PROFITABILITY ANALYSIS OF PROCESSING CASSAVA INTO FUFU IN AGUATA LOCAL GOVERNMENT AREA OF ANAMBRA STATE, NIGERIA

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A PROJECT WORK SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION SERVICES, FACULY OF AGRICULTURE, UNIVERSITY OF BENIN, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELOR DEGREE (B.AGRIC) (OPTION; AGRICULTURAL ECONOMICS AND EXTENSION SERVICES).

JULY, 2021

CERTIFICATION

This is to certify that this project was carried out by MICHAEL MMERISINACHI DEBORAH in Department of Agricultural Economics and Extension Services, Faculty of Agriculture, University of Benin, Benin City.

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Date	Date

DEDICATION

This project is dedicated to the almighty God who is the best in all things. Without him, this project would be a mirage. He is the reason for this project as he created cassava for human utilization.

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ABSTRACT

Nigeria as the world leader in cassava production, is yet to tap the full potential embedded in cassava. This study was conducted to determine the profitability analysis of processing cassava into fufu in Aguata Local Government Area, Anambra State. The specific objectives were to describe the socio-economic characteristics of cassava "fufu" processors in the study area, determine the profitability of processing cassava into fufu, ascertain the determinants of profit among respondents in the study area, and determine the constraints to cassava "fufu" processing.

Simple random sampling technique was used to select 60 respondents from the study area. Data was collected using a structured questionnaire and interview schedule. Data was analyzed using descriptive statistics, gross margin analysis and regression analysis.

Findings show that fufu processing is female dominated. The study indicated that fufu processing is profitable in the study area with an average gross margin of ₦48 786.74 per processor. The major determinants of profits were age of the respondents, packaging cost, starting capital, cost of cassava bought, price per unit sold and quantity sold per week. Fufu processing is faced with a major

constraints, such as inadequate capital (3.87), price fluctuation (4.37), cassava variety (3.40), and weather problem (4.07). The study recommends that the processors pool their resources together so they can jointly boost their business.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Cassava is a major staple crop in Nigeria, as cassava and its product are found in the daily meals of Nigerians. It is the most important root crop in Nigeria in terms of food security, employment creation, and income generation for crop-producing households (Ugwu, 2002). It supplies about 70% of the daily calories of over 50 million people in Nigeria (Oluwole, Olatunji and Odunfa, 2004).

Nigeria is the largest producer of cassava in the world (FAO, 2008) with about 45 million metric tonnes and its cassava transformation is the most advanced in Africa Egesi, Mbanaso, Ogbe, Okojbenin and Fregene, 2006). Cassava plays a particularly important role in agriculture in developing countries, especially in sub-Saharan Africa, because it does well on poor soils even with low rainfall, it is also a perennial crop that can be harvested as required. It is essentially a carbohydrate food with low protein and fat. The edible part of fresh cassava root contains 32–35% carbohydrate, 2-3% protein, 75–80% moisture, 0.1% fat, 1.0% fibre, and 0.70–2.50% ash (Oluwole, Olatunji, and Odunfa, 2004). The production of cassava for human consumption has been estimated to be 65% of cassava products, while 25% is for industrial use, mostly starch 6% or animal feed 19% and 10% lost as waste (Fish and Trim, 1993).

These unique features makes cassava processing an outstanding profitable enterprise both at local and industrial level, since every part of the plant can be put to use (depending on the individual choice). The major uses of cassava in Nigeria include flour, garri, livestock feeds, confectionaries, monosodium glutamate processing sweeteners, glues, textile, pharmaceuticals and fufu. Cassava is processed into several products such as garri, cassava flakes, cassava flour, and Fufu.

Fufu is one of the products from the transformation of cassava mostly consumed by Africans especially in Nigeria. In spite of the desirability of cassava for consumption as food and animal feed, it contains some toxic compounds such as cyanogenic glycosides, linamarin, and lotaustralin which are highly toxic. Thus, the consumption of an inadequately processed cassava product for prolonged periods may result in chronic toxicity. However, the toxicity of the cyanogen is a result of inadequate processing (Bradbury, Cumbana, Mirione and Cliff, 2006). Cassava is processed into fufu by submerged fermentation of peeled cassava root. According to existing research, when the roots of the fermented cassava are sufficiently soft, they are broken by hand and the fibers are removed by manual sieving of the softened mass on a nylon or cloth screen, using water as a carrier in the process. The sieved mass is then left to sediment for about 20-26 hours after which the water is decanted and the filtrate is dewatered by placing it in sack, pressing with heavy stones and leaving the sack overnight (Oyewole and Sanni, 1995).

The product is sold in a wet paste form or converted to ready to eat product by mixing an optimum quantity of the paste in boiling water over heat, and stirring for some time after which it's boiled again and stirred until the desired texture is achieved. Most processors prefer processing cassava to fufu to its final stage as it becomes more costly (price for which the fufu is sold) and more profitable because of the processing function. Uche, (2016) reported that fufu has higher profit, gross margin, mark-up and a better monetary prospect.

Women processors describe "fufu" processing as feasible (workable) activities that can be taken up easily with little investment. It can also be used to raise money to improve their economic well-being and to enter into other livelihood pursuit (Tomlins, Sanni, Oyewole, Dipeolu, Ayinde, Adebayo, Wandsvhneider, White and Wesby, 2002).

1.2 Statement of Problem

A number of problems and constraints are associated with current processing. These include; price fluctuations, low supply of cassava, tastes and preferences of the consumers, price of substitute, and the arduous nature and time taken for processing of which can affect the profitability of fufu.

The study is therefore geared at providing answers to the following research questions.

i. What are the socio economic characteristics of cassavas "fufu" processors in the study area?
ii. What is the profitability of fufu processing in the study area?
iii. What are the determinants of profits from fufu processing in the study area?
iv. What are the constraints faced by fufu processors in the study area?

1.3 Objectives of the study

The main objective of this study is profitability analysis of cassava processing into fufu in Aguata Local Government Area of Anambra state.

The specific objectives were to:

1. describe the socio-economic characteristics of cassava "Fufu" processors in the study area;
2. determine the profitability of fufu processing in the study area;
3. ascertain the determinants of profit from fufu processing in the study area;
4. identify the constraints to cassava "fufu" processing.

1.4 Justification of the study

Cassava displays an exceptional ability to adapt to climate changes. It is tolerant to low soil fertility, resistant to drought conditions, pests and disease and suitability to store its root for long periods underground even after maturity (Kuye and Ettah, 2016). Hence it is grown throughout the year making it preferable to the seasonal crops of yam, beans, pea, amongst others. Use of fertilizer is limited and it is also grown in fallow lands. The crop also grows very well on marginal soils, replacing crops that require greater soil fertility (NISER, 2013). Its ability to fight hunger and poverty has made it an important commodity for intervention by the government and stakeholders in the Agricultural sector. Since most government interventions and policies are aimed at integrating the rural poor into the mainstream of the economy, one of the ways of achieving this is by adding value to their produce. The evaluation of the present state of small scale-cassava processing is therefore imperative. In order to tap the full potentials that cassava presents, there is, therefore, the need for a study on value addition to cassava and the factors that are likely to influence value addition so that rural communities whose livelihoods depend on it will benefit from the present traditional food market and new emerging markets (Nweke, 1988).Cassava processing (fufu being among the major product) was observed to be one of the ways of improving the revenue base of the rural population and meeting the demand of the urban food needs in the country. Processing of cassava provides an avenue for diversification of farming activities for farmers which has been identified as a strong panacea towards alleviating poverty from rural farming community (Ayinde, Afolami and Aromolaran, 2003).

Hence findings from this study will serve as a guide to local farmers or any other group of individuals who intend to venture into processing of cassava to fufu, as this will be able to create awareness on the profitability of fufu product and provide knowledge on how to combat the constraints experienced in the various stages of cassava processing to fufu thereby improving efficiency and productivity in cassava processing which reduces losses of harvested cassava produce. It is also expected that the study will forward meaningful recommendations and add to available literature which can be useful to agricultural researchers, policy makers, donor agencies and scientists in agricultural field.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Cassava “The White Gold” in Africa.

Cassava (*Manihot esculenta Crantz)* is a perennial woody shrub with an edible root, which grows in tropical and subtropical areas of the world. Cassava plays a particularly important role in agriculture in developing countries, especially in sub-Saharan Africa, because it does well on poor soils and with low rainfall, and it is also a perennial crop that can be harvested as required. Its wide harvesting window allows it to act as a famine reserve and invaluable in managing labour schedules. It offers flexibility to resource-poor farmers because it serves as either subsistence or a cash crop (Stone, 2002).

Cassava is the source of raw materials for a number of industrial products such as starch, flour and ethanol. The production of cassava is relatively easy as it is tolerant to the biotic and edaphic encumbrances that hamper the production of other crops. Cassava’s roots are used only to store energy, unlike the roots of sweet potato and yam that are reproductive organs. Despite their agronomic advantages, root crops are far more perishable than the other staple food crops. Once out of the ground, some root crops have a shelf life of only few days. Roots as living organs of plants continue to metabolize and respire after harvest. Cassava has a shelf life that is generally accepted to be of the order of 24 to 48 h after harvest (Andrew, 2002). Cassava utilization patterns vary considerably in different parts of the world. In Nigeria, the majority of cassava produced (90%) is used for human food (IITA, 2010). Cassava is very versatile and its derivatives and starch are applicable in many types of products such as foods, confectionery, sweeteners, glues, plywood, textiles, paper, biodegradable products, monosodium glutamate, and drugs. Cassava chips and pellets are used in animal feed and alcohol production. Animal feed and starch production are only minor uses of the crop in Nigeria. Cassava, in its processed form, is a reliable and convenient source of food for tens of millions of rural and urban dwellers in Nigeria (IITA, 2010).

Nutritional value of cassava roots; the nutritional composition of cassava depends on the specific tissue (root or leaf) and on several factors, such as geographic location, variety, age of the plant, and environmental conditions. The roots and leaves, which constitute 50 and 6% of the mature cassava plant, respectively, are the nutritionally valuable parts of cassava (Tewe and Lutaladio, 2004). The nutritional value of cassava roots is important because they are the main part of the plant consumed in developing countries. Cassava root is an energy-dense food. In this regard, cassava shows very efficient carbohydrate production per hectare. It produces about 250,000 calories/hectare/day, which ranks it before maize, rice, sorghum, and wheat (Julie, Christopher, and Sherry, 2009). They further state that the root is a physiological energy reserve with high carbohydrate content, which ranges from 32 to 35% on a fresh weight (FW) basis, and from 80 to 90% on a dry matter (DM) basis. Eighty percent of the carbohydrates produced is starch (Gil and Buitrago, 2002); 83% is in the form of amyl pectin and 17% is amylose (Rawel and Kroll, 2003). Roots contain small quantities of sucrose, glucose, fructose, and maltose (Tewe and Lutaladio, 2004). Cassava has bitter and sweet varieties. In the latter varieties, up to 17% of the root is sucrose with small amounts of dextrose and fructose (Charles, Sriroth, and Huang, 2005).

Raw cassava root has more carbohydrate than potatoes and less carbohydrate than wheat, rice, yellow corn, and sorghum on a 100-g basis. The fibre content in cassava roots depends on the variety and the age of the root. Usually, its content does not exceed 1.5% in fresh root and 4% in root flour (Gil and Buitrago, 2002). The lipid content in cassava roots ranges from 0.1 to 0.3% on a FW basis. This content is relatively low compared to maize and sorghum, but higher than potato and comparable to rice. Cassava roots have calcium, iron, potassium, magnesium, copper, zinc, and manganese contents comparable to those of many legumes, with the exception of soybeans. The calcium content is relatively high compared to that of other staple crops and ranges between 15 and 35 mg/100 g edible portion. The vitamin C (ascorbic acid) content is also high and between 15 to 45 mg/100 g edible portions (Charles, Chang, Ko, Sriroth, and Huang, 2004). Cassava roots contain low amounts of the B vitamins, that is, thiamine, riboflavin, and niacin (Table 2.1), and part of these nutrients is lost during processing. The mineral and vitamin contents are lower in cassava roots than in sorghum and maize (Gil and

Buitrago, 2002). The protein, fat, fibre, and minerals are found in larger quantities in the root peel than in the peeled root.

However, Gil and Buitrago (2002) opines the carbohydrates determined by free nitrogen extract are more concentrated in the peeled root-central cylinder or pulp. Thus, cassava roots are rich in calories but low in protein, fat, and some minerals and vitamins. Their nutritional value is, consequently, lower than those of cereals, legumes, and some other root and tuber crops such as potato and yam.

Table 2.1 Proximate, Vitamin and Mineral Composition of cassava roots and leaves

Proximate composition	Raw cassava(100g)	Cassava roots	Cassava leaves
Food energy (Kcal)	130	110 - 149	91
Food energy (KJ)	667	526 – 611	209 – 251
Moisture (g)	59.68	45.9 - 85.3	64.8 - 88.6
Dry weight (g)	40.32	29.8 - 39.3	19 - 28.3
Protein (g)	1.36	0.3 - 3.5	1.0 - 10.0
Lipid (g)	0.28	0.03 – 0.5	0.2 – 2.9
Carbohydrate total (g)	38.06	25.3 - 35.7	7 - 18.3
Dietary fiber (g)	1.8	0.1 - 3.7	0.5 - 10.0
Ashe (g)	0.62	0.4 - 1.7	0.7 - 4.5
Vitamins			
Thiamin (mg)	0.087	0.03 - 0.28	0.06 - 0.31
Riboflavin (mg)	0.048	0.03 - 0.06	0.21 - 0.74
Niacin (mg)	0.854	0.6 - 1.09	1.3 - 2.8
Ascorbic acid (mg)	20.6	14.9 – 50	60 – 370
Vitamin A (mg)	--	5.0 - 35.0	8300 – 11800
Minerals			
Calcium (mg)	16	19 – 176	34 – 708
Phosphorus, total (mg)	27	6-152	27-211
Ca/P	0.6	1.6-5.48	2.5
Iron (mg)	0.27	0.3-14.0	0.4-8.3

Potassium (%)	--	0.25(0.72)	0.35(1.23)
Magnesium (%)	--	0.03(0.08)	0.12(0.42)
Copper (ppm)	--	2.00(6.00)	3.00(12.0)
Zinc (ppm)	--	14.00(41.00)	71.0(249.0)
Sodium (ppm)	--	76.00(213.00)	51.0(177.0)
Manganese (ppm)	--	3.00(10.00)	72.0(252.0)

Source: United States Department of Agriculture (USDA) (2009)

2.2 Processing Effects on Nutritional Value of Cassava

Processing cassava affects the nutritional value of cassava roots through modification and losses in nutrients of high value. Analysis of the nutrient retention for each cassava edible product (Table 2 .2) shows that raw and boiled cassava root keep the majority of high-value nutrients except riboflavin and iron. Garri is a common root product that involves grating, fermenting, and roasting. Garri and products obtained after retting of cassava root with peel are less efficient than boiled root in keeping nutrients of high value but are better than products obtained after retting of cassava roots.

Though the latter is richer in riboflavin than sun-dried flour. Fufu, an important staple in Africa, is a mashed cassava root product that is allowed to ferment with Lactobacillus bacteria (Sanni *et al.,* 2002). Medua-membong is a root product that requires only boiling and prolonged washing. Julie, Christopher, and Sherry, (2009) posits that medua-me-mbong has the poorest nutritional value compared to other cassava products with the exception of calcium content In contrast to boiled cassava, processed root loss a major part of dry matter, carbohydrates, protein, and thus calories. Although raw cassava root contains significant vitamin C, it is very sensitive to heat and easily leaches into water, and therefore almost all of the processing techniques seriously affect its content (Julie *et al.,* 2009). Boiled cassava, garri, and products resulting from retting of cassava root with peel, retain thiamine and niacin better than products obtained after retting of shucked cassava roots, smoked-dried flour, and medua me-mbong. Riboflavin is well retained in boiled cassava, garri, and smoked-dried cassava flour obtained after retting of cassava root with peel in contrast, the losses of vitamin B2 (riboflavin) (Julie *et al.,* 2009).

Table 2.2: Nutritional value after processing 100g of cassava root

Nutrient	**Whole Root**	**Peeled Root**	**Boiled Root**	**B*aton or Chikwangue**	**Garri**	**Flour (retting and no peel)**	**Flour (retting and peel)**	**Washed cooked**
Wet root (g)	100	77.0	87.6	38.5	49.2	25.3-29.6	27.9-34.0	66.8
Dry matter (g)	40.0	32.3	28.3	21.6	29.7	21.3-25.6	20.8-28.7	19.0
Calories	157	127	112	86	119	85-102	83-115	76
Protein (g)	1.0	0.48	0.38	0.18	0.37	0.16-0.22	0.26-0.51	0.16
Fat (g)	0.1	0.1	0.04	0.02	0.2	0.04-0.06	0.04-0.12	0.03
Carbohydra	37.9	31.0	27.4	21.2	28.8	20.9-	20.3-	18.8

tes (g)						25.1	28.1	
Fiber (g)	1.3	0.6	0.5	0.4	0.6	0.4	0.3-0.6	0.3
Ash (g)	0.90	0.57	0.46	0.21	0.34	0.16-0.19	0.24-0.50	0.06
Calcium (mg)	26	13	12	7	10	6.0-8.0	7.0-15.0	11
Phosphorus (mg)	47	39	31	13	18	9.0-11.0	10.0-21.0	7
Iron (mg)	3.5	0.4	0.4	3.1	1.5	0.2-0.7	0.8-11.9	0.2
Thiamin (µg)	72	31	20	10	18	6.0-12.0	13	3
Riboflavin (µg)	34	18	16	21	1.5	10.0-12.0	8.0-21.0	6
Niacin (mg)	0.73	0.52	0.41	0.16	0.33	0.11-0.18	0.17-0.37	0.03
Vitamin C (mg)	33	20	1	1	2	0	0	0

Source: Institute of Food Technologists (2009)

2.3 Products Derived From Cassava and Their Uses

Industrial products from cassava; four primary industrial products from cassava stand out as important for Nigeria. These are (a) cassava flour, (b) crude ethanol, (c) native starch, and (d) animal feed/cassava chips and pellets. These products are commonly traded and show the highest potential for growth in demand, and are associated with medium and large-scale processing. In the domestic market, industrial cassava products compete with traditional cassava products, mainly garri. Furthermore, each of the main industrial products (cassava flour, chips for animal feed, chips for food grade ethanol, and cassava starch) faces competition from (a) identical imported products, and (b) substitute products that are either being imported or locally grown. For domestic cassava flour the main competitive product is wheat flour. For cassava chips/pellets it is feed grains. For ethanol it is ethanol from other sources, and for starch it is corn/maize starch. Quite clearly, significantly lowering the cost of raw materials (ex-factory price) would greatly reduce the cost of the final product, making them more competitive. One strategy to achieve this is the vertical integration of commercial farms to each processing plant.

Secondary products from cassava; Cassava can be processed into various secondary products, including modified cassava starch, glucose syrup, extra neutral alcohol, noodle, bakery and confectionery industries, meat and textile processing. It is also industrially processed as a raw material in the coating of pharmaceutical products, the manufacture of glues and adhesives and oil drilling starch (EFDI-Techno Serve, 2005). Glucose syrup: is a concentrated aqueous solution of glucose maltose and other nutritive saccharine made from edible starch. Glucose or dextrose sugar is found naturally in sweet fruits such as grapes or honey. It is less sweet than sucrose (cane sugar) and is used in large quantities in fruits, liquors, crystallized fruits, bakery products, pharmaceuticals, and breweries. Noodles: are a long thin extruded food product made from a mixture of flour, water, and eggs usually cooked in soup or boiling water (Sanni, 2005). At 12.5%, cassava starch/flour forms an integral part of the final product.

2.3.1 Cassava based adhesives

Like the cereal starch adhesives, are of three main types: i) Liquid starch adhesives are supplied by the adhesive's manufacturer in liquid form usually in plastic or lined metal drums, jerry cans and bottles. ii) Pre-gel starch adhesives are produced in dry flakes and milled to specific particles sizes. They are packed in waterproof lined multi-wall paper bags/sacks and are very suitable for export. iii) Dextrin based adhesives are delivered to consumers in liquid and dry forms depending on specification and requirement. The liquid dextrin adhesives are packed as the liquid starch adhesives, while the dry dextrin adhesives are packed as the milled pre-gel adhesives. Dry dextrin adhesives are very suitable for export as intermediate raw materials used especially in Europe and America by the food and industrial companies.

2.3.2 High quality cassava flour (HQCF)

Nigeria imports over one million tonnes of wheat annually. At 10% substitution of cassava flour in wheat flour and with the current national demand, 300,120,000 metric tonnes of HQCF (assuming the national demand for wheat flour is 1.2 million tonnes), is required (IITA, 2011). 30% of the total wheat can be replaced by cassava flour in bread making, and 100% cassava flour is currently being used in pastries and confectioneries (Onabolu, Abass, and Bokanga, 1998). However, with poor regulation and standardization, some bakeries have complained about problems: including presence of impurities such as sand; odour; shorter product shelf life (e.g., biscuits); brittleness; gradual change of colour (biscuits turning pale); unreliable supply; poor final product quality in cases where the cassava flour had partially fermented. With other domestic uses for cassava flour in snacks, a more realistic estimate for the annual demand of cassava flour is therefore 250,000 to 300,000 MT (Cassava Master Plan, 2006), a figure impossible for small holders to supply.

2.3.3 Cassava chips

Cassava chips are dried irregular slices of roots, which vary in size but should not exceed 5 cm in length (CIAT, 2004). The tuberous roots, either peeled or unpeeled, are cut up into chips (cossetted) and dried. Chips from peeled roots are used for human consumption and in animal feed industry and generally store better than flour (IITA, 1990). Chips are the most common form in which dried cassava roots are marketed and most exporting countries produce them. The standard method of processing chips consists of peeling, washing, chipping the cassava roots, and then sun drying the slices. The recovery rate of chips from roots is 20 to 40% depending on the initial dry matter content of the cassava roots and the final moisture of the chips (Cassava Master Plan, 2006). In Nigeria, cassava chips were processed into animal feed and some animal feed millers continued the practice until the late 90s when the price of cassava became too expensive vis-à-vis the price of maize. Presently, no major livestock feed mill uses cassava as a raw material, although smaller mills and large farms that blend their own feed use cassava chips or meal when these are locally available at low prices. The livestock sector in Nigeria is rapidly expanding and a continued demand for animal feed is predictable. In view of the relatively high-income elasticity for meat products, it is likely that this trend will continue during the remainder of this decade. Processing cassava chips into cassava pellets will further reduce transport costs and enhance product quality. Cassava pellets for animal feed Substituting maize with cassava in animal feed have been made using linear programming, saving of up 10% in poultry feed costs and about 20% for pig feed (Cassava Master Plan, 2006). With the Nigerian livestock industry uses up to 1.2 metric tonnes of maize annually (Cassava Master Plan, 2006), substituting 10% of this figure with cassava would involve setting up of at least 200 cassava chip making factories processing about 10 tonnes of cassava roots per day (Cassava Master Plan, 2006), Pellets can be made either from cassava chips or flour. An indigenous Nigeria company, B & T Ventures, Ibadan, in collaboration with the cassava project at IITA, has designed and created a pelleting machine that can produce three different types of cassava pellets: hard, soft, and floating. The hard pellets are used for feeding poultry, the soft ones for feeding ruminants, and the floating ones for feeding fish. However, the machinery is still under R & D and is not as efficient as imported pelleting machines.

2.3.4 Ethanol

Ethanol is produced by the fermentation of sugar related materials such as molasses and sugar juice, or starchy materials. Cassava stands as one of the richest ferment-able substances for the production of crude alcohol/ethanol, with dry chips containing up to 80% of ferment-able substances (starch and sugars) (Cassava Master Plan, 2006).

2.3.5 Tapioca:

In Nigeria, this is made from partly gelatinous cassava starch, (although the cassava crop itself is called tapioca in some places, heat treated to a moist mash in shallow pans. Its shapes are irregular lumps called flakes, or perfectly ground beads. It is consumed in many parts of West Africa, soaked or cooked in water with sugar and/or milk added. High labour processing steps make it quite expensive (Sanni *et al.,* 1992).

2.3.6 High quality garri

With a share of 70% of all cassava fresh roots harvested, garri will continue to dominate the cassava sector in the short term. The growth rate of garri has been put at least 4 to 6% per annual, primarily due to population growth and increasing urbanization, and export to the regional West African market. It already provides livelihoods to more than 5 million farmers and processors (often poor rural women) in Nigeria, as well as to numerous equipment manufacturers, wholesale and retail traders, and transporters. In addition, small-scale garri processing has gradually become the main source of non-farm rural employment in many countries.

2.3.7 Sweeteners

Cassava starch and HQCF can be used as raw material for sweeteners, primarily high fructose syrup (HFS), glucose, and sorbitol. Sweeteners are obtained by hydrolysis of cassava starch or flour or wet cake, to produce glucose, which is further purified to produce HFS or hydrogenated to produce sorbitol. One ton of starch yields 900 kg of glucose, 550 tons of HFS (55% purity), and 1.1 ton of sorbitol (70% purity) (Cassava Master Plan, 2006). The annual demand for these sweeteners in Nigeria is: 150,000 tons of HFS, as part replacement for imported sugar in the soft drink and juice industry, 40,000 tons/year of glucose, and 14,000 tons of sorbitol (FAO, 2011). The sweetener industry is a strong market that is expected to grow by 50% over the next ten years. Ekha Agro Nigeria Limited is currently the only cassava processor, producing sweeteners, liquid glucose, from cassava for supply to Guinness Plc (FAO, 2011).

2.4 Constraints or Challenges to Cassava/Fufu processing Development

The major challenges to the development of the cassava sub sector in Africa include the following:

2.4.1 Low yields

The yields of African cassava producers are 37 - 64% below the global value. In 2013, Nigeria reached 14.1 tons/ha, similar to Brazil but ~37% less than Indonesia (22.5 tons/ha) and Thailand (21.8 tons/ha) (FAOSTATS accessed 2015). The yields of the other top African producers are also low. Cameroon's cassava yield in 2013 was at 14.7 MT/Ha, while Angola achieved yields similar to those of Nigeria at 14.1 tons/ha. DRC's 2013 yield was 8.0 tons/ha, less than 60% of Nigeria's yield. Yields are low by global standards, mainly due to the prevalence of traditional subsistence farming techniques with little or no use of inputs. Fragmented, smaller-holder farms: In Africa, cassava production is carried out in predominantly smaller-holder and fragmented farms with rudimentary technologies, low use of inputs limited economy of scale. Six million small-scale farmers account for 90% of the production in Nigeria.

2.4.2 Limited adoption of improved seeds

Small-scale farmers rarely use improved planting materials (clean, healthy seeds), and the sub-sector is dominated by disease-prone local varieties with long maturation periods and low yield potential. IITA and African NARS have played leading roles in the development of improved cassava varieties that are multiple disease and pest resistant, early maturing, and high yielding. These varieties have the potential to raise productivity by up to 30-40 tons/ha. Thirty-two African countries have released an estimated 384 high yielding varieties between 1970 and 2014. These varieties are high yielding with good levels of multiple disease and pest resistance as well as of acceptable quality for food, feed and industrial uses in Africa. While the combination of these new varieties and better agronomic practices could increase yields per unit area by at least 40%, the rate of adoption by smallholder farmers has been low. The dissemination of these varieties has often suffered from the lack of a reliable planting material distribution system from National Agricultural Research Systems (NARS) because of weak extension systems, insufficient quantities of planting material, and delays in distributing the approved planting materials. This compels farmers to continue to grow local, low yielding, varieties. This is exacerbated by inadequate location specific knowledge on fertilizer use, and other cultural practices such as weed and pest and disease management for cassava systems and late planting specifically in southern Africa region where maize comes first. Private companies are also not involved in distribution because cassava is propagated with vegetative method, and it takes one year to produce cassava planting material compared to three to five months for grain seeds.

2.4.3 Low use of herbicides

Low use of herbicides and pesticides presents another obstacle. In the case of south-eastern Nigeria, only 3% of farmers use herbicides because they do not know about them, lack the technical skills to use them, are not able to afford them or are under pressure from local NGOs to avoid them. When they do use them, most use insufficient amounts of herbicides to save cost. Instead increasing herbicide use would reduce the need for weeding and free up labour for other activities.

2.4.4 Limited use of fertilizers and irrigation

Fertilizers are used infrequently, and even when used, the amounts are below the recommended levels because of the high cost. Use of irrigation techniques is also a constraint in almost all cassava farms in Africa as the system of cultivation is predominantly rain-fed.

2.4.5 High labour use

Cassava farming is highly labour-intensive and related costs can account for up to 90% of total production costs. For example, the cost of developing and preparing land is quite high. In Oyo and Benue states of Nigeria, 98% of the average cassava production cost of USD 700 per hectare is labour (ridging, planting, weeding, etc.) and 2% is inputs (fertilizers, seeds).

2.4.6 Low use of mechanization

Small-scale cultivation is characterized by a low level of mechanization. For example, tractors are used in just 10% of Nigeria's cassava cultivation. Harvesting is done manually and is therefore time-consuming and expensive. In both small-scale and commercial farming, 8-12% of cassava roots are lost due to sub-optimal harvesting methods. A survey conducted by the African Agricultural Technology Foundation (AATF) during the 2004 Triennial Symposium of the

International Society for Tropical Root Crops –Africa Branch revealed a consensus among African cassava experts that the most important intervention to increase the competitiveness of the cassava industry was the adoption of mechanization in cassava production. Such mechanization will enable a reduction of labour costs, thus bringing down the cost of cassava as a raw material and stimulating reliance on local cassava as a competitive raw material for various industries.

2.4.7 High prices of cassava roots

Cassava prices vary greatly from country to country as there is no global commodity market and production costs differ vastly due to varying levels of input use. For example, in 2012, the average price for cassava was USD 161/ton in Nigeria (10% mechanized), and USD 67/ton in Thailand (highly mechanized). Cassava derived products must be price-competitive with their substitute products like corn starch and ethanol made from other sources. Limited access to finance: Both commercial and smallholder farmers have limited access to finance. In Nigeria the agricultural sector accounts for 42% of GDP but has 2% of all formal credit flows. Reasons for this include: conditions to access a bank loan are stringent; interest rates are high (17-25%); and commercial banks do not offer conducive payment terms for agro based activities (e.g., fixed repayment periods that may not match annual cropping, especially when loan release is not coordinated with growing cycles). As a result, commercial farmers may produce lower volumes.

2.4.8 Trade and transport

Smallholder cassava producers have weak and limited access to markets. The high transportation costs and the need to process cassava within 48 hours of harvesting because of its perishable nature, makes small producers to sell most of their product at local markets. The high fragmentation (scattered farms) and poor infrastructure make it difficult to develop commercial-scale aggregation. Poor roads and inadequate storage facilities drive up prices and increase postharvest losses. Weak access to markets: Agricultural markets world-wide are characterized by market structures, both quantitative – aggregation, storage, and processing facilities, and qualitative –quality standards, information services, logistics for distribution of agricultural products. Many of these structures do not exist in many African countries for cassava distribution.

2.5 Contributions towards Addressing the Challenges

IITA has pioneered since the 1970s and will continue to propel the cassava research improvement in Africa to increase and sustain cassava production and utilization in sub-Saharan Africa. The Institute, working with national partners, has been actively involved in the development of value chains of the cassava subsector in Africa since the 2000s. Examples include the Rural Sector Enhancement Program, Pre-emptive management of cassava Mosaic disease in Nigeria, and the Cassava Transformation Agenda all in Nigeria. Under the Nigeria Cassava Presidential Initiative on Cassava (1999 – 2007) IITA research efforts increased cassava production by 10 million tons, making Nigeria global top producer. Similar efforts in Cameroon also helped the country to double cassava production. Other projects such as the Support for Agricultural Research for Development of Strategic Crops which is funded by the Africa Development Bank, and the Cassava Enterprise Development Project are also driving the production and productivity of cassava. In 2004, the New Partnership for Africa's Development (NEPAD) launched the NEPAD Pan African Cassava Initiative (NPACI) as a means to tap on the enormous potential of cassava in Africa for food security and income generation. The project made significant contributions towards cassava production, commercialization and social marketing in Southern Africa with specific emphasis in Malawi, Zimbabwe and Mozambique. These efforts have contributed to food security and incomes in those countries. Other projects such as Great Lakes Cassava Initiative and Cassava Weed Management Project are also having an impact.

2.6 Fufu as a Product from Cassava Processing

Fufu (or fufuo, Fofo, foufou) is a popular African_food. In Tiwi, fufu means "mash or mix" for a soft and doughy staple food of the Akan ethnic groups in Ghana and other African countries. Made of boiled cassava mixed with plantains or cocoyam, it is pounded together in a mortar (waduro) and pestle (woma) and eaten with liquid soups (nkwan) such as light soup (Nkrakra nkwan), Abenkwan (palm nut soup), Nkatenkwan (peanut butter soup) and Abunabun soup. In other West African countries, it is eaten with hot pepper soup, okra, or other kinds of stew.

2.7 Method of Processing Cassava into Fufu

Fufu is at present produced mainly by rural processors at both household and a small scale mainly in Eastern and south western Nigeria (Sanni, *et al,* 1998). They also noted in the late 20th century that 60% of all the cassava harvested across Nigeria was used in processing fufu and only 5% for garri. However, the preference and consumption pattern has been reversed between fufu and garri in recent times, because of fufu's poor shelf life and tedious processing methods (Egwim, Amanabo, Yahaya, and Bello, 2013). This is done by using the traditional method.

Peeling is normally done manually by women and girls using hand knives. The rate per person can be as high as 400kg per 8hours. After the cassava roots have peeled, they are washed and made ready for soaking. Some processors do not peel cassava before soaking and instead remove the peel from the softened roots. It is generally considered that this produces a poorer quality product. The peeled and washed cassava roots are cut manually into chunks of different sizes using a hand knife and soaked in streams, drums or earthen pots of water for 3-5days to undergo a lactic acid fermentation. During soaking, the pH value decreases, the roots soften and this facilitates the reduction in potentially toxic cyanogenic compounds. (Sanni, *et al*, 1998). When sufficiently soft, the roots are taken out, broken by hand and the fibres removed by sieving. At present, processor sieve manually by adding water to the retted mass on a nylon or cloth screen. The fibre produced as a by-product is commonly used for animal feed, withering its wet form or after drying. The starch suspension is allowed to sediment in a large container for about 24hours. After sedimentation, the water is decanted while the fine, clean filtrate (mainly starch) is dewatered by putting it into raffia or cotton bags, pressing with heavy stones and leaving it overnight to remove excess water. The fufu is collected and sold to the consumers as a wet paste in small units packaged in plastic or polypropylene bags (Haln, 1989).

To prepare fufu for consumption, a quality of the slurry containing about 25%.Fufu solids in water is boiled directly in an open Pan .After constant stirring using a wooden rod, a strong sticky paste or dough is formed.

2.8 Constraints to the Development of Fufu Processing

2.8.1 Variable quality

Fufu is considered by consumers to be good quality when it has a smooth texture, characteristics aroma and is creamy-white, grey or yellow in colour (Akingbala, Oguntimein, and Abass, 1991; Oyewole and Odunfa, 1992; Blanshard, 1994). The quality of fufu has been reported to vary with processor and season (Oyewole and Sanni, 1995).The variability in fufu quality has been attributed to various local practices during the soaking (fermentation) stage of processing. Processors indicate that for sufficient retting to occur, shorter fermentation periods (2-3 days) are required during the dry (hot) seasons, while longer periods (3-5days) are required during the rainy (cold) season. Data collected during the COSCA survey confirmed that in Nigeria considerable variations in the soaking period for fufu production are practiced. The Production of fufu is largely home based and fermentation is usually left to chance inoculation from the environment (Oyewole and Sanni, 1995). The vessels used for previous batches usually serve as a source of inoculum for the initiation of fermentation (Oyewole, 1997). Little or no control is involved in the processing and this may influence the quality of fufu. Other factors that could be responsible for the variable quality of fufu include the size to which the roots are cut prior to soaking, varietal differences in dry matter content (Hahn, 1989), and the quality of the roots or the water used for processing.

2.8.2 Delays in processing fresh roots

Cassava roots brought from the farm to the market are often stored at ambient temperature for two to three days prior to processing either due to transportation problems between the farm sites and the processing centers or delays in processing caused by the slow manual processing operations that are often employed (Idowu and Akindele, 1994). Physiological deterioration of cassava occurs only a few days after harvest (Wenham, 1995) and this may contribute to the variable quality of fufu.

2.8.3 Long processing times

Various researchers (Blanshard, Dahniya, Poulter, and Taylor, 1994; Ampe, Agossou, Treche, and Brauman, 1994) have reported effective retting of not less than 60 hours for temperature of between 30 and 35C in the laboratory. These data correspond with typical processing conditions in Nigeria. Fermentation time is an issue for processors: for example some processors expose their fermenting roots to direct sunlight as a means of accelerating the process. Other processors adopt 'short-cuts' such as fermenting the roots for less than two days or processing immature cassava roots, reportedly to enhance financial gain (Oyewole and Sanni, 1995)

2.8.4 Cyanogenges in the final product

In terms of nutritional quality, potential toxicity in cassava is due to the presence of the cyanogenic glucosides, linamarin and lotuastralin. Although health problems have been attributed to cyanide exposure from insufficiently processed cassava, there are only few reports of acute poisoning in Nigeria (Akintonwa and Tunwashe, 1992). It is generally considered that the processing techniques used for cassava in Nigeria are capable of reducing the cyanogen content to low levels (Obigbesan, 1994). The mechanisms of cyanogen reduction during fermentation have been determined (Westby and Choo, 1994).

2.8.5 Physical aspects of processing

In survey carried out among 50 processors, mainly women, in ten localities around Abeokuta, south west Nigeria, the manual peeling of cassava roots using a hand knife was considered to be tedious and time consuming (Oyawole and Sanni, 1995). Roots with irregular are difficult to harvest and to peel by hand this leads to great losses of useable root material. Also smaller roots require more labour for peeling (Hahn, 1989). Apart from peeling, sieving is another unit operation that is time consuming though not considered too labour-intensive.

2.8.6 Poor shelf life

Fufu is a high moisture content product which renders it highly perishable. It is consumed immediately after preparation or stored until required in baskets or plastic bags for not more than a week. Poor shelf-life of fufu is serious limitation for large-scale processors and consumers.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Study Area

This study was carried out in Aguata local Government Area, Anambra state located in the south east geopolitical zone of Nigeria. It lies within the geographical co-ordinate of 6°20`N 7°00`E.

Its boundaries are formed by Delta state to the West, Imo state and River's state to the south, Enugu state to the east and Kogi state to the north. The name was derived from Anambra River (Omambala) which flows through the area and is a tributary of the River Niger.

It's made up of 21 L.G.A with total land area of 4,844km^2 and a population estimate of 4,177,821(National population census 2006) and its population estimates as of 2019 by ANSG is 10,800,000 with density of 860km^2.

Aguata L.G.A has her headquarter in Ekwulobia, with some part of it within Aguluezechukwu. It has an area of 195km^{2}and a population of 370,172(NPC 2006).

This study was carried out in major markets in 5 out of 14 towns, which includes Ekwulobia, Achina, Uga, Igbo-Ukwu and Umuchu.

3.2 Sampling Techniques

The two-stage Sampling technique was employed to select the respondents.

First stage: Five communities were purposively selected from the fourteen communities in the local government area due to the size and prevalence of processors/marketers in this communities.

Second stage: Simple random technique was used to select 60 respondents from the study area.

3.3 Data Collection

3.3.1 Data source

Primary and secondary data was employed in this study. The primary data were collected using 60 copies of structured questionnaire and interview schedule. Secondary data were collected from agricultural journals; Conference/workshop/seminar Papers, agro-based organizational reports, texts and other periodicals.

3.4 Measurement of Variables

- Sex variable was determined as Male (1) or female (2).
- Age variable was measured in year.
- Household size was measured by the number of individuals in the family.

- Marital status was determined as single, married and divorced.
- Level of education was measured in informal, formal (primary, secondary and tertiary).
- Marketing experience was measured in years.
- Cost of performing various marketing functions, total revenue, total cost and gross margin was measured in naira (₦).

3.5 Analytical Techniques

Objective one: Descriptive statistics such as frequency, percentages, and means were used to analyse objective one.

Objective two: This was analyzed using the gross margin and profitability analysis.

$$GM = TR - TVC \quad \ldots\ldots\ldots (1)$$

$$TR = P \times Q \quad \ldots\ldots\ldots (2)$$

$$TC = FC + VC \quad \ldots\ldots\ldots (3)$$

$$NP = TR - TC \quad \ldots\ldots\ldots (4)$$

Where TR = Total revenue, P = Price of output, Q = Quantity of output

TC = Total cost, FC = Fixed cost, VC = Variable cost

NP = Net profit

All cost, revenue and gross margin were measured in naira (₦).

Objective three: To ascertain the determinants of profit from fufu processing. This was analyzed using multiple linear regression model.

The multiple linear regression model

Implicit form:

$$Y = F(X_1, X_2, X_3, X_4 X_5, X_6 \ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

Where:

Y = Net profit (₦)

X_1 = Age (Years)

X_2 = Packaging Cost (₦)

X_3 = Starting Capital (₦)

X_4 = Cost of Cassava (₦)

X_5 = Price per Unit (₦)

X_6 = Quantity sold per week (kg)

The explicit form is given as:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + e \ldots\ldots\ldots\ldots(6)$$

Where b_0= Intercept

e = Error term

B_1-B_6 = Regression coefficients

Y = Dependent variable (Total revenue – Total cost = Net profit)

X_1-X_6= Independent Variables

Objective four: To identify the constraints faced by cassava processors in the study area. Information from a 5- point Likert type scale was used to analyse this objective. The most serious constraint was given the highest score of 5, the responses was grouped as

- Very serious (VS) =5
- Serious (S) =4
- Moderately serious (MS) =3
- Least serious (LS) =2
- Not serious (NS) =1

For a given constraint, the mean will be calculated by summing the score on each item and then dividing by the total number of responses. When the mean is less than 3, then it means the constraint is not serious, while, when equal to 3 or greater than 3 means that the constraint is very serious.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio Economic Characteristics of the Respondents

The socio economic characteristics of respondents examined in this study are presented in Table 4.1.

4.1.1 Sex of respondents

Sex categorization of the fufu processors shows that all of the respondents were females. This implies that fufu processing is female dominated, its enterprise is majorly operated by women, since it has to do with food production which is a common practice in Anambra " that women are more involved in food processing and sales".

4.1.2 Age distribution

Age ranges of the women was from 20-70 years, as was obtained from the study, it showed that 8.3% of the respondents were between the age of 20-29 years old, this was followed by 48.5% of the respondents who were 30-39years old, also 25.0% of the respondents were 40-49years old, 11.7% of the respondents were 50-59years old and least among the age category 60-69years old comprised of 6.6% of the population. This suggests that majority of the respondents belong to the economically active population category. They can therefore put more efforts into cassava fufu processing in order to increase their output. This is also in agreement (with Sanni, *et al.*, 1998) that one of the constraint associated with fufu processing is the arduous nature, showing that individuals that are economically active should be involved in fufu processing.

4.1.3 Marital status

The result also shows that 11.7% were single and widowed respectively, while 76.7% of the respondents were married, majority of the respondents were married. This indicates that majority of the processors are likely to make use of family labour for their activities.

4.1.4 Level of education

The level of education of the respondents indicated that majority of the respondent were secondary school graduates rating about 53.3%, followed by primary school graduates who were 36% of the population. Those with no formal education were 5.0% also tertiary institution graduates were 5.0%.The implication of this is that the processors are liable to readily adopt new technology and innovation which can improve as well as increase production as far as fufu processing is concern.

4.1.5 Size of household

About 31.7% of the respondents concurred that they have household size of 1-5, while 65.0% of the respondents concurred that they have household size of 6-10, while 3.3% of the respondents came from household size of 11-15.

4.1.6 Major occupation

The study also showed that the processors were involved in dual occupation, as such 41.7% of the respondents where farmers, 51.7% of the respondents were traders and 6.7% of the respondents were involved in other occupation. In relation to their (respondents) ages, as observed from the study, shows that mostly those between the age range 20-49 years were involved in trading, from 50-60 years were involved in either trading or farming. From 60 and above were involved in livestock rearing, all in a small scale. For anyone that performs farming as an occupation, has dual source of cassava (market and farm).

Personal Characteristics	Frequency	Percentage (%)
GENDER		
Male	0	0
Female	60	100
Total	60	
AGE(YEARS)		
20-29	5	8.3
30-39	29	48.5
40-49	15	25.0
50-59	7	11.7
60-69	4	6.6
Total	60	
MARITAL STATUS		
Married	46	88.3
Single	7	11.7
Divorced	0	0
Widow	7	11.7
Total	60	
OCCUPATION		
Farming	25	41.7
Trading	31	51.7
Others	4	6.7
Total	60	
SIZE OF HOUSEHOLD		
1-5	19	31.7
6-10	39	65.0
11-15	2	3.3
Total	60	
LEVEL OF EDUCATION		
No formal education	3	5.0
Primary education	22	36.7
Secondary education	33	53.3
Tertiary education	3	5.0
Total	60	

Table 4.1: Socio Economic Characteristics of the Respondents

Source: Field Survey 2021

4.2 To Estimate the Cost and Returns of Cassava Processing into Fufu per Processor per Week.

The cost and return analysis of fufu processors presented in Table 4.2 showed that the enterprise for fufu processing in Aguata Local Government Area, had a total revenue of ₦62 092.905 per processor, with a total quantity of 1153.5wraps (per processor)of fufu sold in a week at an average price of ₦53.8 per wrap. Total variable cost of ₦13 306.17, with cost of cassava as the highest variable cost, with about 52.83% on TVC (because of the high rate of inflation of cassava during the course of this study, due to the invasion of the Fulani's herdsmen on the farmers farm, hence destroying the cassava roots with their cows).This was followed by packaging cost and transportation cost accounting for 9.0% and 8.81% of TVC respectively. This indicates that fufu processing requires a lot of packaging materials throughout its processing stages, whereas transportation cost could be attributed to the poor road networks and in some cases no accessible roads, thereby posing a serious constraint to bringing the products to market. Cost of offloading & loading accounts for 3.13% of TVC, this indicates the bulk nature of cassava roots before they are processed. Levies accounts for 3.57% and cost of water for 2.11% of the TVC. Water was purchased in the study area because of the scarcity of water sources such as streams, boreholes in individual houses and in the communities. Cost of storage, labour and harvesting accounts for 0.93%, 0.81% and 0.95% respectively of the total variable cost.

The study also showed that harvesting cost accounts for 0.69% of TC, labour and cost of water 0.58% and 1.58% respectively. Cost of; storage , transportation, loading & offloading, packaging, levies and cassava accounts for 0.67%, 6.42%, 2.27%, 6.52%, 2.59%, and 38.22% respectively. Other costs covering the cost of fuel e.g firewood and miscellaneous, accounts for 17.76% on TVC and 12.86% on TC. The Gross Margin was a good one, with an amount of ₦48 786.74. The total fixed cost was ₦5 074.33, with net income or net profit of ₦43 712.405, showing that fufu processing is a "PROFITABLE BUSINESS" this was in affirmation with Uche, (2016) stating that fufu has higher profit, gross margin, mark-up and a better money prospect.

Table 4.2: Cost and Return Analysis of Fufu Processing per Processor per Week.

Item	Amount per processor(₦)	% on TVC	% on TC
TOTAL REVENUE	62 092.905		
Price	53.83		
Average quantity sold	1153.50(wraps)		
	126.67	0.95	0.69
Harvesting	107.5	0.81	0.58
Labour	289.83	2.11	1.58
Cost of water	123.33	0.93	0.67
Storage	1180.0	8.87	6.42
Transportation	416.5	3.13	2.27
Loading &	1198.17	9.01	6.52
offloading	475.0	3.57	2.59
Packaging	7025.0	52.83	38.22
Levies	2364.17	17.76	12.86
Cost of cassava			
Other costs			
	13 306.17		
TOTAL VARIABLE COST	48 786.74		
GROSS MARGIN			
	5 074.33		
TOTAL FIXED COST	43 712.405		
NET PROFIT			

SOURCE: Field Survey, 2021

4.3 Effect of Named Predictors on Net Profit (JOIN ALL TOGETHER AS DISCUSSS)

Table 4.3: Effect of Age, Starting capital,Packaging cost, Cost of cassava, Quantity sold and Price per unit on Net Profit (Total Revenue – Total Cost)

Regression Statistics	
Multiple R	0.994
R Square	0.988
Adjusted R Square	0.986
Standard Error	3,375.625
Observations	60.000

SOURCE: Field Survey, 2021

ANOVA

	Df	Sum of squares	Mean square	F	Significant.
Regression	6	48852283590.000	8140908107	714.438	.000
Residual	53	1527091869.000	1139484561.61		
Total	59	49459375460.000			

	Coefficients	Standard error	t statistics	Sig.
Constant	-77696.441	5929.200	-13.104	0.000
Age	-159.727	54.379	-2.937	0.005
Packaging cost	-2.044	0.785	-2.603	0.012
Starting capital	-0.88	0.196	-0.450	0.655
Cost of cassava	-1.349	0.280	-4.813	0.000
Quantity sold				

per week	51.553	1.182	43.614	0.000
Price per unit	1525.374	124.442	12.258	0.000

SOURCE; Field Survey 2021.

From table 4.3, the r^2 is 0.988. This means that 98.8% of the variance seen in the net profit can be explained by the combination of age, packaging cost, starting capital, cost of cassava purchased, quantity sold per week and price per unit. $P<0.05$, therefore the findings from this study are statistically significant.

4.4 Constraints Faced by Respondents

The Likert type scale was used to get information that was used to achieve the objective .The most serious constraint was given the highest score of 5 and the least 1, on 5 point scale.

For a given constrain, the mean was calculated. Price fluctuation, weather problem and low supply has the highest mean of 4.37, 4.07 and 4.17 respectively, indicating the major constraints faced by the respondents in the study area. The issue of low supply agrees with the fact there was a constant increase in price of cassava roots as a result of the insecurity in the country as at the time the study was carried out.

Inadequate capital, cassava variety, transport cost and water supply has the mean of 3.87, 3.40, 3.28 and 3.42 respectively, still indicating that these constraints are serious issues that needs the intervention of the Government.

Insufficient storage (mean=2.85) and lack of information to fufu processors (mean=2.02) weren't a serious issue. Unfavourable Government policy has the least mean (1.0) showing that the Government does not interfere in fufu processing activities.

Table 4.4: Constraints on Fufu Processing Faced By the Respondents

Constraints	Mean
Inadequate capital	3.87*
Price fluctuation	4.37*
Weather problem	4.07*
Cassava variety	3.40*
Insufficient storage	2.85
Lack of information	2.02
Unfavourable Government policy	3.28
Low supply	4.17*
Water supply	3.42*

SOURCE: Field Survey, 2021 *Mean score ≥ 3 is significant.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The study was on the profitability of processing cassava into fufu in Aguata Local Government Area, Anambra state .The specific objectives were the socio economic characteristics of the fufu processors, cost, returns and gross margin analysis of the fufu processing and the constraints faced by the fufu processors. The socio economic characteristics of the respondents in the study Area shows that all respondents were female (100%). Age range 30-39 years had the highest frequency with 29 respondents and 48.5% were as age range 60-70 years had the lowest frequency with 4 respondents and 6.6% of the respondents. Marital status of the respondents showed that married women dominates the enterprise with frequency of 53 respondents and 88.3% of the respondents. Occupation accounted for 41.7%, 51.7% and 6.7% for farming, trading and other occupations respectively. Size of household accounts for 31.7%, 65.0% and 3.3% of the age ranges 1-5years, 6-10years and 11-15years, respectively. Level of education shows that majority of respondents were only able to obtain SSCE Certificate (53.3%), followed by primary education (36.7%), then tertiary and no formal education 5.0% respectively. From the cost, returns and gross margin analysis, it was observed that the total revenue of the respondents in the study was ₦3,787,500, Total Variable Cost of ₦797,790, total gross margin was given as

₦2,989,710, total fixed cost ₦304,460, total sum of the starting capital of the respondents ₦573,500, Net profit or income was ₦2,111,750, showing that fufu processing is a profitable enterprise. The major constraints faced by the respondents in study area was price fluctuation, weather problem and low supply followed by inadequate capital, cassava variety, transport cost and water supply. Insufficient labour, insufficient storage and lack of information were less serious. Unfavourable Government policy was not a serious at all.

5.2 Conclusion

It was concluded that fufu processing is female dominated. The fufu processing is a profitable enterprise. The significant determinants were total quantity sold, price per unit sold and cost of cassava purchased. Fufu processing is a labour and time consuming activities, its also faced by other constraints such as odour, colour and texture (which are controllable factors).

5.3 Contribution to Knowledge

The study identified some constraints faced by fufu processors in the study area and which can also be experienced in other places and also shows the profitability of fufu processing enterprise.

5.4 Recommendations

Based on the findings of this study, it is to be noted that the following recommendations to improve fufu production, directly influences or improves the agricultural/food sector of the country as a whole.

i. Since transportation and transportation cost is a serious constraint, provision of good roads is very important so as to reduce the stress and cost of transportation of processed fufu.

ii. Everyone is left on his own accord to produce fufu and sell in the market without inspection. Hence it is recommended that government should establish a smaller inspection body or organization mostly among the rural dwellers to inspect the fufu processors and their product, these will help to curtail any form of poor hygiene, improve quality and food security.

iii. It was also observed that they were not in any co-operative society, extension agents is hereby encouraged to introduce or help them form a co-operative society in order to tackle some of their serious constraints such as low-supply, price fluctuations.

iv. Due to the arduous nature of the fufu processing, the government should establish a center with improved technology for processing cassava, such invention will improve the health of the fufu processors and regulate the production of quality and hygienic fufu.

v. Government should supply farmers with better hybrid of cassava planting stocks in other to improve the availability of cassava to fufu processors, as cassava variety is a serious constraint faced by fufu processors.

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APPENDIX

RESEARCH QUESTIONNAIRE
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION SERVICE
FACULTY OF AGRICULTURE
UNIVERSITY OF BENINBENIN CITY, EDO STATE.

Dear Respondents,

I am a final student of the above named institution carrying out a research on the topic "Profitability of cassava processing in Aguata local government, Anambra state". I kindly solicit for your help in carrying out this project by providing answers to the following research questions.

Kindly answer the questions as accurately as possible so as to ensure reliable data for this research. It is only for academic purpose hence our response will be treated with utmost confidence.

Thank you for your co-operation. Please tick (√) as appropriate.

Yours Faithfully,

Michael Mmerimsinachi Deborah.

SECTION A : SOCIO-ECONOMIC CHARACTERISTICS

Location/Name (Community /village)____

2. Sex: Male [ ] Female [ ]

3. Age (Years):____

4. Marital status: Single [ ],Married [ ],Widowed [ ],Divorced [ ].

5. Level of education:No formal education [ ],Primary education [ ],Secondary education [ ],Tertiary education[ ],Others[ ]Specify_____________

6. Size of household:____

7. Major occupation: Farming [ ],Trading [ ],Artisans [ ], other occupation [ ].

SECTION B:PROCESSING INFORMATION AND ACTIVITIES

9. Source of labour: individual/ self labour [ ]hired labour [ ], family labour [ ].

10. Processing/sales Experience of fufu:______________________________

11. Cassava production : All year round [ ], specific months of the year [ ].

    If so specify ____

12. Please indicate your sources of cassava. ____________________

13. What Quantity of cassava do you buy for processing per week? Heaps( ) , Wheel barrow( ),Bags( ).

14. What is the average weight per unit selected in question 13.

15. What Quantity of fufu comes out per unit?

16. What is the average weight of the fufu?

17. Please tick which of these do you sale to? Wholesaler [ ] or retailer [ ].

18. Sources of funds: Personal savings [ ],Friends and relatives [ ],loans [ ].

19. Are you in any co-operative ?Please specify________________________________.

SECTION C: COST AND RETURNS PER WEEK

20. Kindly give information on the cost of performing the following marketing functions

Processing Functions	Quantity	Cost (₦)
Harvesting		
Labour		
Cost of water		
Rent of equipment		
Storage		

Transportation		
Loading & off-loading		
Packaging materials		
Levies		
Starting capital		
Cost of fixed items i.Basins ii.Drums iii.Seive iv.Buckets		
Cost of cassava		
Others, please specify		

21. What Measurement is used for sale of fufu

22. What is the price per Unit?

23. What Quantity do you sell in a week?

24. Do you have any other source of income? Yes [ ],No [ ].If yes please provide answers to any options in the table below.

SOURCE OF INCOME	**AMOUNT EARNED (₦)**
Livestock rearing	
Civil servant	
Trading	
Artisans	
Hired labour	
Others (please specify)	

SECTION D: PROCESSING CONSTRAINTS

25. What are the problems you have always experienced?

Problems	Very serious	Serious	Moderately serious	Least serious	Not serious
Inadequate capital					
Price fluctuations					
Weather problem					
Cassava variety					
Insufficient labour					
Insufficient storage					
Lack of information					
Transport cost					
Inadequate government policy					
Low supply					
Water supply					
Others (specify)					