 | 4 |
| **Mean** | **48.29** | | | **47.61** | | **44.12** |
| **Standard dev.** | **8.46** | | | **8.08** | | **6.79** |
| **Gender** | | | | | | |
| Male | 243 | 78.14 | 14 | 77.77 | 18 | 69.24 |
| Female | 68 | 21.86 | 4 | 22.23 | 8 | 30.76 |
| **Marital status** | | | | | | |
| Single | 8 | 2.57 | 1 | 5.55 | 1 | 3.84 |
| Married | 263 | 84.57 | 9 | 50.00 | 22 | 84.63 |
| Widowed | 24 | 7.71 | 2 | 11.11 | 2 | 7.69 |
| Divorced | 16 | 5.15 | 6 | 33.34 | 1 | 3.84 |

### 4.1.5. Household size among the actors of HQCF value chain

The average household size for cassava producers was 6.91, for HQCF processors was 5.62, and for HQCF marketers was 7.08, according to the profile of household size of the HQCF value chain actors shown in Table 4.2 revealed that the majority of cassava producers' household family size were more than 7 family members. Large household sizes are known to be a source of farm and off farm income generating activities(Sentumbwe, 2007). However, it is worth noting that, in some situations, large household sizes do not mean improved efficiency, as family labor may consist predominantly of school-aged children who are always in school. The marketer's household size ranged from 4-6 family members, while the HQCF processors household size also ranged from 4-6 family members. The median family size for the actors in the HQCF value chain was cassava producers; 6.91, HQCF processors; 5.26, HQCF; marketers 7.08.

### 4.1.6. Educational level of actors in the HQCF value chain

The actors' educational distributional level showed that 58.20% of the cassava producers had some form of formal schooling, indicating that the cassava farmers in the study region were educated. It also implied that the implementation of new cassava farming technologies was easy (Table 4.2). 100% of HQCF processors were trained, indicating that higher education enabled HQCF processing, as shown by the processors' ability to make successful and well-informed decisions, and 59.09 % of marketers were educated. This result demonstrates the value of education to stakeholders who have recognized the many benefits and advantages it provides. This result corroborated (Oluyole, (2015); Ogboji, (2016); Ayoola (2016) findings that HQCF processors were taught. Education is likely to affect processors' ability to implement advanced processing technology and, as a result, increase productivity and performance. Farmers and HQCF processors would be able to understand production methods and new technology adoptions if they have a high literacy level.

**Table 4.2:Some socio economic characteristics of the actors in the HQCF value chain**

| Characteristics | Cassava producers (n=311) | | HQCF Processors (n=18) | | HQCF Marketers (n=26) | |
|---|---|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentages | Frequency | Percentage |
| Household size | | | | | | |
| 1-3 | 3 | 0.96 | 0 | 0 | 0 | 0 |
| 4-6 | 139 | 44.70 | 15 | 83.33 | 13 | 50.00 |
| 7-above | 169 | 54.34 | 3 | 16.67 | 13 | 50.00 |
| Mean | 6.91 | | 5.26 | | 7.08 | |
| Standard dev. | 2.15 | | 1.03 | | 2.47 | |
| Years of education | | | | | | |
| 0-6 | 0 | 0 | | 0 | 0 | 0 |
| 6-9 | 14 | 4.50 | | 0 | 0 | 2 |
| 9-12 | 112 | 36.01 | | 0 | 0 | 21 |
| 12-15 | 4 | 1.29 | | 0 | 0 | 0 |
| 15 and above | 156 | 50.16 | | 18 | 100 | 3 |
| Mean | 9.31 | | | 15 | | 3.48 |
| Standard dev. | 3.59 | | | 0.84 | | 1.35 |

### 4.1.7. Years of experience of actors in HQCF value chain

The years of experience have an effect on the managers' skills and productivity in carrying out their processing tasks. Ayoola*et al*., (2016). According to Table 4.3, 23 % of farmers have had more than 20 years of farming experience, while 19.23% of processors had more than 8 years of processing experience. This has implications for the managers' skill and productivity in carrying out their processing tasks (Ajibefun, 2002). The majority of the marketers (72.73%) have had more than ten years of experience.

### 4.1.8. Farm /firm size of actors in HQCF value chain

The average farm size of 2.78 hectares obtained showed that huge proportion of the farmers cultivated farm sizes of less than 3 ha (Table 4.3). The average HQCF production was 34.88 tonnes, and the average HQCF marketer firm size was 2.85 tonnes. More than 90% of cassava production takes place on subsistence farms that usually grow 0.5 ha of cassava (Plan, (2006); Lamboll et al., 2018)

**Table 4.3:Some socio economic characteristics of the actors in the HQCF value chain**

| Characteristics | Cassava producers (n=311) | | | HQCF Processors (n=18) | | HQCF Marketers (n=26) | |
|---|---|---|---|---|---|---|---|
| | Frequency | Percentage | | Frequency | Percentage | Frequency | Percentage |
| Years of experience | | | Years of experience | | | | |
| ≤10 | 45 | 14.47 | ≤5 | 13 | 72.22 | 5 | 19.23 |
| 11-20 | 143 | 45.98 | 6-10 | 5 | 27.78 | 1 | 3.84 |
| 21-3 | 60 | 19.29 | 11-15 | 0 | 0 | 5 | 19.23 |
| 31-40 | 31 | 9.29 | >15 | 0 | 0 | 15 | 57.70 |
| >41 | 32 | 10.29 | | | | | |
| Mean | 21.73 | | | 8.44 | | 10 | |
| Standard dev. | 10.81 | | | 2.11 | | 1.38 | |
| Farm size | | | Firm size/output | | | | |
| ≤3 | 107 | 34.41 | ≤30kg | 0 | 0 | | |
| 3-5 | 80 | 25.72 | ≤200kg | 13 | 72.22 | | |
| 6-8 | 72 | 23.15 | ≤1ton | 3 | 16.66 | 10 | 38.46 |
| 8-10 | 30 | 9.64 | ≤5ton | 2 | 11.12 | 4 | 15.39 |
| >10 | 22 | 7.07 | >5ton | 0 | 0 | 12 | 46.15 |
| Mean | 2.78 | | | 34.88ton | | 2.85 ton | |
| Standard dev. | 2.82 | | | 0.66 | | 2.58 | |

### 4.1.9. Value addition

The value added at various levels in HQCF value chain is presented in Figure 4.1. The value added at cassava producer level especially the producer of unfermented cake was estimated at ₦82.84/kg. The goal here is to produce unfermentedHQCFcake and it starts bysorting and selection of healthy roots from the lot for processing, Peeling where the rind is completely removed to ensure low fiber and white color of the finished product. Mechanical peelers are available in medium to large scale processing. Washing the peeled roots thoroughly in clean water to remove pieces of peel, sand and other dirt. Grate roots properly obtain uniformly smooth mash. The smoothness of the mash determines the quality, yield and market value of the finished HQCF. The mash is loaded into sacks and pressed to remove as much moisture as possible. Pressing is completed when water is no longer dripping from the sacks. Complete dewatering facilitates drying. Pressing should be done immediately after grating to avoid the onset of fermentation. The value added by HQCF processors was estimated at ₦437.61/kg and this is the stage where the most value is added. At the processor stage, value addition entails turning raw cassava into finished products. Drying, *m*illing, screening and proper packaging are ensureddried grits are milled in a hammer or disc attrition mill to a fine and uniform particle size. Flour is screened using a motorized flour sifter fitter with a 250µm screen. This removes fiber and improves the smoothness of the flour. Bulk handling of the final product should be in polyethylene lined polypropylene sacks. Adequate packaging is needed to avoid moisture uptake of HQCF and attack by pests during storage. Storage should be in well ventilated rooms and fit for purposee. The value added by the HQCF marketers in the HQCF value chain was estimated at ₦8.23/kg, this include rebranding, re-packaging into smaller sizes, storage and transportation.

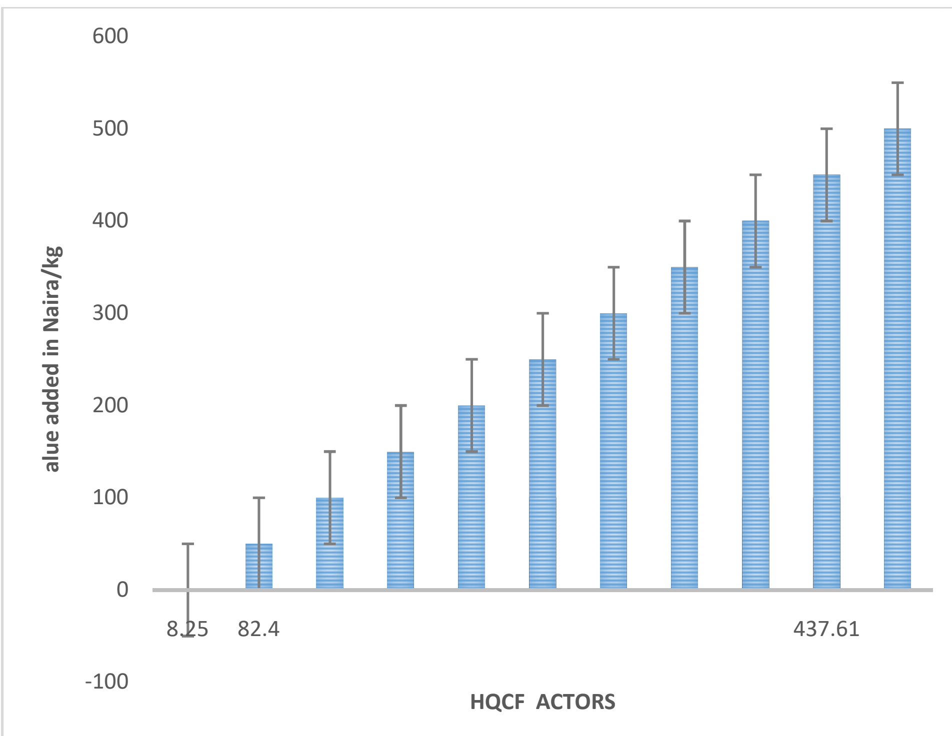


Figure 4.1: Value added along HQCF value chain

### 4.1.10. Value chain mapping, product velocity and quantity movement in the HQCF value chain.

The outcome of HQCF Value chain mapping presented in figure 4.2. The figure revealed that the average inputs supply was ₦147,953.04, with 68% (₦100,608.07) of the total consumed by cassava farmers, 15% (₦22,192:96) to the flour mills cassava farmers, 12% (₦1775; 40) to the small medium enterprise HQCF processors cassava farms and 5% (₦7,397:45) to the primary producers cassava farmers. Cassava famers produced an average output of 31.43 tonnes, sold 40% (12.57 tonnes) to the farm gates and market assemblers, 25% (7.86 tonnes) were sold to the primary processors, while 35% (11tonnes) were sold directly to the HQCF millers. The cassava marketers and assemblers sold 42%(13.20 tonnes) of their cassava to the HQCF millers, 20%(6.29 tonnes) to the SME processors and 38% (11.94 tonnes) to the primary processor.In addition the primary processors sold 50%(15.72 tonnes) to their products (intermediate product) directly to the HQCF millers/processors; 35% (11 tonnes) to the SME HQCF processors and 15% (11 tonnes) to retailers and shopping malls. Similarly the SME HQCF /millers' processors sold 36% (9.35 tonnes)of their products to the wholesalers and retailers; 24%(6.23 tonnes) to the smaller retailers, shopping malls and supermarket; 15%(3.89 tonnes) to the food industry; 5%(1.21 tonnes) to other users of HQCF; 15%(3.89 tonnes) to the HQCF millers/processors and 5%(1.21 tonnes) to flour mills.

Furthermore the wholesalers/retailers 80%(94.81 tonnes) to the retailers, shopping malls and supermarkets and the remaining 20% (5.19 tonnes) to the food industries.The HQCF millers/processors sells 35%(28.60 tonnes) of their HQCF to the flour mills,12%(8.09 tonnes) to other users of HQCF, 10% (6.74 tonnes)to the food industries, 25%(16.86 tonnes) to retails and shopping malls,8% (5.39 tonnes)to the wholesalers,10%(6.74 tonnes for export) to the SME HQCF millers. Finally the export market gets 10%, 15% and 2% from the HQCF processors and flours mills which is form of 10% HQCF incorporated into wheat flours, pasta and noodles to neighboring countries.

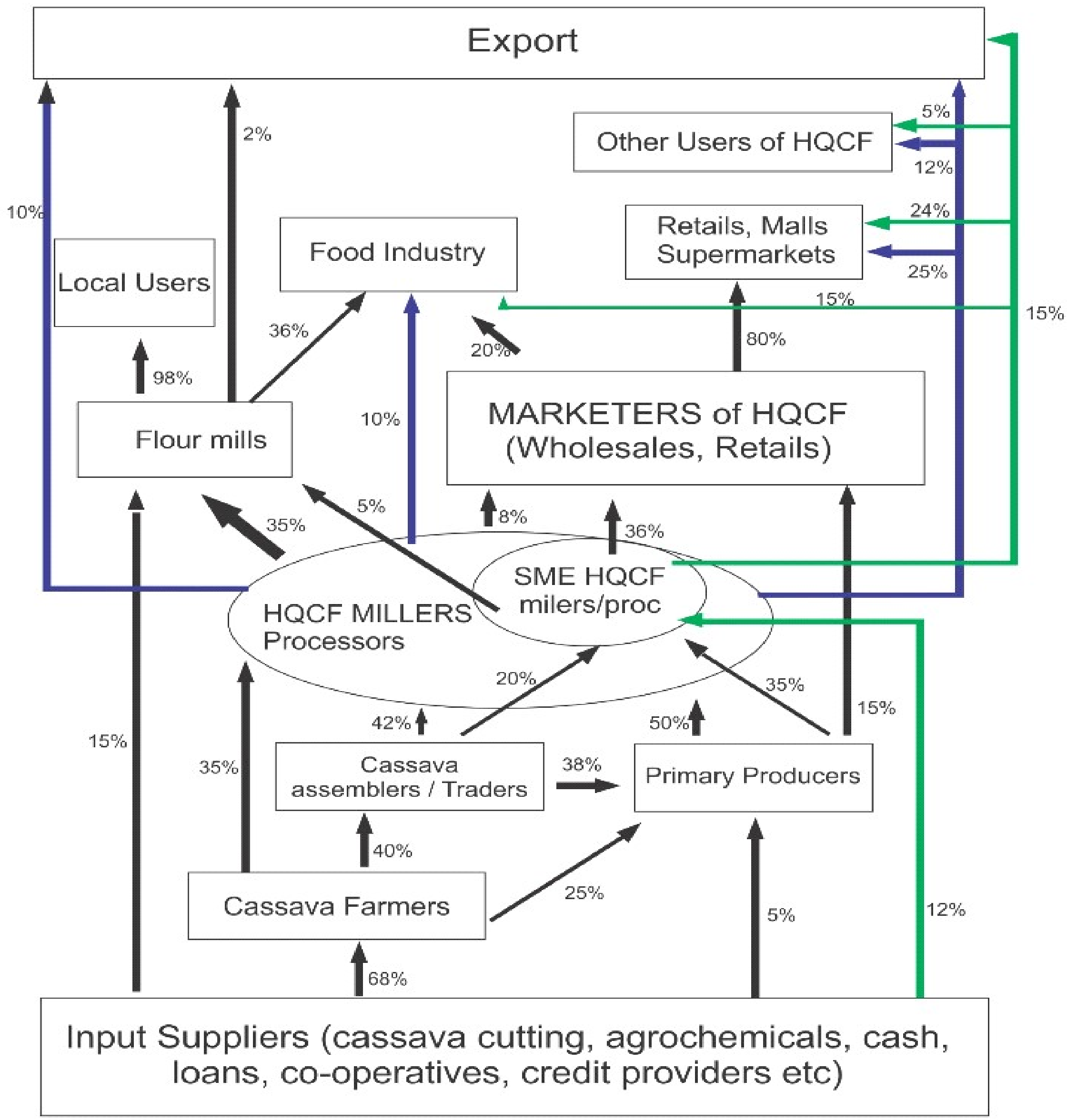


Figure 4.2: Value chain mapping and percentage product and volume flow.

**4.2.0. Cost and profits generated by the cassava farmers in the HQCF value chain.**

The cost and profits (returns) of cassava producers in the study area in Table 4.4revealed that the revenue from sale of cassava roots was ₦902,553.10/annum and this constituted 98.11% of the total revenue while the sales generated from the sale of other products processed by the farmers (garri, starch and fufu) is ₦17,409.61/annum and this constituted 1.89% of the total revenue. From the results above it reveals that the major revenue accruing to the farmers was from the sale of cassava roots. Also the Table revealed that the mean total variable cost (TVC) in cassava production is ₦70,601.01 /annum, labour was 57.58% of the TVC. The cost of cassava cuttings and herbicides were 11.39% and 31.04% of the TVC respectively. While the other costs of land clearing, agrochemicals, and harvesting constituted 8.92%, 7.13%, 4.31% and 37.22% of the TVC respectively. The implication of this results is that the labour and cost of other inputs (herbicides and cuttings) have the largest share of variable costs of producing cassava roots in the study area, this agreed with the study carried out by Enimu*et al*, (2016) where labour and cost of inputs constitutes the highest share of variable cost in cassava production. Furthermore the Table revealed that the mean total fixed cost (TFC) in cassava farming was ₦ 20,862.42/annum, the cost of capital assets made up of 79.14% of the TFC, while the cost of land and depreciation constituted 12.95% and 7.91% of the TFC respectively.

Cassava farming's mean total cost of production was calculated to be 91,463.44/ha/year, implying that the cost of capital assets was the largest fixed cost. The mean gross margin and net farm income from cassava production were ₦849,361.17/ha/year and ₦828,499.28/ha/year, respectively, confirming that cassava production was profitable in the study region. These results matched those of Ogboji (2016), who posted a gross margin of ₦127, 742.39/ha, which is clearly higher than zero.The profitability index (PI) was 0.98, indicating that for every naira gained in revenue, the cassava farmer received 98 kobo in net income. The internal rate of return (IRR) was calculated to be 90.6 %. As a result, the return on investment for every naira spent on cassava production was ₦90.60k. The better the farm business, the higher the rate of return on investment. The capital turnover (CTO) per hectare was greater than 1 (10.6), which indicated that for every naira invested per hectare of cassava productionabout ₦100.60 Kobo returned as revenue to the producers. The benefit cost ratio was 9.56 implying that the farmer earned about ₦10 on every naira invested in cassava production and indicating that it's a profitable farm enterprise. In addition the hired labour ratio revealed that the female gender were more involved in cassava production than the male.This is supported by the findings ofOnyemauwa (2012)that women participate actively in most of the agricultural cultural and processing practices

**Table: 4.4. Cost and return analysis of cassava farmers/ha/year**

| S/ No | Item | Amount(₦) | Percentage |
|---|---|---|---|
| **A** | Revenue | | % of TR |
| i | Revenue cassava roots | 902553.10 | 98.11 |
| ii | Revenue (garri,fufu) | 17409.61 | 1.89 |
| iii | Total Revenue(TR) | 919962.71 | |
| **B** | Costs | | % of TVC |
| | Variable costs | | |
| i | Cost of cassava stems | 8038.91 | 11.39 |
| ii | Cost of herbicides | 21911.90 | 31.04 |
| iii | Total cost of inputs | 29950.81 | 42.42 |
| | Costs of Labour | | |
| iv. | | | |
| v | Land clearing | 6295.82 | 8.92 |
| Vi | Planting | 5032.15 | 7.13 |
| Vii | Agro chemical application | 3042.77 | 4.31 |
| viii | Harvesting | 26279.46 | 37.22 |
| ix | Total cost of labour | 40,650.20 | 57.58 |
| X | Total variable cost | 70,601.01 | |
| **C** | Fixed costs | | % of TFC |
| i | Cost of land | 2701.77 | 12.95 |
| ii | Cost of capital assets | 16509.68 | 79.14 |
| iii | Cost of depreciation | 1,650 | 7.91 |
| iv | Total fixed cost(TFC) | 20,862.42 | |
| v | Total production cost | 91463.43 | |
| **D** | Gross margin(TR-TVC) | 849,361.17 | |
| **E** | Net farm income(NFI) | 828499.28 | |
| **F** | Benefit Cost Ratio(TR/TC) | 9.56 | |
| **G** | Profitability index(PI) | 0.98 | |
| **H** | Rate of Return on | 90.6% | |
| **I** | investment(RRI) | 10.6 | |
| | Capital Turn Over(CTO) | | |
| **J** | Hired labour Ratio | 10:12 | |
| **K** | Mean Output | 31.43 tons/year | |

### 4.2.2. Cost and profits generated by the HQCF processors in the value chain

The cost and profit (return) for the HQCF processors shown in Table 4.5, revealed that the mean total revenue/year (TR) from HQCF processing was ₦3,340,230:77/ year. The revenues from the sale of HQCF, animal feeds (which comprises of grits, unsuitable cakes and cassava) and cassava peels were ₦2,965,384:62, ₦363,957:69and ₦10,888:46 respectively and these constituted 88.78%, 10.90% and 0.32% of the TR respectively. The result revealed that a highest proportion of the revenues of the HQCF processors was derived from the sale of HQCF. The mean total variable cost (TVC) in HQCF processing was ₦71,692.02. The cost of alternate source of power, cost of cassava roots, cost of power and labour were 72.78%, 18.08%, 7.35% and 1.79% of the TVC respectively. The results informed that the cost of alternate source of power was the major variable cost in HQCF processing, followed by the cost of cassava roots.These results are consistent with those of Lamboll*et al*, (2017) and Marchant*et al*, (2015), who discovered that HQCF production has lower profit margins than wheat flour milling due to higher energy costs.

The Table also revealed that the mean total fixed cost (TFC) for HQCF processing was ₦2,195,249.98, being the cost of machines for milling, drying, dewatering, grating, peeling and chirping and constituted 47.32%, 31.37%, 10.56%, 7.71%, 7.02% and 2.02% respectively of the TFC in HQCF processing. The mean total cost of HQCF production was ₦ 2,266,942.00, which indicates that initial capital investment in HQCF processing is very high conforming to Manu, (2017) who found out that HQCF requires high start-up capital. Furthermore the mean gross margin and the net processing income from HQCF processing were ₦46,028,307.98 and ₦ 43,761,365.97 respectively pointing out that HQCF manufacturing in the area of study was profitable. These results matched those of Manu (2017), which also found out that HQCF production was profitable in southern Ghana. The profitability Index (PI) was 0.35, which indicated that for each naira earned as revenue, 35 kobo accrued to HQCF processor as net income. The rate of return on investment (IRR) was estimated as 50.51%. Therefore, for each naira invested in HQCF production ₦50.51k was the return on investment. The greater the rate of return on investment the better the HQCF enterprise. This conforms to Ayoola *et al* (2016) that the rate of return of HQCF processors was 0.32 and positive, suggesting that high quality cassava flour processors are in stage II (rational phase) of their production cycle, with performance increasing at a slower rate than quantity input usage. This also means that increasing the significant inputs by one unit would result in a 0.32 % increase in HQCF production. The capital turnover (CTO) per tonne was greater than 1 (1.52), indicating that for every naira invested per tonne of HQCF production about ₦10.52 Kobo returned as revenue to the processors. The benefit cost ratio was 1.52 implying that the HQCF processor earned about ₦10 on every naira invested in HQCF production and indicating that it was a profitable enterprise, (Ogboji, 2017, Manu, 2017).The hired labour ratio reveals that the female gender were more involved in the peeling, washing and slicing units while the male gender dominated the bagging and sealing units of the HQCF production.

**Table: 4.5. Cost and return analysis of HQCF processors/tonne/year**

| S/No | Item | Amount(₦) | Percentage |
|---|---|---|---|
| **A** | **Revenue** | | % of TR |
| I | Revenue (HQCF) | 2,965,384:62 | 88.78 |
| Ii | Revenue (waste A animal feeds) | 363,957:69 | 10.90 |
| Iii | Revenue (waste B cassava peels) | 10,888:46 | 0.32 |
| Iv | Total revenue | 3,340,230:77 | |
| **B** | **Cost** | | % of VC |
| | **Bi. Variable cost** | | |
| | Cost of power | 5,269:71 | 7.35 |
| I | Cost of alternate source of power | 52,180 | 72.78 |
| ii | Cost of cassava roots | 12,961:54 | 18.08 |
| Iii | Cost of labour | 1,280:77 | 1.79 |
| Iv | Total variable cost(TVC) | 71,692:02 | |
| | **Bii. Fixed costs (machinery)** | | % of FC |
| I | Peeling machines | 154,080:80 | 7.02 |
| Ii | Grating machine | 169,325:00 | 7.71 |
| Iii | Chipping machines | 44,423:08 | 2.02 |
| Iv | Dewatering machines | 231,828:80 | 10.56 |
| V | Drying machine | 688,611:50 | 31.37 |
| Vi | Milling machine | 906,980:80 | 47.32 |
| vii | Total fixed cost | 2,195,249:98 | |
| viii | **Total production cost** | 2,266,942:00 | |
| C | **Gross margin** | 3,268,538:15 | |
| D | **Net processing income** | 1,144,980:79 | |
| E | **Benefit Cost Ratio** | 1.52 | |
| F | **Profitability index(PI)** | 0.35 | |
| G | **Rate of Return on** | 50.51% | |
| H | **investment(RRI)** | 1.52 | |
| | **Capital Turn Over(CTO)** | | |
| I | Hired Labour Ratio in the HQCF Processing(Men : Women) | | |
| I | Peeling | 0:7 | |
| Ii | Washing | 0:4 | |
| Iii | Slicing | 0:3 | |
| Iv | Bagging | 4:2 | |
| V | Sealing | 3:1 | |
| J | Mean quantity of HQCF tons/year | 4.88 | |

### 4.2.3. Cost and profits generated by the HQCF marketers in the value chain

The results for the cost and return assessment for the HQCF marketers shown in Table 4.6, the mean total revenue/year (TR) from HQCF marketing was ₦ 597724.10. The mean total marketing cost (TMC) ₦589,474.22. The costs of purchase, transportation, shopping facilities and salary payments were 95.56%, 2, 28%, 1.73% and 0.43% of the TMC respectively. The results above reveals that the cost of purchase of HQCF had the highest proportion of investing in HQCF marketing. The mean marketing margin (MM) from is HQCF marketing was ₦8,249.88 which indicated that venturing into HQCF marketing was profitable which corroborates the findings of Ogboji, (2017) which HQCF marketers had positive gross margin of ₦20,365.46 per tonne of HQCF marketed. The gender ratio reveals that more hired female labour were involved in marketing of HQCF than the male, (Ogboji, 2017, Onyemauwa, 2012).

**Table: 4.6. Cost and return analysis of HQCF marketers/tonne/year**

| S/No | Item | Amount(₦) | Percentage |
|---|---|---|---|
| A | Revenue | | % of TR |
| I | Sales (TR) | 597,724.10 | 100 |
| B | Variable cost | | |
| I. | Purchase of HQCF | 563,327.60 | 95.56 |
| I. | Cost of transportation | 13,444.83 | 2.28 |
| I. | Rents(shop facilities) | 2,514.29 | 0.43 |
| /. | Salaries of staff | 10,187.50 | 1.73 |
| /. | Total marketing cost(TMC) | 589,474.22 | |
| C | Market Margin | 8,249.88 | |
| D | Hired labour Gender ratio(Men to Women) | 10:45 | |

**4.2.4. Factors influencing returns of cassava production, HQCF production and marketing margin in HQCF marketing.**

#### 4.2.4.1. Factors influencing returns on cassava production

The linear functional form was carefully selected as the leading equation because it had the highest $R^2$ value of 58 percent, the most critical variables, and the highest F value of the three functional forms used (Linear, Semi-Log, and Double Log). The factors that affect cassava farmers' income in the study area are shown in Table 4.7. The adjusted $R^2$ was 0.50, indicating that the explanatory variables' combined actions explained 50% of the observed variations in cassava farmers' returns in the study area. At the 5% level of significance, the F-value (12.93) was important, indicating that the model was well-fitting and that the cumulative effects of all independent variable on the returns of the cassava farmers studied were significantly greater than zero. Just five of the variables in the regression table were significant, with the coefficient of total cost of labor being positive and statistically significant at 1%, implying that the higher the cost of labor, the larger the farmers benefit. Also with a positive coefficient (=0.480), which meant that a unit rise in labor costs would result in a 48 percent increase in returns. This may be attributable to the fact that cassava farmers in the study area employed hired labor, which in congruence with the results of Obayelu*et al*,(2015), who affirmed that a rise in hired labor can only mean farm expansion. Hired labor, on the other hand, can only be used before the marginal product reaches the minimum wage, so it can't be used indefinitely.

Also significant at 1% with coefficient ($\beta$=0.105) was farm size, which implied that increasing farm size would increase cassava farmers returns. Similarly the coefficient of total costs of inputs was positive and significant at 10% with positive co efficient ($\beta$= 0.030) which indicated a positive relationship between the variable and returns from the production of cassava, a unit increase in cost of input will positively influence cassava farmers return in the study area by 3%, which indicated that these variables are positive determinants of returns for cassava production. Thus agreeing with Ogundari and Ojo (2006), Bassey*et al*, (2018) that an increase in the normalized profit of cassava would benefit from a rise in the price of inputs per unit with a pragmatic coefficients, *and vice versa*. In contrast the coefficient of cost of capital asset owned was negative and significant at 5% with negative co efficient (β= -0.030) , which indicated an inverse relationship with returns ,which may further imply that acquiring capital assets by the cassava farmers in the study area will inversely affects the returns. According to Onoja*et al*,(2012)., the negative sign coefficient value for the capital variable could indicate that the opportunity cost of capital invested in the cocoa industry was becoming too high, and that excessive expenditures were being incurred without corresponding returns on investment.

**Table 4.7: Significant factors influencing returns from cassava production.**

| Variables | Coefficient | Standard error | t-value | P value |
|---|---|---|---|---|
| Total cost of labour | $0.480^{***}$ | 0.151 | 4.99 | 0.000 |
| Farm size | $0.105^{***}$ | 0.018 | 5.83 | 0.000 |
| Farming experience | 0.012 | 0.017 | 0.71 | 0.473 |
| Total cost of farm inputs | $0.030^{*}$ | 0.170 | 0.182 | 0.069 |
| Cost of capital assets | $-0.030^{**}$ | 0.171 | -2.31 | 0.021 |
| Household size | 0.002 | 0.010 | 0.20 | 0.852 |
| Constant | 0.008 | 0.011 | 0.72 | 0.469 |

$R^2$=0.52, Adj$R^2$=0.50, F value=12.93, ***=significant at 1%, **= significant at 5%, * significant at 10%

### 4.2.6. Chi-square of contingency testfor factors influencing net returns of HQCF processors

Thechi-square of contingency **test** for factors influencing net returns of HQCF processors and independent variables of the HQCF processors is presented in Table 4.8. Four variables were found to be significant. These variables are years of experience ($\chi^2$ = 12.57), and cost of capital assets ($\chi^2$ = 12.44) were significant at 5%. While cost of alternate source of electricity ($\chi^2$ = 23.33) and cost of cassava roots ($\chi^2$ = 23.76) weresignificant at 1%. These results imply that expertise makes the HQCF processors more profitable, as the years of operating a HQCF mills increases, the processors develop more practical means and mode of operation which enhanced their output which results into more net income accrued. In addition significant cost of capital assets indicated that the more well equipped the processors, with all the necessary machineries and equipment, the more the output and hence more income will be generated by the HQCF processors, this is consistent with Amaza*et al,* (2016) results that cost of capital was notable factor in affecting production of cassava into HQCF.

Furthermore the result indicated that electricity was one of the major requirements in processing of HQCF, constant and available electricity will enhance their production processes. This conformed to the findings of Marchant*et al*, (2015) that the HQCF processors generate their own electricity with diesel generators which affected production of HQCF significantly. Net returns from processing of cassava into HQCF are dependent on the output of HQCF processors per year. The more the output the more the net returns for the HQCF processors.

Furthermore this result is close to the research findings by Adeniyi (2015) and Yee*et al.* (2012) who found that capital,years of experience, education, cost of fueling (alternate source of electricity) were positive and significant effects on HQCF output.

**Table 4.8: Results ofchi-square of contingency testfor factors influencing net returns of HQCF processors**

| Variables | Chi square value | df |
|---|---|---|
| Years of education | 22.33*** | 5 |
| Years of experience | 12.57** | 5 |
| Cost of electricity | 0.20 | 5 |
| Cost of capital asset | 12.44** | 5 |
| Cost of alternate source of electricity | 23.33*** | 5 |
| Cost of cassava root | 23.76*** | 5 |

***=significant at 1%, **= significant at 5%, * significant at 10%

### 4.2.7 Chi-square of contingency testfor factors influencing net returns of HQCF marketers.

The Chi-square of contingency testfor factors influencing net returns of HQCF marketers and independent variables of the HQCF marketers is presented in Table 4.9. Years of experience ($\chi^2$ = 24.33), cost of HQCF bought ($\chi^2$ = 25.57) and transportation cost ($\chi^2$ = 21.22) were significant at 1%. Salaries paid to workers by HQCF marketers was significant at 5%These results imply that higher years of experience of the HQCF marketers results into higher margin from HQCF marketing. This result corroborated with the findings of Mugonola, (2017) that year of marketing experience was significant determinant of market margin. In addition, cost of HQCF bought indicated that the higher the investment of the HQCF marketers in stocking HQCF, the more the margin from HQCF marketing. Also, the result indicated that as transportation cost increases, the margin from HQCF marketing also increases. This can be explained by the fact that transportation cost significantly affects marketing costs. This result is consistent with Mugonola's (2017)resultswhich found that paying for the transporting of refined cassava products raised the profit margin for the distribution of processed cassava products. Finally, the significance of salaries paid to workers reveals that workers were maximally utilized by the HQCF marketers so as to ensure that maximum margin were earned from HQCF

**Table 4.9: Results ofchi-square of contingency testfor factors influencing net returns of HQCF marketers**

| Variables | Chi square value | df . |
|---|---|---|
| Years of education | 0.237 | 5 |
| Years of existence | 24.33*** | 5 |
| Cost of HQCF bought | 25.57*** | 5 |
| Transportation cost | 21.22*** | 5 |
| Salaries | 12.43** | 5 |
| Age | 0.171 | 5 |

***=significant at 1%, **= significant at 5%, * significant at 10%

### 4.3.0.Competitiveness and comparative advantage in HQCF vale chain.

The aim of this objective was to assess the competitiveness and comparative advantage of cassava production, HQCF production alongside HQCF marketing in the study area.

### 4.3.1. Competitiveness of cassava in high quality cassava flour value chain.

The competitiveness in production of cassava in the study area as reported in Table 4.10. Cassava farmers made a private profit of ₦849,361.67 per hectare, with a private cost ratio (PCR) of 0.17. The outcome revealed that cassava farmers made a profit. At market rates, private profits are an indicator of investment competitiveness. This meant that, given current technology, input and output costs, and policies, cassava production was competitive. Furthermore, cassava farmers made financial progress and can grow cassava without government assistance. The results were consistent with those of Ogboji, (2016) and Adesiyan*et al*, (2018), who found that cassava farmers had positive private benefit, indicating that farmers earn returns on their investments.

**Table 4.10: PAM results for competitiveness of cassava production/ha/year**

| | Revenue ₦ | Cost ₦ | | Private Profits ₦ | Private cost ratio(PCR) |
|---|---|---|---|---|---|
| | | Tradable input cost | Domestic factor cost | | |
| Private prices | 919962.71 | 29950.81 | 40650.20 | 849361.67 | 0.107 |

### 4.3.2. Competitiveness of HQCF in the value chain.

The competitiveness of HQCF output in the study area, with private profitability of HQCF at ₦697,830 per tonne and a private cost ratio (PCR) of 0.29 less than one as shown in Table 4.11. The outcome showed that the HQCF processors' private profits were positive. This meant that, given current technology, input and output costs, and current policies, HQCF production was competitive. In addition, the HQCF processors were making money and could export HQCF without government assistance. The results were consistent with those of Ogboji (2016), who found that processors received a higher return with positive private benefit in her research.

**Table 4.11: PAM results for competitiveness of HQCF production/tonne/year**

| | Revenue ₦ | Cost ₦ | | Private Profits ₦ | Private cost ratio(PCR) |
|---|---|---|---|---|---|
| | | Tradable input cost | Domestic factor cost | | |
| Private prices | 3,610,000 | 716,920.02 | 2,195,249.98 | 697,830. | 0.029 |

### 4.3.3. Competitiveness of HQCF marketing in the value chain.

Competitiveness of marketing of HQCF in the study area as shown in Table 4.12 indicated that HQCF marketers' private profitability was a positive, ₦8,249.88 per tonne and a private cost ratio (PCR) of 0.39, which was lower than one. The findings revealed that the HQCF marketers' private profits were positive, supporting Ogboji's (2016) assertion that HQCF marketers are earning returns, implying that potential expansion is assured. Given current technology, input and output costs, and current policies, this meant that HQCF marketing was competitive. In addition, the HQCF marketers made a profit and were able to recoup the costs of domestic factors and also sustain production while still being competitive.

### 4.3.4. Comparative advantage of cassava production in HQCF value chain

Producing cassava in the study area had social profitability of ₦945,243.65, which was positive, implying that farmers producing cassava in the study area had a comparative edge in the cultivation of cassava, which was further validated by domestic resource cost (DRC) 0.045, which is less than one, Table 4.13**.** The results were in consonant with that of Adesiyan*et al.* (2018), whose results admitted that cassava production had a comparative advantage.

**Table 4.12: PAM results for competitiveness of marketing of HQCF /tonne/year**

| | Revenue ₦ | Cost ₦ | | Private Profits ₦ | Private cost ratio(PCR) |
|---|---|---|---|---|---|
| | | Tradable input cost | Domestic factor cost | | |
| Private prices | 57724.10 | 563327.60 | 26146.62 | 8249.88 | 0.393 |

**Table 4.13: PAM results for comparative advantage in cassava production/ha/year**

| | Revenue ₦ | Cost ₦ | | Social Profits ₦ | Domestic Resource Cost |
|---|---|---|---|---|---|
| | | Tradable input cost | Domestic factor cost | | |
| Social prices | 1029982.91 | 39974.96 | 44764.30 | 945,243.65 | 0.045 |

### 4.3.5. Comparative advantage of HQCF processing in HQCF value chain

The social profitability of HQCF processors (Table 4.14) was ₦782,334 and positive, implying that HQCF processors have a competitive advantage in the output of HQCF, which is further supported by the domestic resource cost (DRC) of 0.746, which is less than one. The social positive value was very high, implying that encouraging the development of HQCF would aid economic growth. Pearson *et al*, (2003), and Abdul-Qadir*et al*, (2005) found similar results.

### 4.3.6 Comparative advantage of HQCF marketing in HQCF value chain

HQCF marketers had a Social profitability of ₦206,927.68 which was positive,further confirmed by domestic resource cost (DRC) 0.153 which was below one, as revealed in Table 4.15, which implied that the HQCF marketers has a comparative advantage in marketing of HQCF also in line with the findings Ogboji, (2016) that the positive social profit of HQCF marketers indicated that HQCF marketing stage of the value chain had comparative advantage.

**Table 4. 14: PAM results for comparative advantage of HQCF production/tonne/year**

| | Revenue ₦ | Cost ₦ | | Social Profits ₦ | Domestic Resouce cost |
|---|---|---|---|---|---|
| | | Tradable input cost | Domestic factor cost | | |
| Social prices | 3,902,625 | 818,031.02 | 2,302,259.98 | 782,334 | 0.746 |

**Table 4.15: PAM results for Comparative advantage of HQCF marketing/tonne**

| | Revenue | Cost ₦ | | Social Profits ₦ | Domestic Resource Cost |
|---|---|---|---|---|---|
| | | Tradable input cost | Domestic factor cost | | |
| Social prices | 898823.20 | 654538.70 | 37356.82 | 206,927.68 | 0.153 |

### 4.4.0. Transfers and impact of government policies on HQCF value chain

The aim of this objective was to measure the effect of policies such as taxes, subsidies on the production of cassava, HQCF production and marketing of HQCF

### 4.4.1. Transfers and impact of government policies on cassava production:

Cassava development had a negative output divergence of -110020.20 as shown in Table 4.16. This meant that the government's current production policies were affecting cassava growers. The tradable input transition is the gap in between the cost of marketable inputs in private (real market) prices and productivity (social) prices, or (J=B-F). Cassava output input divergence was -10024.15, according to table 22. This meant that cassava inputs were subject to taxation.The negative net transfer of cassava production was -95881.96, implying that the overall impact of distortion in policies and/or emporium distortion lessened the cassava growers' profit margins, which is consistent with Ogboji's (2016) findings that producers were not affected by government policy intervention.

### 4.4.2. Transfers and impact of government policies on HQCF production:

Transfers (output, input and net) were used to assess the impact of government policies. The production transition is described as the gap in between the private (real market) and social (social) market values of sales, or (I=A-E). Results from Table 4.17 which indicated HQCF development had a negative performance divergence of -292,625 percent. This meant that the government's current output policies were reducing the profitability of HQCF processors.The tradable input transition is the gap in between the market value of marketable inputs in private (real market) prices and productivity (social) prices, or (J=B-F). Table 23 revealed that the HQCF output input divergence was -101111. This meant that the inputs used to make HQCF were taxed. The net impact of distortion policies and/or market failure decreased profitability of HQCF processors, resulting in a negative net transfer of HQCF output of -84,504, contradicting the findings. According to Ogboji (2016), the government's new production policies improved the profitability level of HQCF producers

**Table 4.16.PAM results fortransfers and influence of government policies on cassava production.**

| | Output Transfer ₦ | Tradable Input Transfer₦ | Domestic Factor Transfer₦ | Net Transfer₦ |
|---|---|---|---|---|
| Divergence | -110020.020 | -10024.15 | -4114.40 | -95881.96 |

**Table 4.17.PAM results for transfers and influence of government policies on HQCF Production.**

| | Output Transfer₦ | Tradable Input Transfer₦ | Domestic Factor Transfer₦ | Net Transfer₦ |
|---|---|---|---|---|
| Divergence | -292,625 | -101111 | -107,010 | -84,504 |

### 4.4.3 Assessment of transfers and impact of government policies on HQCF marketing:

Transfers (output, input and net) were used to assess the impact of government policies. The production transition is described as the gap in between the private (real market) and social (social) market values of sales, or (I=A-E). Outcomes shown in Table 4.18 indicated that HQCF marketing had a -301099.10 negative production divergence. This suggested that the government's current production policies were reducing the profitability of HQCF marketers. The gap between both the market value of tradable input variables in private (real market) prices and productivity (social) costs, or (J=B-F), is known as the tradable input transfer. Table 4.23 revealed that the HQCF marketing input divergence was -91211.10. This meant that HQCF marketers had to pay a tax on their inputs. The negative net transfer of HQCF marketing was -198677.80, implying that the overall outcome of diffraction policies and/or market distortion reduced HQCF marketers' profitability, which was consistent with Ogboji's (2016) findings that current production policies reduced HQCF marketers' profit margins.

**Table 4.18.PAM results fortransfers and influenceof government policies on HQCF marketing.**

| | Output Transfer ₦ | Tradable Input Transfer₦ | Domestic Factor Transfer₦ | Net Transfer₦ |
|---|---|---|---|---|
| Divergence | -301099.10 | -91211.10 | -11210.20 | -198677.80 |

### 4.4.4 Protection coefficients in cassava production

The protection quantum or coefficient using the PAM coefficients for cassava production was calculated using the nominal protection coefficient on output (NPCO), nominal protection coefficient on input (NPCI), effective protection coefficient (EPC), profitability coefficient (PC), and producer subsidy ratio (SRP).Table 4.19 showed that cassava producers were not covered by policy (NPCO = 0.89), a value less than one, suggesting that existing policies did not protect cassava producers, in line with Adesiyan*et al*, (2018), who said that government intervention reduced market prices below international prices.. Table 4.19 showed that the government subsidized the cost of tradable inputs for these commodities' production (NPCI = 0.75), implying that government policies subsidized the cost of tradable inputs for these commodities' production. The input divergences in cassava output were induced by either distorted government policies or market inefficiencies, confirming the findings of Adesiyan*et al*,(2 018) and Ogboji, (2016), who found that the NPCI for cassava was less than unity, implying that government policies subsidized the cost of tradable inputs for the creation of these commodities and farmers were not protected.

The EPC value for cassava production was 0.89 (Table 4.19) less than 1, implying that the producers of cassava have ceased to be covered by policy intervention on value added operation/activities which correlated with the findings of Adesiyan*et al*, (2018), who found that producers were not shielded by government policy and faced implicit tax. According to Table 4.19, the PC of cassava production (PC = 0.89) is less than one. This meant that policies took away 95 percent of cassava producers' profits, and that producers with international trade had less opportunities. As a result, a PC value greater than zero refutes Adesiyan*et al*, (2018), who stated that global trading would improve producers' prospects. Cassava had a negative value (SRP = -0.09) in Table 4.19 indicating that there was a net transfer from cassava farmers to society and taxpayers. As supported by Adesiyan*et al*, (2018), who found that the SRP value indicated that the producers had negative value, representing a tax on the system, 9 percent of the divergence was used to subsidize other products as a consequence of policy distortions.

**Table 4.19. Overview of transfers and effects of policy indicators on production of cassava**

| **Ratio indicators** | **Values** |
|---|---|
| Nominal Protection Coefficient on Output (NPCO) | 0.89 |
| Nominal Protection Coefficient on Input (NPCI) | 0.75 |
| Effective Protection Coefficient (EPC) | 0.89 |
| Subsidy Ratio to Producers (SRP) | -0.09 |
| Profitability coefficient (PC) | 0.89 |

### 4.4.5 Protection coefficients in HQCF production

Table4.20 showed that HQCF producers were also not supported by policy (NPCO = 0.93), implying a tacit tax on HQCF output, which contradicted Ogboji's (2016) findings (NPCO = 2.9). Table 4.20 (NPCI = 0.88) also showed that policy subsidized tradable inputs used in HQCF production, contradicting Ogboji's (2016) findings with NPCI greater than one, which showed that market prices of inputs are higher than social prices.

The EPC for HQCF output was 0.94 (Table 4.20), indicating that policy interference in value added activities did not benefit producers.Table 4.20 also revealed that the PC of HQCF production was 0.89. This meant that Policies diverted 79% of income away from the production of HQCF processors. SRP is a percentage of overall social revenue that analyzes a country's overall policy transfers to producers. The SRP was negative which signifies a capital redirection from the manufacturer to public. Table 4.20 revealed that HQCF processors had a negative value (SRP = -0.02), indicating a net transfer from HQCF processors to society and taxpayers. This meant that 99 % of the divergence caused by policy inconsistencies was used to subsidize other goods.

### 4.4.6 Protection coefficients in HQCF marketing

Table 4.21 revealed that HQCF marketers were also not shielded by policy (NPCO = 0.67), indicating a tax inferred on HQCF marketers, which was consistent with Ogboji's (2016) findings, which revealed an NPCO less than one, indicating the existence of taxes (tariffs). Table 4.21 (NPCI = 0.86) also showed the policy subsidized tradable inputs used in HQCF marketing. The EPC value for HQCF marketing was 0.07 (Table 4.21), suggesting that policy interference on value added processes did not shield marketers. Table 4.21 further revealed that the PC of HQCF was 0.76. This meant that policies took 24 % of HQCF's revenue away from the marketers. SRP's negative value denotes a net shift from advertisers to society and taxpayers. Table 4.21 indicated that HQCF marketing had a negative value (SRP = -0.22), suggesting a net transfer from HQCF marketers to society and taxpayers. This suggested that 22% of the divergence was used to subsidize other goods as a consequence of policy distortions.

**Table 4.20. Overview of transfers and effects of policy indicators on HQCF production**

| Ratio indicators | Values |
|---|---|
| Nominal Protection Coefficient on Output (NPCO) | 0.93 |
| Nominal Protection Coefficient on Input (NPCI) | 0.88 |
| Effective Protection Coefficient (EPC) | 0.94 |
| Subsidy Ratio to Producers (SRP) | -0.02 |
| Profitability coefficient (PC) | 0.89 |

.**Table 4.21. Overview of transfers and effects of policy indicators on HQCF marketing**

| **Ratio indicators** | **Values** |
|---|---|
| Nominal Protection Coefficient on Output (NPCO) | 0.64 |
| Nominal Protection Coefficient on Input (NPCI) | 0.86 |
| Effective Protection Coefficient (EPC) | 0.07 |
| Subsidy Ratio to Producers (SRP) | -0.22 |
| Profitability coefficient (PC) | 0.04 |

### 4.5.0. Sensitivity analysis

PAM is a fixed model that does not take into account amendments in policy specifications or productive capacity (Akter et al, 2003,). Sensitivity analysis determines how different values of an independent variable affect a particular dependent variable under a given set of assumptions. Following Liverpool *et al.*2009, Adeoye, 2013 and Oluyole, 2017, Sensitivity analysis was carried out under the following scenarios

1. changes in farm level yield (production) by ± 10%; ±20%; ±40%
2. changes in exchange rates by ± 10%; ±20%; ±40%
3. changes in tariff rates by ±10%; ±20%; ±40%

The scenarios were chosen based on the information on yieldprice, exchange rate and tariffrates as observed by the national bureau of statistics, Nigeria ports authority and agricultural development project in the south west zone

### 4.5.1. Sensitivity analysis for cassava production

Sensitivity evaluations were performed at a 10% level to appraise the aftereffect of changes in demand, rate of exchange, competitiveness, and policy indicators. Table 4.22 shows the effects of sensitivity analyses. According to the table, a 10% increase in cassava performance improved the study area's productivity and comparative advantage in cassava development. The PCR, DRC, and SCBR ratios all suggested this. While a 10% raise in the exchange rate was ineffective on the PCR, it did boost the rating of cassava production's comparative advantage, as indicated by the DRC and SCBR ratios.

### 4.5.2 Sensitivity analysis for HQCF production

At a 10% change in production, sensitivity analyses were performed to examine the impact of adjustments in tariff on competitiveness and policy indicators. The comparative advantage of processing cassava into HQCF was sensitive to the performance of the HQCF processors, according to sensitivity analyses from Table 4.23. By increasing HQCF production by 10%, the productivity and comparative advantage of processing cassava into HQCF will increase. The PCR value decreased from 0.211 to 0.162, the DRC value decreased from 0.162 to 0.130, and the SCBR ratio decreased from 3.338 to 3.320, indicating this.

The PCR value increased from 0.211 to 0.320; the DRC value increased from 0.162 to 0.210; and the SCBR value increased from 3.338 to 3.410, indicating that reducing the HQCF production by 10% reduced the productivity and comparative advantage of processing cassava into HQCF. The DRC and SCBR ratios increased from 0.162 to 0.165 and decreased from 3.338 to 3.271, respectively, as a 10% rise in tariff has no major impact on the PCR value, but it increases the competitive advantage of HQCF. The PCR was unaffected by a ten percent reduction in tariffs.

**Table 4.22: Sensitivity analysis for cassava producers in the HQCF value chain**

| | Base value | increasing cassava output by 10% | decreasing cassava output by 10% | increasing exchange rate by 10% | decreasing exchange rate by 10% |
|---|---|---|---|---|---|
| PCR | 0.107 | 0.036 | 0.056 | 0.046 | 0.046 |
| DRC | 0.045 | 0.044 | 0.047 | 0.044 | 0.046 |
| SCBR | 12.154 | 12.150 | 12.156 | 12.151 | 12.154 |
| NPCO | 0.0893 | 0.893 | 0.893 | 0.890 | 0.896 |
| NPCI | 0.749 | 0.749 | 0.749 | 0.744 | 0.740 |
| EPC | 0.898 | 0.900 | 0.890 | 0.877 | 1.000 |
| SRP | -0.093 | -0.093 | -0.094 | -0.095 | -0.090 |

**Table: 4.23: Sensitivity analysis for HQCF processors in the value chain**

| | Base value | Increasing the HQCF output by 10% | decreasing HQCF output by 10% | Increasing tariff on HQCF by 10% | decreasing tariff on HQCF by 10% |
|---|---|---|---|---|---|
| PCR | 0.029 | 0.018 | 0.032 | 0.029 | 0.029 |
| DRC | 0.746 | 0.714 | 0.794 | 0.749 | 0.754 |
| SCBR | 1.250 | 1.232 | 1.322 | 1.209 | 1.350 |
| NPCO | 0.925 | 0.925 | 0.925 | 0.907 | 0.918 |
| NPCI | 0.876 | 0.876 | 0.876 | 0.775 | 0.970 |
| EPC | 0.937 | 1.036 | 0.927 | 0.930 | 1.043 |
| SRP | -0.021 | -0.021 | -0.031 | -0.061 | -0.001 |

### 4.5.3. Sensitivity analysis for HQCF marketing

Sensitivity tests on production and tariff adjustments on competitiveness and policy indicators were conducted at a 10% level to analyze the effect of transition. Changes in marketing production and tariff on HQCF affects the competitiveness and the comparative advantage of HQCF marketing in the area of study, according to sensitivity analyses results from Table 4.24. The HQCF marketers' competitiveness was boosted by a 10% rise in marketing performance. A 10% tariff rise on HQCF had little effect on PCR, but it did boost the competitive advantage of HQCF marketers. Furthermore, a 10% tariff cut on HQCF was ineffective on the PCR, but increased the competitive edge/advantage of HQCF marketers.

**Table: 4.24:Sensitivity analysis for HQCF marketers**

| | Base value | Increasing HQCF output by 10% | decreasing HQCF output by 10% | increasing tariff on HQCF by 10% | decreasing tariff on HQCF by 10% |
|---|---|---|---|---|---|
| PCR | 0.393 | 0.363 | 0.453 | 0.393 | 0.393 |
| DRC | 0.153 | 0.143 | 0.153 | 0.143 | 0.163 |
| SCBR | 1.299 | 1.099 | 1.299 | 0.199 | 1.099 |
| NPCO | 0.064 | 0.064 | 0.044 | 0.044 | 0.114 |
| NPCI | 0.861 | 0.861 | 0.861 | 0.841 | 0.859 |
| EPC | 0.069 | 0.079 | 0.019 | 0.066 | 0.074 |
| SRP | -0.221 | -0.221 | -0.251 | -0.281 | -0.211 |

### 4.6.0 Challenges /constraints in value chain of HQCF production in the study area

### 4.6.1. Constraints/challenges to cassava production in the study area

Table 4.25 shows the topmost challenges faced by cassava farmers in the area of study. Inadequate credit accessibility (92.68 %), the lack of improved cassava varieties (86.67 %), the issue of land accessibility (81.61 %), and the high cost of agro-chemicals (57.10 %) are the most ranking obstacles to increased cassava production in the study area, according to the findings. Inadequate preparation (extension service) (15.48 %), a weak fertilizer distribution system (20.32 %), and insufficient marketing platforms were the less serious issues faced by cassava farmers (23.87 %).

Credit accessibility as a major constraint emanated from the reliance on friends and family as a major source of farm credit in the area of study. This is attributed to the fact that formal credit agencies such and banks and finance houses are not willing to give credit to the farmers due to the stringent condition attached to such credit and inability of the cassava farmers to provide the required collateral.

**Table 4.25: Constraints to cassava production in the study area**

| Constraints/Impediments | Rank | Percentage% |
|---|---|---|
| Credit accessibility | 1st | 92.18 |
| Improved cassava varieties | 2nd | 86.77 |
| Land accessibility | 3rd | 81.61 |
| High cost of agro chemicals | 4th | 57.10 |
| Inadequate marketing channels | 5th | 23.87 |
| Poor fertilizer distribution system | 6th | 20.32 |
| Inadequate training (extension service) | 7th | 15.48 |
| Inadequate storage facilities | 8th | 8.71 |

### 4.6.2. Constraints / challenges to High Quality Cassava Flour (HQCF) processors in the study area

Results showed that the main constraints in the study area's cassava tuber processing into HQCF were unavailability of improved cassava tubers (100.00%), poor transportation facilities (88.46%), high cost of agro-machineries (88.43%) and inadequate power supply (79.62%), Table 4.26. The problem of improved cassava tubers has significantly affected the quality of flour obtained by the processors. Poor transportation infrastructural facilities significantly affected the output and distribution of HQCF. Higher costs incurred through alternative power supply as result of inadequate power supply also negatively affected the production of HQCF. High costs of agro-machineries also increased the initial capital required for processing cassava tubers into HQCF.

### 4.6.3 Constraints / challenges faced by High Quality Cassava Flour (HQCF) marketers in the study area

The most prevailing challenges faced by the HQCF marketers. The results presented in Table 4.27 revealed that the major constraints were procurement of HQCF (100%), inadequate market information (88.64%), credit accessibility (84.09%) and poor transportation facilities. The less severe constraints facing HQCF marketing were inadequate marketing channels (47.73%) and inadequate storage facilities (31.82%).

**Table 4.26: Constraints to HQCF production in the study area**

| Constraints/impediments | Rank | Percentage % |
|---|---|---|
| Insufficient improved cassava tubers | 1st | 95.99 |
| Poor transportation facilities | 2nd | 88.46 |
| High cost of agro-machinery | 3rd | 88.43 |
| Inadequate power supply | 4th | 79.62 |
| Land accessibility | 5th | 76.20 |
| Inadequate marketing channels | 6th | 69.23 |
| Inadequate training | 7th | 3.58 |
| Inadequate water supply | 8th | 0.00 |

**Table 4.27: Constraints faced by HQCF marketers in the study area**

| Constraints/impediments | Rank | Percentage % |
|---|---|---|
| Procurement of HQCF | 1st | 92.18 |
| Inadequate market information | 2nd | 88.64 |
| Credit accessibility | 3rd | 84.09 |
| Poor transportation facilities | 4th | 79.55 |
| Inadequate storage facilities | 5th | 60.18 |
| Inadequate marketing channels | 6th | 52.27 |

Source field survey 2017

# CHAPTER FIVE

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.1. Summary

The study inquired into the value chain of high quality cassava flour in Nigeria, mapped out the linkages among the actors and activities, examine the profitability of HQCF, assessed the competitiveness and comparative advantage of high quality cassava flour production and effects of government policies HQCF value chain. The study was carried out among cassava farmers, HQCF processors, and HQCF marketers in south western Nigeria. Primary and secondary data were utilized. Multistage cluster sampling was utilized for the cassava producers, the HQCF processors/millers and the marketers. The mean age of farmers was 48 years, HQCF processors was 47 years and for HQCF marketers was 44 years. Most of the respondents were male and formally educated. The key stages in high quality cassava flour production were input supply, producers, processors/millers, marketers, intermediate consumers and final consumers. Key activities and functions in high quality cassava flour were input procuring, cassava production, HQCF processing and milling, and marketing. Main stakeholders/actors in the value chain were the input supplier, cassava farmers, assemblers, HQCF processors, HQCF millers and HQCF marketers. The highest contributor in value addition for the value chain of HQCF are the HQCF processors/millers while the least were the marketers.

The profitability analysis revealed that the major revenue accruing to the farmers was gotten from cassava roots sold, the labour cost and cost of inputs have the huge share of variable costs of cassava production while the cost of capital assets was the major fixed cost in cassava farming. The mean gross margin and net farm income (₦849,361.17/ha/year and ₦828,499.28/ha/year) from cassava production were high and positive. The profitability Index (PI) revealed that 98 kobo returned to cassava farmer on every naira invested as net income. The rate of return on investment (IRR), which was extrapolatedat 90.6%. Therefore, for each naira infused into production of cassava. ₦90.60k was the return gotten on investment. Furthermore the capital turnover (CTO) per hectare was greater than 1 (10.6), indicating that for every naira invested per hectare of cassava production about ₦100.60 Kobo returned as revenue to the producers. The benefit cost ratio was 9.56 implying that the farmer earns about ₦10 on every naira invested in cassava farming, all the profitability indicators result confirmed that the production of cassava in the area of study was rewarding.The cost of labor, farm size, and input costs were all significantly positive at 1%, 1%, and 10%, respectively, indicating a direct relationship between the variables and cassava output returns, while the cost of capital asset owned was significant and also negative at 5%, implying an opposite relationship.

For the HQCF processors a larger percentage of the revenues of the HQCF processors was gotten from the sale of HQCF, the cost of alternate source of power was the major variable cost in HQCF processing, followed by the cassava roots cost. The mean total cost of HQCF production was ₦2,266,942.00, which indicated that initial capital investment in HQCF processing was very high. Gross margin and the net processing income, (₦46,028,307.98/year and ₦43,761,365.97/year) for HQCF processing were positive and high, the profitability Index (PI) revealed that 35 kobo returned to HQCF processor as net income, rate of return on investment (IRR) which further implied that, for every naira invested on HQCF production ₦50.51k was the return on the investment and the capital turnover (CTO) per tonne was greater than 1. Also benefit cost ratio was 1.52 which confirmed that the manufacture of HQCF in the study area was profitable. The chi square of contingency test for factors influencing net returns of HQCF processors and independent variables of the HQCF processors revealed that three variables were found to be significant forasmuch as the p-value is below 0.05 ($p < .05$). Years of experience, cost of capital assets were significant at 5% while cost of alternate source of electricity was significant at 1%.

Cost of purchase of HQCF had the huge share of investing in HQCF marketing. The mean marketing margin (MM) for HQCF marketing was ₦8,249.88 indicating that venturing into HQCF marketing was profitable. The chi square of contingency test for factors influencing net returns of HQCF marketers and independent variables of the HQCF marketers revealed that four variables were found to be significant forasmuch as the p-value is below 0.05 ($p< .05$). Years of experience ,cost of HQCF bought and transportation cost were significant at 1% while salaries paid to workers by HQCF marketers was significant at 5%.

The PAM analysis results indicated that given the most recent technologies, cost of inputs and outputs prices and the predominant policies cassava farmers had a private profit of ₦849361.67/ha which was positive, also the private cost ratio (PCR) an indicator for competitiveness was 0.107, less than one which implied that cassava production is competitive. The competitive indicators for the HQCF processors and HQCF marketers were positive and less than one with respect to the private profits (₦43833057.99 per tonne ,₦8249.88 per tonne,) and private cost ratio (PCR),(0.029,0.0393,) respectively.Positive social profit one of the PAM comparative advantage indicators revealed that the cassava farmers, HQCF processors and HQCF marketers all had comparative edge in the producing of cassava, HQCF production and also HQCF marketing with the social values at(₦ 945,243.65 , ₦782,334, ₦206,927.68) respectively.

Measures of government protections from PAM revealed that the NPCO values (which shows how far domestic output prices differ from international benchmark prices.) for the cassava farmers (0.89), HQCF processors:(0.93) and marketers (0.64) were below one indicating that the actors were not policy protected. For the cassava farmers (0.74), HQCF processors (0.88), and HQCF marketers (0.86), the Nominal Protection Coefficient (NPCI), which shows how much domestic prices for tradable inputs differ from their social prices, was less than one, indicating the presence of subsidies. Furthermore, for cassava farmers (0.88), HQCF processors (0.94), and HQCF marketers (0.69), the Effective Protection Coefficient (EPC), which reflects the combined impacts of policy modifications / transfers having an impact on both tradable ( inputs and outputs), was all less than one, indicating that all actors were taxed more for tradable inputs than outputs. The Subsidy Ratio to Consumer (SRP) is a metric which calculates overall policy transfers of producer's as a percentage of total social revenue. It may be negative or positive. Many of the actors' SRP values were negative, indicating that all of the negative divergences were caused by policy distortions and were used to subsidize other goods. A PC less than one means that policies reroute profits away from the manufacturing sector (or inflict net taxes).All of the actors' PC values were less than one, indicating that the majority of revenues were diverted away from them.The Net Transfer (NT) was negative for all actors, indicating that the overall impact of distortion policies and/or market failure decreased the actors' profitability.

The outcome of the sensitivity analysis for cassava production showed that a 10% increase in cassava output improved cassava production's productivity and comparative advantage in the study region. The PCR, DRC, and SCBR ratios all suggested this. While a 10% upsurge in the exchange rate was ineffectual on the PCR, it did boost rating of cassava production's comparative advantage, as indicated by the DRC and SCBR ratios.

Besides this, a sensitivity analysis of HQCF processors revealed that the comparative advantage of processing cassava into HQCF is dependent on the performance of the HQCF processors. By increasing HQCF production by 10%, the productivity and comparative advantage of processing cassava into HQCF will increase. The PCR value decreased from 0.211 to 0.162, the DRC value decreased from 0.162 to 0.130, and the SCBR ratio decreased from 3.338 to 3.320, indicating this. On the other hand, lowering the HQCF production by 10% reduced the productivity and comparative advantage of processing cassava into HQCF, as shown by the PCR value increasing from 0.211 to 0.320, the DRC value increasing from 0.162 to 0.210, and the SCBR value increasing from 3.338 to 3.410. The DRC and SCBR ratios increased from 0.162 to 0.165 and decreased from 3.338 to 3.271, respectively, as a 10% rise in tariff has no major impact on the PCR value, but it increases the competitive advantage of HQCF A 10% tariff cut has no impact on PCR, but it does minimize comparative advantage, as shown by the DRC and SCBR ratios. This study appears to suggest that the efficiency of HQCF processors and the tariff structure are important factors in improving comparative edge in the manufacturing of HQCF from cassava.

Furthermore, the outcomes of a sensitivity analysis for HQCF marketing showed that shifts in marketing performance and tariffs on HQCF importation affect the study area's competitiveness and comparative advantage. The HQCF marketers' competitiveness was boosted by a 10% rise in marketing performance. A 10% tariff increase on HQCF imports was ineffectual on the PCR, but it did boost competitive strength /edge of HQCF marketers. Furthermore, a 10% tariff reduction on HQCF importation was ineffectual on PCR but increased the competitive strength/edge of the HQCF marketer.

Credit accessibility, limited access to high yielding cassava varieties due to a lack of distribution and high costs of farm inputs such as cassava cuttings and agro-chemicals has been a major bane to increased cassava output among the farmers. The situation is also aggravated by the problem of land tenure system, making land inaccessible to the cassava farmers. The major impediments in the processing of cassava tubers into HQCF in the study area were unavailability of improved cassava tubers poor transportation facilities, high cost of agro-machineries and inadequate power supply. The major constraints encountered by the HQCF marketers include insufficient supply of HQCF, inadequate market information, credit accessibility and poor transportation facilities.

## 5.2. Conclusion.

The study focused on the value chain of high quality cassava flour in south west Nigeria and established that cassava production, HQCF processing and HQCF marketing were profitable. .The cost of labour, farm capacity/size, and costs of inputs were all positive and influential factors while the cost of capital asset owned was negative and significant factor influencing profits in cassava production.

In HQCF production, years of experience, cost of capital assets, cost of alternate electricity and output were significant factors to the returns of the HQCF processors, while years of experience, cost of HQCF purchased, and cost of transportation, salaries being paid were significant factors to the returns of HQCF marketers.

Cassava production, HQCF processing and HQCF marketing all had competitive indicators to be positive; the PCR was positive and less than one implied competitiveness under prevailing technologies, prices of output and policy transfers. The cassava farmers, HQCF processors and HQCF marketers all had positive social profit which implied comparative edge in cassava production, HQCF manufacture and HQCF marketing. Transfers and impact of government policies on HQCF valuechain were evaluated using transfer indices (output, input and net) all had negative divergence for all the actors which measurement of government protections which are Nominal Protection Coefficient on Output (NPCO), Nominal Protection Coefficient (NPCI), Effective Protection Coefficient (EPC), Subsidy Ratio to Producer (SRP) ,Profitability Coefficient (PC), Net Transfer (NT), all of this meant that the actors were not shielded by regulation, that the actors were taxed, that all of the negative divergences were caused by policy distortions and were used to subsidize other goods, and that the unmitigated impact of government policies distortions and/or market shortfalls decreased the actors' profitability.

**5.3. Recommendations.**

The findings in this study and their implication, led to the following recommendations.

There is need to encourage agribusiness entrepreneur's entry into the HQCF value chain, considering the profitability ratios and returns, every reference/ node/entry point of the value chain is profitable with the production of cassava having the highest returns.

- **Encouragement of Private/Public involvement for profitable investments**:There is need to encourage agribusiness entrepreneur's entry into the HQCF value chain, considering the profitability ratios and returns, every reference/ node/entry point of the value chain is profitable with the production of cassava having the highest returns.

- **Provision of enabling incentives and environment:**There is need for government to facilitate policies that will increase HQCF production, encourage HQCF processors (in terms of reduction of import duties on the equipment and machines) and its HQCF usage.
- **Government allocation of capital budgets into the production of HCF**:There is need for government policy interventions to allocate capital budget to increase production in the value chain thus improving the national income. (The SRP values for all the actors were negative becausemuch of the negative difference was due to policy distortions, which were then used to subsidize other goods)
- **Elimination of distortions to protect investors**: In order to enhance competitiveness, the government must eliminate policy distortions and implement incentive mechanisms that protect participants in the HQCF value chain. (According to the sensitivity analysis, increasing cassava yield and HQCF processor performance improved productivity and comparative advantage.)

## 5.4 Suggestions for further study

The following areas are suggested for further study:

1. Assess of the Strengths, Weaknesses, Opportunities, and Threats of using indigenous technology to produce HQCF in Nigeria
2. Assessment of the inclusion of HQCF among the users of HQCF in south west Nigeria.

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## APPENDIX

APPENDIX I:**Adjustment of International Prices to Farm gate level (Wheat grain/flour)**

[a] International prices from World Bank Commodity Price data (Pink Sheet) for January 2018

[b] border price adjusted with the market rate to reflect realistic economic prices

[1]Lagos to Kano corridor route

[11] Lagos to Niger corridor route

| Adjustment of International Prices to Farm gate level (Wheat grain/flour) | | | | | |
|---|---|---|---|---|---|
| | Kebbi state | Kaduna state | Niger state | Nassarawa state | Ebonyi state |
| FOB US (Gulf) wheat grain/flour (£/ton)[a] | 415.00 | 415.00 | 415.00 | 415.00 | 415.00 |
| Freight and insurance(£/ton) | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 |
| CIF Lagos port(£/ton) | 445.00 | 445.00 | 445.00 | 445.00 | 445.00 |
| Exchange rate (Dec.2017) | 300 | 300 | 300 | 300 | 300 |
| Exchange rate premium (10%) [b] | 10% | 10% | 10% | 10% | 10% |
| CIF Lagos in domestic currency (₦/ton) | 195,400 | 195,400 | 195,400 | 195,400 | 195,400 |
| Weight conversion factor (kg/ton) | 1100 | 1100 | 1100 | 1100 | 1100 |
| CIF in domestic currency (₦/kg) | 195.40 | 195.40 | 195.40 | 195.40 | 195.40 |
| Transportation and handling cost to wholesale market (₦/kg) | [1]16.00 | [1]16.00 | [11]16.00 | [111]16.00 | [111]16.00 |
| Value before processing(₦/kg) | 207.40 | 206.40 | 205.40 | 205.40 | 204.40 |
| Processing conversion factor (10%) | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Cost of milling | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| Import parity price (₦/kg) | 326.54 | 319.46 | 320.92 | 316.92 | 314.85 |
| Distribution costs to farm (₦/kg) | 6.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Farm gate import parity price (₦/kg) | 332.56 | 324.48 | 322.92 | 320.25 | 318.85 |

**Appendix II**: **Functional forms of regression analysis for significant factors influencing returns from cassava production**

**Linear form is** $Y = 0.008\ (0.72) + 0.480X_1(4.99)^{***} + 0.105X_2(5.83)^{***} + 0.012X_3(0.71) + 0.030X_4(0.182)^{*} – 0.030X_5(-2.31)^{**} + 0.002X_6(0.020)$

$R^2 = 0.52$, Adj$R^2 = 0.50$, F-value = 12.93

**Log form is** $LnY = 0.018\ (0.62) + 0.580X_1(0.69) + 0.115X_2(5.83)^{***} + 0.032X_3(0.71) + 0.040X_4(0.182)^{*} – 0.034X_5(-2.31)^{**} + 0.004X_6(0.010)$

$R^2 = 0.48$, Adj$R^2 = 0.40$, F-value = 11.30

**Double Log form is** $LnY = 0.016\ (0.42) + 0.685LnX_1\ (0.54) + 0.145LnX_2\ (5.14)^{***} + 0.041LnX_3\ (0.51) + 0.040LnX_4\ (0.082) – 0.038LnX_5\ (-2.61)^{**} + 0.006LnX_6\ (0.030)$

$R^2 = 0.45$, Adj$R^2 = 0.38$, F-value = 11.12

Note: figures in parenthesis are t-values, ***=significant at 1%, **= significant at 5%, *=significant at 10%,

**Appendix III**: Questionnaire administered to cassava producers

Value Chain Analysis of High Quality Cassava Flour (HQCF) In South- West Nigeria.

Dear Respondent,

This research questionnaire is meant to elicit information for the research work titled above .The researcher is a student of the above named department. Your co-operation is highly solicited in supplying accurate and reliable information on the questions .The information is solely for research purpose and will be treated as such .Thank you.

Date____________________________ Questionnaire No: ____________________

SECTION A. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF CASSAVA PRODUCERS

| S/NO | Characteristics | Options | Response |
|---|---|---|---|
| 1 | State/Local Govt. Area: | | |
| 2 | Village: | | |
| 3 | Are you male or female: ________ | If Man=1,or woman=2 | |
| 4 | Marital group: | Not married =1, or Married =2, or separated =3, or either spouse dead=4 | |
| 5 | Age in years________ | | |
| 6 | Religion sect: _____________ | Are you a Christian =1, or muslim = 2, indgenous =3, non mentioned =4 | |
| 7 | Educational level:___________ | No formal=0, Koranic classes=1, Adult classes = 2 Primary school=3, High school =4, colleage=5. | |
| 8 | No of Years of Education: ___________ | | |
| 9 | Do you obtain any agricultural formal training | 1 2 | |

| | | | |
|---|---|---|---|
| 10 | Household size:_____________ | | |
| 11 | Which type of farming system do you engage in? | Single crop mixed crop Others | |
| 12 | If intercropping, what type of cassava production system(s) are you engaged in? ____________ | Cassava/Yam/maize/melon =1<br>Cassava/cocoyam/maize =2<br>Cassava/maize/cowpea=3 | |
| 13 | How long have you been practicing the farming system(s) indicated above? | Cassava/Yam/maize/melon ------- months/ years Cassava/cocoyam/maize ---------- months/ years Cassava/maize/cowpea ------------ months/ years | |
| 14 | What variety of casava do you grow? | | |
| 15 | What is the capacity or level of your farming operation? | Homestead/subsistence 1<br>Small scale production 2<br>Large scale production 3<br>Community project/cooperative 4 | |

16. Social Assets Membership in social groups

| | | | | | |
|---|---|---|---|---|---|
| Groups | Member(Yes/No) | Position held | Name of Group | Membership size | Indicate the activities |
| Coop society | | | | | |
| Daily contribution group | | | | | |
| Religion group | | | | | |
| Town clubs | | | | | |
| Farmers Group | | | | | |
| Others not mentioned | | | | | |

SECTION B. PRODUCTION/SYSTEM/TECHNOLOGY

17. How many times do you produce cassava in a year?

| Product | No of production in a year | Period of production (Months) | Peak Period of production | Reasons for Peak Period |
|---|---|---|---|---|
| Cassava tubers | | | | |

18. what is the capacity of land used for the cultivation of cassava in the last growing season?

| Growing seasons | Size of land cultivated (hectares) |
|---|---|
| 1st season | |
| 2nd season | |

19 Do you processes your cassava, YES NO If yes into what?

20.-HQCF , 2.-Garri, 3.- starch, 4.- fufu 5. Others( specify)____________________

21. Please provide record of inputs used in the production of cassava.

| | Quantity used 2016 | | | Unit cost | | |
|---|---|---|---|---|---|---|
| | Kg | Bag | Other measure | Kg | Bag | Other measure |
| | | | | | | |
| Cassava Stems | | | | | | |
| Herbicides | | | | | | |
| Others (specify) | | | | | | |

21. Please indicate the labour activities used in the production of cassava

| *Labour* | | | | |
|---|---|---|---|---|
| *Activities* | *Num ber* | *Hrs/ Day* <br> *Day* | *D a ys* | *Wage rate/ day* |
| *Bush clearing* | | | | |
| *Land preparation* | | | | |
| *Planting* | | | | |
| *Weeding* | | | | |
| *Agro chemicals Application* | | | | |
| | | | | |
| *Harvesting* | | | | |

| | | | | |
|---|---|---|---|---|
| *Others* | | | | |

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

| Land acquisition type | Year of acquisition/Rent | Cost |
|---|---|---|
| Land inherited | | |
| Purchased | | |
| Lease/rent | | |

23. Kindly complete the table below on source of financing on your cassava farm.

| Source of capital | Amount available for the last growing season( N) | Interest paid(%) per year |
|---|---|---|
| Personal | | |
| Friends/relatives | | |
| Cooperatives | | |
| Banks | | |
| Local money lender | | |
| Government | | |

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

| Equipment | Quantity(in number) | Date of acquisition | Cost of acquisition (N/one) | Expected life span | Cost of maintenance per week as applicable | |
|---|---|---|---|---|---|---|
| | | | | | Repair | Fuelling |
| Hoes | | | | | | |
| Cutlasses | | | | | | |
| Tractor | | | | | | |
| Plough | | | | | | |
| Bags<br>50kg bag<br>100kg bag | | | | | | |
| Harrow | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wheel barrow | | | | | | |
| Transporting vehicle (lorry/pick up) | | | | | | |
| Others: (i) | | | | | | |
| (ii) | | | | | | |
| | | | | | | |

25. Indicate equipment rented or borrowed for production in the last growing season for Cassava.

| Equipment | Quantity Rented (in number) | Duration of usage | | Cost of usage (N: K) | | Other expenses incurred ( if applicable) (N:K) | |
|---|---|---|---|---|---|---|---|
| | | No of hour/day | No of days/week | Cost / hrs | Cost/day | Repair | Fuelling |
| Hoe | | | | | | | |
| Cutlasses | | | | | | | |
| Tractor | | | | | | | |
| Knapsack sprayer | | | | | | | |
| Bags 50kg bag 100kg bag | | | | | | | |
| Basket | | | | | | | |
| Others: | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (i) | | | | | | | |
| (ii) | | | | | | | |

SECTION D. SALES AND MARKETING

26. Please indicate the quantity of cassava you produced in the last growing season.

| Produce | Peak season | | | low-season | | |
|---|---|---|---|---|---|---|
| | Quantity (kg) | Quantity ( bag) | Quantity in other local measure | Quantity (kg) | Quantity ( bag) | Quantity in other local measure |
| Cassava tubers | | | | | | |
| Cassava stems | | | | | | |
| Others: _________ | | | | | | |

27. In what forms and prices do you normally sell your cassava after harvesting?

| Forms of sales (per peak ups/bags) | Response (Yes = 1, No = 0) | Farm gate/ producers price (N: K) |
|---|---|---|
| Cassava tubers | | |
| HQCF | | |
| Garri | | |
| Others: ___________ | | |

28. Who are your suppliers (Please note Stem supplier brands)

| Suppliers | Material Supplied | Variety | Nature of supply (1-Cash, 2-Credit) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

29. Who are your buyers?

| Buyers | Item purchased? |
|---|---|
| | |
| | |
| | |

30. How do you sell off your cassava, modeof getting them to the market and who helps in selling them?

| Cassava | Location of sale (Km) to farm | | | | Transportation mode[1] | | | Sales person[2] | | Buyer[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Farm gate | Mar ket | Farm gate | Mark et | Cos t | Home stead | Farm gate | Marke t | Home stead | Far m gat e | Market |
| Cassava tuber | | | | | | | | | | | |
| HQCF | | | | | | | | | | | |
| Garri | | | | | | | | | | | |
| Fufu | | | | | | | | | | | |
| Starch | | | | | | | | | | | |
| cassava flour | | | | | | | | | | | |
| Others | | | | | | | | | | | |

*at that location if not it should be left blank*

*1: 0= on foot, 1= bicycle, 2=motor bike, 3= vehicle, 4= others specify*

*2: 0=Husband, 1=wives, 2= other household adult male , 3=other houeshold adult female, 4= male child member, = female child member*

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

SECTION E GOVERNMENT POLICY

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

32. If yes, please provide the following information

| Level [a] | Items [b] | 2016 | | |
|---|---|---|---|---|
| | | No. of time | Rate | Amount |
| | | | | |
| | | | | |
| | | | | |

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

b: 1- Equipments, 2- Income/profit, 3- Transaction, 4- fertilizer purchase, 5- Others (specify) ______________

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

34. In what form and how much do you receive in a production period from the government?.

| Level [a] | Items [b] | 2016 | | |
|---|---|---|---|---|
| | | No. of time | Rate | Amount |
| | | | | |
| | | | | |

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

b: 1- Equipments, 2- Income/profit, 3- Transaction, 4- Fertilizer purchase, 5- Others (specify) ______________

35. What are the major challenges/ constraints affecting the growth of your production?

| Constraints | Tick | Ranking | Perception of severity [b] |
|---|---|---|---|
| Land accessibility | | | |
| Improved cassava varieties | | | |
| Credit accessibility | | | |
| High costs of agro machinery | | | |
| Training | | | |
| Poor distribution system for fertilizer | | | |
| Inadequate marketing channels | | | |
| Storage facilities | | | |
| Others (specify): | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |

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

APPENDIX IV: Questionnaire administered to HQCF processors/millers

Value chain analysis of high quality cassava flour in South- west Nigeria.

Good day, this is a research question is aimed at gathering data on Value Chain Analysis high quality cassava flour in Nigeria . Please, fill it appropriately, as data collected will be used for the purpose of the study.

Questionnaire code /_____________/ Date of interview: _____________
Name of company/firm ________________

Name of interviewer:

SECTION A. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

The questions are addressed to HQCF processors as respondents.

| | | |
|---|---|---|
| 1 | State/Local Govt. Area: | |
| 2 | Village: | |
| 3 | Are you male or female: ________ | If Man=1,or woman=2 |
| 4 | Marital group: | Not married =1, or Married =2, or separated =3, or either spouse dead=4 |
| 5 | Age in years________ | |
| 6 | Religion sect: _____________ | Are you a Christian =1, or muslim = 2, indgenous =3, non mentioned =4 |
| 7 | Educational level:___________ | No formal=0, Koranic classes=1, Adult classes = 2 Primary school=3, High school =4, colleage=5. |
| 8 | No of Years of Education: ___________ | |
| 9 | Do you obtain any agricultural formal training | 1 2 |
| 10 | What is the family size:_____________ | |
| 11 | How many family members are income earners ?______ | |
| 12 | What type of processing system do you operate? ___________ | Cottage=1 ,MPC=2, SMP=3, LP=4,AMPUS=5. |
| 13 | How long have you been practicing the processing type as indicated in question 12? | |

*Cottage-30kgdry flour / day and home processing , Micro Processing Centers{MPC}- 200kg dry flour/day and has(shed,grater,1-2 press,1 modem roaster) , Small Medium Processor {SMP}can produce 1 ton/day, Large Processors {LP} can produce 5-100ton/day , Autonomous mobile processing units, {AMPUS} can produce 5mt/hr. of wet cake.

14. Social Assets Membership in social groups

| Groups | Member (Yes/No) | Position held | Name of Group | Membership size | Indicate the activities |
|---|---|---|---|---|---|
| Coop society | | | | | |
| Daily contribution group | | | | | |
| Religion group | | | | | |
| Town clubs | | | | | |
| Farmers Group | | | | | |
| Others not mentioned | | | | | |

SECTION B. PROCESSING/SYSTEM/ TECHNOLOGY

15.Do you experience peak and low periods in cassava processing? ( ) Yes ( ) No

a. When is the peak period _____________ to _____________

b. When is the low period _____________ to _____________

16. What variety of cassava do you buy for processing? Indicate…………………

17. What processing method do you use?

:1-Grating, 2- Dewatering, 3- sieving, 4- drying, 5- Grinding/Milling, 6-All of the above ,7- Others (Specify) _____________

18. Do you need to align your products to any form of registered standards or food certification?-------------------------------

19. Who are the regulators of these standards and requirements?-------------------------------
----------------

20. What are the basic conditions aiding conformity to these standards?---------------------
-----------------------

21. Do you have any problems in this regard?

| S/N | Processing Method [a] | Location [b] | Collaboration (1-Yes, 0- No) |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

a:1-Grating, 2- Dewatering, 3- sieving, 4- Frying, 5- Grinding/Milling, 6- Others (Specify) ______________

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

22. Do you have processing facilities? Yes ( ), No ( )

23. How did you acquire your processing facilities?

| Method of acquisition | Type [a] | Installation capacity (tons) | Date of acquisition | Number of machines | Cost of acquisition (N) | Rent (N) | | | Maintenance cost |
|---|---|---|---|---|---|---|---|---|---|
| Owned | | | | | | Hourly | Daily | Monthly | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Rented | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Given/ Inherited | | | | | | | | | |
| | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |

a: Metal Grater/Grating Machine-1,Dewatering Machine/ Pressers-2, Sieve-3, Frying Machine/Frying pan/Mud oven-4, Milling Machines -5, Water storage tank-6,Others (Specify) _____________

SECTION C. INPUT USED IN PROCESSING

24. How did you acquire the place you are carrying out your processing operations?

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

25. How many kilogram of cassava can your facilities process

| Time for processing | Per hour | Per cycle | Per day | Per month | Per year | Others |
|---|---|---|---|---|---|---|
| Quantity Processed | | | | | | |

26. Provide the quantity and cost of cassava tuber processed below

| 2016 | | |
|---|---|---|
| Quantity/month (kg) | Unit cost (Naira) | Cost per month |
| | | |
| | | |
| | | |

27. What type of package do you use? _____________

28. How much do you spend on packaging per unit? _____________ (Naira)

29. How many days do you operate in a week? _____________

30. What is the source of power to your processing facilities?

| S/N | TYPES [a] | COST PER CYCLE | COST PER MONTH |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

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

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

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

34. Kindly complete the table below on source of financing .

| Source of capital | Amount(N: K) | Interest paid per year | Duration |
|---|---|---|---|
| Personal | | | |
| Friends/ relatives | | | |
| Cooperatives | | | |
| Banks | | | |
| Local money lend | | | |
| Government | | | |

35. How many hours do you work in a day? ______________

36. How many workers do you have,please specify:

| | |
|---|---|
| Hours / Day | |
| Monthly pay/person | |
| Weekly pay/person | |

| | |
|---|---|
| Daily pay/ person | |
| Hourly pay/person | |

SECTION D. SALES AND MARKETING

37. In what forms and prices do you normally sell your cassava after processing?

| Forms of sale [a] | Farm gate/ producers price (N:K) |
|---|---|
| | |
| | |
| | |
| | |

a: 1= HQCF, 2= Garri 3= Fufu(Akpu), 4= Starch, others (specify): ______________

38. Please indicate the average quantity of cassava processed by you in the last production cycle?

| Products [a] | Peak season | | | low-season | | |
|---|---|---|---|---|---|---|
| | Quantity (Kg) | Unit price | Quantity in other local measure | Quantity (Kg) | Unit price | Quantity in other local measure |
| | | | | | | |
| | | | | | | |
| | | | | | | |

a: 1-HQCF , 2 -Garrri, 2-Fufu(Akpu), 3- Starch, 4-others (specify): ______________

39. Who are your suppliers?

| Suppliers | Material Supplied | Nature of supply (1-Cash, 2-Credit) |
|---|---|---|
| | | |

| | | |
|---|---|---|
| | | |
| | | |

40. Who are your buyers?

| Buyers | What do they purchase? |
|---|---|
| | |
| | |
| | |

41. Along with your processing activities, which other business processes are included within your operations?

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

a:1- HQCF production, 2- Flour milling, 3- Akara-akpu production, 4-Packing, 5-distribution, 6-others (specify) _____________

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

SECTION E. GOVERNMENT POLICY

42. Do you pay tax/levy to government any level? ( ) yes, ( ) No

43. If yes, please provide the following information

| Level [a] | Items [b] | 2016 | | |
|---|---|---|---|---|
| | | No. of time | Rate | Amount |
| | | | | |

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |

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

b: 1- Facilities, 2- Income/profit, 3- Transaction, 4- Water use, 5- Others (specify) _______________

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

44. If yes in the above question 40, in what form and how much do you receive in a year?

| Level [a] | Items [b] | 2016 | | |
|---|---|---|---|---|
| | | No. of time | Rate | Amount |
| | | | | |
| | | | | |

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

b: 1- Equipments, 2- Income/profit, 3- Transaction, 4- Fertilizer purchase, 5- Others (specify) _______________

45. What are the major challenges/ constraint affecting the growth of your processing?

| Constraints | Tick | Ranking | Perception of severity [b] |
|---|---|---|---|
| Water availability/supply | | | |
| Electric supply | | | |
| Transport/Road condition | | | |
| Storage facilities | | | |
| Improved cassava tubers | | | |
| Land accessibility | | | |
| Credit accessibility | | | |

| | | | |
|---|---|---|---|
| High costs of agro machinery | | | |
| Training | | | |
| Inadequate marketing channels | | | |
| Others (specify): | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |

b: 1- Not severe, 2- Not very severe, 3- Undecided, 4- Just severe and 5- Very severe.

APPENDIX V: Questionnaire administered to HQCF marketers

Value chain analysis of high quality cassava flour in South- west Nigeria.

Good day, this is a research question is aimed at gathering data on Value Chain Analysis high quality cassava flour in Nigeria . Please, fill it appropriately, as data collected will be used for the purpose of the study.

Questionnaire code /_____________/ Date of interview: _____________ Name of company/firm____________________

Name of interviewer:

SECTION A. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

The questions are addressed to cassava marketers/assemblers and HQCF marketers as respondents.

| | | |
|---|---|---|
| 1 | State/Local Govt. Area: | |
| 2 | Village: | |
| 3 | Are you male or female: ________ | If Man=1,or woman=2 |
| 4 | Marital group: | Not married =1, or Married =2, or separated =3, or either spouse dead=4 |
| 5 | Age in years:________ | |
| 6 | Religion sect: _____________ | Are you a Christian =1, or muslim = 2, indgenous =3, non mentioned =4 |
| 7 | Educational level:___________ | No formal=0, Koranic classes=1, Adult classes = 2 Primary school=3, High school =4, colleage=5. |
| 8 | No of Years of Education: ___________ | |
| 9 | Do you obtain any agricultural formal training | 1 2 |
| 10 | What is the family size:_____________ | |
| 11 | How many family members are income earners ?______ | |
| 12 | What type of cassava product do you sell? ___________ | Cassava tubers=1, HQCF=2, =3, Starch=4<br>Others (specify) = 6 |

| | | |
|---|---|---|
| 13 | How long have you been into marketing of HQCF/garri/fufu/starch? ------------------------------ | |
| 14 | At what level of market do you operate | Wholesale level ( ) Retail level ( ) |

15. Social Assets Membership in social groups

| Groups | Member (Yes/No) | Position held | Name of Group | Membership size | Indicate the activities |
|---|---|---|---|---|---|
| Coop society | | | | | |
| Daily contribution group | | | | | |
| Religion group | | | | | |
| Town clubs | | | | | |
| Farmers Group | | | | | |
| Others not mentioned | | | | | |

SECTION B. MARKETING /SYSTEM/ TECHNOLOGY

16. do you experience either peak or low periods in HQCF marketing? ( ) Yes ( ) No

a. When is the peak period ______________ to ______________

b. When is the low period ______________ to ______________

17. What marketing method do you use?

| S/N | Business process[a] | Location [b] | Collaboration with other stakeholders (1-Yes, 0- No) | If yes, specify |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

a:1-Hawker, 2- Neighborhood store, 3- Central Market store, 4- Stall, 5-Supermarket, 6- Others (Specify) _____________

b: 1-within locality, 2-other part of the state, 3- other part of the country, 4- Others (Specify) _____________

SECTION C. INPUT USED IN MARKETING ACTIVITIES

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

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

19. Do you have your own means of transportation? Yes ( ), No ( )

20. If yes, in what form?

| Forms | Year of acquisition | Cost of acquisition (N) | Expected life span (years) | Maintenance cost per (N) | |
|---|---|---|---|---|---|
| | | | | Repairs/month | Fuelling/week |
| Pick-up Van | | | | | |
| Lorry | | | | | |
| Motor-bike | | | | | |
| Bicycle | | | | | |
| Wheel barrow/ Truck | | | | | |

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

| Source (point of purchase). | Distance (Km or Mile) from point of purchase to | Method and cost of transportation per day. |
|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | point of sale. | | | | | | |
| | | By head (N) | Bicycle (N) | Motor-bike(N) | Pick-up Van(N) | Lorry(N) | Animal (N) |
| Farm | From farm to store ________ | | | | | | |
| Farm | From farm to local periodic market ________ | | | | | | |
| Processor | From processor to local market ________ | | | | | | |
| Processor | From processor to urban market ________ | | | | | | |
| Processor | From processor to store ________ | | | | | | |
| Whole seller | Whole seller to store ________ | | | | | | |
| Retailer | Retailer to store ________ | | | | | | |

22. Do you make use of electricity in your store/shop? Yes ( ) No ( )
23. If yes in 25, how much is your monthly electricity bill per month N____________
24. Do you use fuel (petrol/ diesel)? Yes ( ) No ( )
25. If yes in question 27, how much do you spend on fuel in a week? N
26. How many days do you operate in a week? _____________
27. Do you have access to credit? Yes ( ), No ( )------------------------

28. If yes, fill the following table accordingly….

| Source of capital | Amount(N: K) | Interest paid per year | Duration |
|---|---|---|---|
| Personal | | | |
| Friends/ relatives | | | |
| Cooperatives | | | |
| Banks | | | |
| Local money lend | | | |
| Government | | | |

29.. Do you need to align your products to any form of registered standards or food certification?-------------------------------

30. Who are the regulators of these standards and requirements?-----------------------------------------------

31. What are the basic conditions aiding conformity to these standards?-----------------------------------------

32. Do you preserve your stored produce? Yes ( ) No ( )

33. If yes, please complete the table below….

| Chemical | Quantity / volume / month | | Period of storage | Cost (N: K) |
|---|---|---|---|---|
| | Kg | Other measures | ( days/ months/ years) | Kg |
| Fungicides | | | | |
| Pesticides | | | | |
| Insecticide | | | | |
| Smoking / drying | | | | |
| Specify others<br>i | | | | |

| | | | | |
|---|---|---|---|---|
| ii | | | | |

34. How many hours do you work in a day? _____________

35. How many workers do you have, please specify:

| | Professional | | | Unskilled | | |
|---|---|---|---|---|---|---|
| | 15-year-old children and less or equal | Male adult older than15 years old | Female adult older than 15 years old | 15-year-old children and less or equal | Male adult older than15 years old | Female adult older than 15 years old |
| Number | | | | | | |
| Hour / Day | | | | | | |
| Monthly pay/person | | | | | | |
| Weekly pay/person | | | | | | |
| Daily pay/ person | | | | | | |
| Hourly pay/person | | | | | | |

SECTION D.SALES AND MARKETING

36. In what form do you buy your cassava?

| of purchase | Quantity(week [ ], month [ ]) | | | Price at local market (N) | | | Price at the central market (N) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Kg | Bag | Local measure | Kg | Bag | Local measure | Kg | Bag | Local measure |
| a tubers | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |

37. In what form do you sell your cassava?

| Forms of purchase | Quantity sold per week | | | Price (N: K) | | |
|---|---|---|---|---|---|---|
| | Kg | Bag | Local measure (N) | Per Kg | Per Bag | Per Local measure |
| Cassava tubers | | | | | | |
| HQCF | | | | | | |
| Garri | | | | | | |
| Starch | | | | | | |
| Other 1: | | | | | | |
| Other 2: | | | | | | |

38. Who are your suppliers?

| Supply side | Nature of supply (1-Cash, 2-Credit) |
|---|---|
| | |
| | |
| | |

39. Who are your buyers?

| Buy side | What do they purchase? |
|---|---|
| | |
| | |
| | |

40. Along with your marketing activities, which other business processes are included within your operations?

| SN | Business process [a] | Location [b] | Collaboration (1-Yes, |
|---|---|---|---|

| | | | 0-No) |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

a:1- Cassava production, 2-Processing, 3-Tapioca production, 4-Flour milling, 5-Packing, 6-others (specify) ______________

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

SECTION E. GOVERNMENT POLICY

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

42. If yes, please provide the following information

| Level [a] | Items [b] | 2016 | | |
|---|---|---|---|---|
| | | No. of time | Rate | Amount |
| | | | | |
| | | | | |
| | | | | |

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

b: 1- Facilities, 2- Income/profit, 3- Transaction, 4- Water use, 5- Others (specify) ______________

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

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

| Level [a] | Items [b] | 2016 | | |
|---|---|---|---|---|
| | | No. of time | Rate | Amount |
| | | | | |

| | | | | |
|---|---|---|---|---|
| | | | | |

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

b: 1- Equipments, 2- Income/profit, 3- Transaction, 4- Fertilizer purchase, 5- Others (specify) ______________

45. What are the major challenges/ constraint affecting the growth of your marketing?

| Constraints | Tick | Ranking | Perception of severity [b] |
|---|---|---|---|
| Inadequate marketing channels | | | |
| Market information | | | |
| Transport/Road condition | | | |
| Storage facilities | | | |
| Improved cassava tubers | | | |
| Land accessibility | | | |
| Credit accessibility | | | |
| Product supply/ quality | | | |
| Training | | | |
| Others (specify): | | | |

b: 1- Not severe, 2- Not very severe, 3- Undecided, 4- Just severe and 5- Very severe. +