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ECONOMIC ANALYSIS OF YAM FLOUR PROCESSING IN SAKI, OYO STATE, NIGERIA

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ABSTRACT

The study examined the economics of yam flour processing in Saki, Oyo State, Nigeria. Primary data were obtained using questionnaire. A multistage sampling procedure was used in selecting one hundred and twenty (120) yam processors. Data were analysed using descriptive statistics, budgetary analysis and multiple regressions. Results revealed that 86.5% of yam flour processors were female, 71.2% were married, and 41.4% had primary education. In addition, mean age, household size and production experience of the processors of yam flour were 40 years, 6 persons and 15 years respectively. The gross margin and net farm income were N146,770.03 and N141,536.79 per processing cycle, while the return on investment was 3.25 for every N1 invested which implies that yam flour processing is profitable. Multiple regression revealed that the coefficient of labour cost, transportation cost, cost of storage and packaging and distance to market were negatively significant at 5%, 1%, 1%, and 1% probability level. Also, year of processing experience and membership of association were positively significant at 1% and 5% probability level respectively. The main constraints facing processors of yam flour in the study area were inadequate storage facilities, lack of infrastructural facilities and problem associated with climate change. It is therefore recommended that policies that would enhance large processing capacity so that at the long-run, output and profit can be maximized.

Keyword: Yam flour processing, Yam Processors, Budgetary analysis, Saki.

INTRODUCTION

Yams (Dioscorea species) are annual root tuber-bearing plants with more than 600 species out of which six are socially and economically important in terms of food, cash and medicine (IITA, 2009). Some of the yam species are water yam (Dioscoreaalata), white yam (Dioscorearotundata), yellow yam (Dioscoreacayanensis), Chinese yam (Dioscoreaesculanta) and three-leaf yams (Ike and Inoni, 2006; Olubukola and Bolarin, 2006; Zaknayiba and Tanko, 2013).

Yams are the fifth most harvested crops in Nigeria, following after cassava, maize, guinea corn, and beans/cowpeas. More so, after cassava, yams are the most commonly harvested tuber crops in the country (National Bureau of Statistics, 2012). Yams do not only serve as the main source of earnings and food consumption, but also as a major employer of labour in Nigeria. Processed yam can be easily stored for a long period (12 - 18 months) in absence of moisture (IITA,2003); hence yam is commonly processed into varying forms such as yam flour,

poundo yam flour, flakes, starch, chips etc. using different methods of processing and this serves as a source of generating income to the farmers, processors and marketers.

Problem Statement

In recent years, much attention has been drawn to the quality of dehydrated food product obtained through yam processing. The lack of quality consciousness by the producers and sellers is astonishing, considering the fact that processed yam of various forms is a major staple food in the country, there are many export opportunities for Nigerian products to countries in the West African sub- region. (Philips *et al*, 2004). Yam flour is one of the Nigerian Food products which could be exported if produced and displayed in a more hygienic condition. Also, yam flour production have been faced with constraints which includes poor processing, inadequate storage facilities, poor transportation, lack of infrastructural facilities and problems associated with climatic change, numerous efforts have been made to counter all these problems by investors, government, policy makers and non-governmental organization. So it is imperative to examine the economics of yam flour processing and this give rise to the following research questions:

1. What are the socioeconomic characteristics of yam processors in the study area?
2. What is the profitability of yam processing in the study area?
3. What are the factors affecting the profitability of yam processing in the study area?
4. What are the constraints to yam processing in the study area?

Objectives of the Study

The broad objective of the study was to examine the economics of yam flour processing in Saki, Oyo State, Nigeria.

The specific objectives were to:
1. describe the socioeconomic characteristic of yam flour processors in the study area
2. estimate the profitability of yam flour processing in the study area
3. determine the factors affecting the profitability of yam flour processing in the study area
4. identify constraints facing processing of yam flour in the study area.

LITERATURE REVIEW

Varieties of Yam

The genus Dioscorea contains a wide range of yam species used as food. There are many varieties of yam species widespread throughout the humid tropics, the most economically important species which are grown are White yam (D. rotundata), Yellow yam (D. cayensis), Water yam (D. alata), Chinese yam (D. esculenta) Aerial yam (D. bulbifera) and Trifolate yam (D. dumentorum) (Ike and Inoni, 2006).

White yam (Dioscorea rotundata) is grown in West Africa especially Nigeria. It is about 1.6 m in height and weighs about 2-5 kg depending on size. The tuber has a rough skin usually dark to light brown in colour. This rough skin can be peeled with minimal degree of difficulty. The yam become edible only if it is well washed and properly cooked. These steps are necessary in order to reduce the anti-nutritional components of yam before consumption (Dumnnt and Vernier, 1997; Alinnor and Akalezi, 2010).

Yellow yam (Dioscorea cayenensis Lam.) which derives its common name from its yellow flesh is also native to West Africa and very similar to the white yam in appearance. Its yellow flesh is caused by the presence of

carotenoids. Apart from some morphological differences (the tuber skin is firm and less extensively grooved), the yellow yam has a longer period of vegetation and a shorter dormancy than white yam (Mignouna and Dansi, 2003).

Water yam (Dioscorea alata L.) is the most widely distributed species of yam, though the total quantity produced is less than that of white yam (Scott *et al*., 2000). According to Lebot et al. (2005), it is the most widely distributed species in the humid and semi-humid tropics. It is a vigorously growing, twining, herbaceous vine reaching 10-20 m in length. The large tubers are used as food. D. alata is less highly regarded than the indigenous D. rotundata in West Africa (Brunsnschweiler *et al*., 2004). The tuber shape is generally cylindrical, but can be extremely variable. Tuber flesh is white and "watery" in texture. It is an important food in Africa, the Caribbean and especially Melanesia where it has considerable social and cultural importance (Lebot *et al*., 2005). There is very little international trade, even though significant trade in the commodity occurs within the various producing countries. A large number of cultivars have been recorded throughout the tropics varying in shape and colour of leaves, stems and tubers. The most widely grown cultivar in the Caribbean is 'White Lisbon', which is high-yielding, with shallow -rooting tubers with a pronounced neck and 2-3 finger-like portions with a length of about 20 cm; outer cortex creamy white; flesh white; very palatable and storing well for 5-6 months. The' Lisbon' yams probably get their name from the port of Lisbon to which yams were taken from Sao Tome to feed slaves, who were resold there before shipping them to the New World (Onwueme, 1997).

Bitter yam (Dioscorea dumetorum) is also called trifoliate yam because of its leaves. It originates in Africa where wild cultivars also exist. One marked characteristic of the bitter yam is the bitter flavour of its tubers. Another undesired characteristic is that the flesh hardens if not cooked soon after harvest. Some wild cultivars of bitter yam tubers are highly poisonous (Mignouna et al., 2004).

Chinese yam (Dioscorea opposita): The Chinese yam plant is smaller than the African, with the vines about 3 meters (10 feet) long. It is tolerant to frost and can be grown in much cooler conditions than other yams. It is now grown in China, Korea, and Japan. It was introduced to Europe in the 1800s when the potato crop was falling victim to diseases, and is still grown in France for the Asian food market. The tubers are harvested after about 6 months of growth. Some are eaten right after harvesting and some are used as ingredients for other dishes, including noodles, and for traditional medicines (Kay, 1987).

Constraints to Yam Flour Processing

Some studies (Ayanwuyi *et al*., 2011; Kleih *et al*., 2012) stressed that low soil fertility, lack of improved yam varieties, poor road networks, high cost of labour and lack of finance to carry out necessary farming activities were the constraints to productivity. Yams like many other crops in Nigeria are labour intensive. The high cost of labour has been among the major constraints to yam production. It has constrained smallholder yam farmers from enhancing productivity (Ayanwuyi *et al*., 2011; Migap and Audu, 2012). The labour cost of yam production from mounding to staking, especially in the forest areas account for approximately 40% of cultivation costs. In addition, about 50%

of the expenditure goes to the planting process (IITA, 2009). In order to cut labour cost, most family members practically do all the production and marketing activities themselves (Ike and Inoni, 2006). Okeoghene et al. (2013), confirmed that over 65% of smallholder farmers used family labour in Delta State, Nigeria.

Yam Flour Processing (Elubo)

Yam flour is brownish in colour, and is made from dried yam. Yam flour is often fortified with vitamins (e.g. A, B, B_2, B_3) or minerals (e.g. iron), or occasionally blended with other flours. With regard to the properties of the end-product, both yam flour and Instant Pounded Yam Flour are expected to have a moisture content of around 10%, and should be free of moulds (fungi), etc. It is estimated that dried yam products have a shelf-life of approximately one year. Yam flour is used to make a very popular Nigerian meal called "Amala". Yams used in the production of amala are usually white in color but turn brown when dried and blended into flour called "Elubo"in Yoruba language. This gives amala its brown colour. Amala is eaten mostly by the Yorubas in Southwest and Tivs in middle belt of Nigeria.

Machinery and Equipment of Yam Flour Processing

The major machinery and equipment for processing of yam flour are:

a. Yam Slicer
b. Yam Parboiler
c. Cabinet Dryer
d. Hammer Mill with Cyclone
e. Weighing Scale
f. Packaging machine

Processing Technology

The process involved in yam flour production is:

i. Procurement of good quality tubers:

The first step to producing yam flour is getting the white variety of yam tubers (rotundata). Sometimes, to avoid wastage, yam tubers which are about spoiling are used to make yam flour.

ii. Washing yam tubers:

Selected yam tubers are washed thoroughly to remove dirt and sand particles. This also ensures that the yam flour is hygienically produced.

iii. Peeling of yam tubers:

This is the removal of the outer corky periderm. The method of peeling varies. The general methods apply include:

a) Steam Peeling: This involves the exposure of the tubers to steam pressure for a period of time. The process may be in batches or continuous. During this steam pressure, the steam penetrates the pressure cortex, often the peel results in a slight expansion of the space between the peel and the cortex. This makes it easy for the peels to be removed when subject to minor abrasive or mechanical processing.

b) Chemical Peeling: This involves the immersion of the yam tuber in some nontoxic chemical such as caustic soda solution of low concentration which helps to soften the peel. Usually, when this method is used, they are coupled with the use of heat. The process is controlled by varying the concentration of the dye and its temperature for effective peeling process. One major setbacks of this method is the need to use a large volume of water to remove the effect of the chemical during the post-peeling washing.

c) Mechanical peeling: The basic mechanical method includes the abrasive peelers, rotary laid mounted rim peelers and use of belt conveyor. In the abrasive peeler, the peeler consists of a vertical cylinder with a rotating disc in the bottom and a hinge cover at the top. Abrasive grits may be applied to the inner walls of the chambers or to rotating disc or both. A measured load of the root or tuber is put into the cylinder and when the disc is rotated, the tuber spins or thimble so that the peels are rubbed off when the tubers shall against the abrasive surface.

iv. Soaking of yam tubers: After peeling the yam tubers, they are cut into smaller sizes called flakes after which they are parboiled at 50 ^{o}C in 2 minutes and allowed to cool in the water in which they were parboiled.

v. Drying: Drying is done to reduce the moisture content in the yam flakes. The yam flakes are dried in the drying chamber at a particular temperature. This helps reduce the growth of moulds and other bacterial micro-organisms which may affect the quality of the yam flour. It also ensures freshness and preservation of the quality of yam flour produced.

vi. Milling: Dried yam flakes are milled in a miller until a uniform particle size is achieved.

vii. Bagging and packaging: The yam flour produced are bagged and packaged in an air-tight bag to avoid the growth of mould and other micro-organisms which may occur as result of moisture and air.

Importance of Yam Flour

1. Good for Weight Loss: Yam Flour is an effective weight loss aid. It has a high fibre content that helps to flush out waste from the body. And even the pepper which is used to prepare most of the local soups for the dish contains a chemical compound called capsaicin that prevents immature fat cells from developing and so promotes weight loss.

2. Improves Cardiovascular Diseases: The presence of dietary fibre in yam flour helps to reduce low-density lipoproteins which is one of the carriers of cholesterol.
Thereby preventing or reducing the risks of getting any related health conditions which can be caused by high cholesterol in the body.

3. Helps to Manage Diabetes: Yam flour is a good meal for diabetic patients due to its low glycemic index, thus won't cause a rapid rise in blood glucose level of diabetes patients. This is so due to its ability to digest and absorb the carbohydrates in the yam flour slowly which helps to doesn't cause a spike in the blood sugar/insulin levels.

4. Reduces the Risk of Cancer: Yam flour also contains dietary fibre which reduces the risk of colon cancer by preventing hazardous compounds in food from affecting the colon mucosa. It is highly rich in antioxidants that help to fight free radicals in the body. It reduces the risk of cancer and inflammation and prevents cell damage.

5. Boosts Immunity Naturally: Yam flour contains various vitamins and antioxidants that reduce the rate of oxidative stress in the body, thus making the immune system stronger and better. It improves your immunity and fights against infections easily.

6. Improves Eye Health: Daily intake of

Yam flour improves eyesight and helps in curing itchy, watery and sore eyes. The flour gotten from yam is very healthy because it contains lesser calories and more protein per 100g.

7. Stimulates the Digestive System: Yam flour has high fibre and water content and contains anti-inflammatory properties which aid in digestion, thereby preventing constipation.

Studies show that fibre is very essential for healthy bowel movement and secretion of gastric and digestive juices. However, Yam flour is significantly required for a good digestive process.

8. Rich Source of Vitamin B6: Vitamin B6 is a good source of nutrient that helps the body to reduce the risk of developing heart diseases and also helps the body to break down a substance called Homocysteine, which contributes to arterial and blood clots in the blood vessel wall.

9. Prevents Anti-Aging: Yam flour contains antioxidant properties that are very effective in reducing cell damage. It fights against free radicals which causes protein, DNA and cell membrane damage, thus slows downs ageing process.

Foods rich in such antioxidants are considered the first and foremost kind of food for anti-ageing as it slows down the ageing process and promotes a beautiful skin.

10. Fight against Heart Disease: Yam flour helps to fight against heart disease by reducing the buildup of High cholesterol in the body. It boost good cholesterol level or HDL and prevents the thickening of blood vessel walls which is the first sign of heart disease.

11. Promotes Balance in the body: Stress can weaken the immune system, thereby reducing brain function causing an imbalance in the body. Yam flour promotes balance in the body by relieving the body from those accumulated stress.

12. Source of Carbohydrate: Yam contains a high amount of carbohydrate which provides the body with energy and helps in the regulation of blood glucose. This carbohydrate also help to break down fatty acids and prevention of ketosis.

13. Rich Source of Vitamins: Yam flour contains cutting edge-vitamin contents that has a lot of benefit to the human health. The presence of vitamin A makes it a powerful antioxidant in improving eye vision, brain function and reduces inflammation as well. Vitamin B-complex provides the body with the essential nutrients required for body-building and as well makes the body to be in a healthy state. The content of vitamin C provides the body with the basic components required to fight against some common diseases. It also helps to nourish the skin and enhance hair texture due to the content of collagen.

14. Provides Essential Minerals: Consumption of yam flour provides the body with essential minerals such as iron which regulates blood formation and prevents clotting in the body. Potassium helps to maintain normal blood pressure and other minerals which are very essential to the body.

RESEARCH METHODOLOGY

The Study Area

This research was conducted in Saki in Oyo North senatorial district of Oyo State. Saki is

a town situated in the northern part of Oyo State in western Nigeria. It has an area of 2,014 km^2 and a population of 388,225 at the 2006 census. Saki town lies near the source of the Ofiki River, the chief tributary of the Ogun river, about 40 miles (60 km) from the Benin border. It is referred to as the food basket of Oyo State because of its agricultural activities. It is the headquarters of Saki West local government authority.

Sampling Procedure

Multi stage sampling procedure was employed in the study. In stage one, there is purposive selection of one senatorial district out of the three senatorial districts in Oyo State. Oyo North senatorial district was selected because of the abundance of yam and yam processors in the area. Stage two, two Local Government was selected purposively out of the thirteen Local Government Areas in the district, because there are abundance yam production and processing there. They are Saki West Local Government and Saki East Local Government. Stage three, three processing centres were purposively selected in the two Local Government and twenty questionnaire were administered to the yam flour processors in each processing centre which give a sample size of 120.

Analytical Techniques

Data were analyzed using Descriptive statistics, Budgetary analysis and Multiple regression model. Also, data were captured using Statistical Package for Social Student (SPSS).

Descriptive Analysis

Objectives 1 and 4, that is, the socioeconomic characteristic of yam flour processors and constraints facing processing of yam flour were analyzed using this descriptive statistics such as frequency, distribution table and percentages. This was employed to summarize the socioeconomic characteristics of the respondents and constraints facing yam processing in the study area. These characteristics were age, marital status, education level, sex of the processor and household size were used to describe the socioeconomic characteristics of the yam flour processors.

Budgetary Analysis

The profitability of yam flour processing, that is, objective 2 was analyzed using budgetary analytical tools. This was used to determine the profitability of yam processing in the study area. It is specified as follow:

G.M. = TR – TC ---------- equation (1)

Where, TR = Total revenue of the respondent

TVC = Total variable cost (₦)--- equation (2)

TFC= Total fixed cost (₦) ------ equation (3)

TVC + TFC = (TC) Total cost (₦)

G.M = Gross margin (₦) -------- equation (4)

Net farm income (NFI) = GM – TFC ---------- equation (5)

Rate of return on investment =NFI/TC ---------- equation (6)

Multiple Regression Analysis

This was used to achieve objective 3. This was used to determine the factors affecting the profitability of yam processing. The implicit form of the model for yam flour processing in the study area is as follows:

$Y = F(X_1, X_2, X_3, X_4, X_5, X_6 \ldots X_{11} + e)$
Y= Profit
X_1 = Cost of yam tuber (in Naira)
X_2 = Labour cost (in Naira)
X_3 = Transportation cost (in Naira)
X_4 = Cost of storage and packaging (in Naira)
X_5 = Sex (Male = 1 or Female = 0)
X_6 = Age (years)
X_7 = Household size (In number)
X_8 = Years of experience of yam flour processors (years)
X_9 = Years spent in school (years)
X_{10} = Distance to market (km)
X_{11} = Membership of Association (Yes = 1, no = 0)
E = error term

RESULTS AND DISCUSSION

Socioeconomic characteristics of respondents.

Descriptive statistics is used for socioeconomic characteristics were frequency and percentage. The findings on each variable are presented and discussed below:

Table 1 show that 86.5% of the respondents were female and 13.5% of the respondents were male. This means that yam processing in the study area is dominated by female, that is female are more involved in the business of yam processing. Hence, if more men are encouraged to go into the production of yam flour, output of yam flour will increase by an appreciable amount. This is in line with the findings of Salawu*et al*. (2014) who show that 70.8% were female in his research on the economics of yam processing in Oyo state.

Also, majority of the respondents (92.8%) were Yoruba while (7.2%) were Igbo. This revealed that yam flour production was dominated by Yoruba people in the study area. This is in line with the findings of Salawu*et al.* (2014) who show that 100% were Yoruba in his research on the economic analysis of yam processing in Oyo State.

Fifty point 5percent (50.5%) of the respondents had family size ranging from 6 to 10. The average household size is approximately 6. The implication of this study is that most of the respondents have large families. Bameke (2010) asserts that family size is an important index in any rural development intervention which can affect the outcome of that intervention.

Furthermore, 54.1% earned income per production between 30001 and 60000, 35.1% earned income between 15001 and 30000, 5.4% earned income below 15000 and 5.4% earned income above 60000. The average income per production is 37,216.22. This means that more income was earned by the respondent for family sustainability.

Table 1: Socioeconomic characteristics of the respondents

Sex	Frequency	Percentage
Male	15	13.5
Female	96	86.5
Total	**111**	**100**

Tribe of Respondents	Frequency	Percentage
Yoruba	103	92.8
Igbo	8	7.2
Total	**111**	**100**

Household size	Frequency	Percentage
Less than 6	46	41.4
6 to 10	56	50.5
11 to 15	9	8.1
Mean	6	
Total	**111**	**100**

Monthly income (₦)	Frequency	Percentage
Less than 15000	6	5.4
15001 to 30000	39	35.1
30001 to 60000	60	54.1
Greater than 60000	6	5.4
Mean	37216.22	
Total	**111**	**100**

Source: Field survey, 2018

Distribution of respondents based on their processing pattern.

Table 2 reveals that 10.8% of the sampled respondents have less than 6 years of experience, 30.6% have 5-10 years of experience, 39.6% have 11-15 years, and 18.9% have more than 15 years of experience. This implies that people are experienced in the business, a knowledgeable which would enable the processors to understand the intricacies of the business. Also, experience has been shown to enhance more efficient use of scarce resources by small holders in Nigeria (Njoku and Odili, 1991).

Businessmen and women normally belong to one producer association or another. Table 9 shows that majority (77.5%) belong to yam processing association while 22.5% does not belong. This implies that those in association will enjoy various services provided by the association and this will enhance their production and marketing strategies which in turn improve their income level.

Table 2 shows that majority (45%) of the sampled respondents are engaged in yam flour processing, 2.7% were Artisan, 7.2% were Civil servant, 30.6% were traders and 14.41% were farmers. The implication of this finding is that larger proportion of the respondents are engaged in yam processing.

Furthermore, table 2 shows that the respondents produced (34.2%) yam flakes apart from yam flour. This will also serves as an additional source of income to the respondents in the study area. This is in line with the findings of Salawu *et al.* (2014) who show that 88.3% produced flour in his research on the economic analysis of yam processing in Oyo State.

Also, majority of the respondents (71.2%) made use of hired labour while 28.8% use family labour. This implies that the respondents will incur more cost on the use of labour and this can affect the productivity of yam flour in the study area. This is in line with the findings of Salawu *et al*. (2014) who show that 50.8% make use of hired labour in

his research on the economic analysis of yam processing in Oyo State.

In the same vein, the respondents operate at different level of production. Majority of the respondents (36.0%) operate at the retail level, 33.3% operate at both retail and wholesale level and 30.6% operate at the wholesale level.

Table 2 shows that majority of the respondents (31.5%) produced 16kg and above of yam flour, 30.6% produced between 6 to 10kg, 18.0% produced between 11 to 12kg and 19.8% produced below 6kg of yam flour.

Table 2 shows that majority of the respondents (64.0%) does not have access to credit while 36.0% have access to credit facilities. This implies that credit is a constraint to yam processing in the study area.

Also, the majority of the sampled respondents (60.4%) bought their yam from the market while 38.7% got the yam used for processing from their farm and 0.9% got the yam used by trade by barter.

Table 2: Distribution of respondents based on their processing pattern

Variables	Frequency	Percentage
Production experience (years)		
Less than 6	12	10.8
6 to 10	34	30.6
11 to 15	44	39.6
Greater than 15	21	18.9
Mean	13	
Quantity of output (bags)		
Less than 6	22	19.8
6 to 10	34	30.6
11 to 15	20	18.0
Greater than 15	35	31.5
Is yam flour processing your primary occupation		
Yes	50	45.0
No	61	55.0
Secondary occupation		
Artisan	3	2.7
Civil servant	8	7.2
Trading	34	30.6
Farming	16	14.41
Access to credit		
Yes	40	36.0
No	71	64.0
Labour used		
Hired labour	79	71.2
Family labour	32	28.8
Other products apart from yam flour		
Yam flakes	38	34.2

Membership of association		
Yes	86	77.5
No	25	22.5
Level of processing		
Wholesale	34	30.6
Retail	40	36.0
Both	37	33.8
Source of Yam		
From owned farm	43	38.7
Bought from market	67	60.4
Trade by barter	1	0.9

Source: Field survey, 2018

Cost and Return Structure of Yam Processing

One of the objectives of this study is to evaluate the profitability of yam processing in the study area the results of the analysis are presented below;

The result revealed that the revenue realized from yam processing in the study area was ₦183,765.80, the total cost of production was ₦42,229.01, the gross margin realized from yam processing in the study area was ₦146,770.03 and the net farm income realized from yam processing was ₦141,536.79 over processing cycle per bag.

The total fixed cost contributed 12.4% to the total production cost, depreciation on grinding machine contributed 9.9% to the total cost of production, depreciation on container contributed 1.65% to the total production cost, depreciation on knife contributed 0.43% to the total cost of production while depreciation on sack contributed 0.40% to the total cost of processing.

The total variable cost contributed 87.6% to the total processing cost, cost of yam tuber contributed 59.5% to the total cost of processing, cost expended on labour contributed 12.4% to the total cost of production, cost of fuel, water and wood contributed 4.74% to the total cost of production, transportation cost contributed 5.62% to the total production cost, cost of storage and packaging contributed 2.90% to the total production cost while cost of peeling yam tubers contributed 2.45% to the total production cost.

The implication is that cost of purchasing yam tubers contributed most to the total production cost, followed by cost expended on labour, depreciation on grinding machine, transportation cost, cost expended on fuel, water and wood, cost of storage and packaging, cost of peeling, depreciation on container, depreciation on knife and depreciation on sack.

The gross margin and net farm income of yam processors in the study area are positive which implies that yam flour processing is a profitable enterprise. The rate of return on investment in yam flour processing was esti-

mated as 3.25 which imply that for every N1 invested, a return of 25kobo was realized. This is in line with the findings of Salawu *et al.* (2014).

Table 3: Cost and return structure of yam processing

Variable	**Mean(₦)**	**% Cost**	**% Total Cost**
1. **Revenue**	183,765.80		
Fixed Cost			
i. Depreciation on grinding machine	4,183.78	79.95	9.91
ii. Depreciation on container	697.75	13.33	1.65
iii. Depreciation on knife	183.69	3.51	0.43
iv. Depreciation on sack	168.02	3.21	0.40
2. Total Fixed Cost	5,233.24	100.00	12.39
Variable Cost			
i. Cost of yam tuber	25,115.32	67.89	59.47
ii. Labour cost	5,245.95	14.18	12.42
iii. Cost of fuel, water and wood	2,002.70	5.41	4.74
iv. Transportation cost	2,373.87	6.42	5.62
v. Cost of storage and packaging	1,224.60	3.31	2.90
vi. Cost of peeling	1,033.33	2.79	2.45
3. Total Variable Cost	36,995.77	100.00	87.61
4. Total Cost	42,229.01		
5. Gross Margin	146,770.03		
6. Net Farm Income	141,536.79		
7.Rate of return on investment	3.35		

Source: Field survey, 2018

Factors Affecting Profitability of Yam Processing

The result of the multiple regression analysis of the determinants of profitability of yam processing to yam flour revealed that the model is fit, the probability of F revealed that the model is fit at 1% ($p<0.01$) level of significance, the R^2 revealed that 54.4% variation in profit was jointly explained by significant explanatory variable. The dependent variable is profit and with eleven regressors. The coefficients of age, sex, cost of yam tubers, household size and years spent in school were not significant, the coefficients of labour cost, transportation cost , distance to market and cost of packaging and storage had a negative and significant effect on the profitability of yam flour processing and the coefficients of years of experience and membership of association had a positive and significant effect on the profitability of yam flour processing in the study area.

The coefficient of cost of labour revealed that increase in cost of yam tubers reduces the profit of the processors and it is significant at 5% ($p<0.05$) probability level.This implies that if the cost of labour increases by ₦1 the profit realized from yam processing to yam flour will reduce by ₦4.46. The coefficient of transportation cost re-

vealed that increase in cost of yam tubers reduces the profit of the processors and it is significant at 1% ($p<0.01$) probability level, this implies that if the cost of transportation increases by ₦1 the profit realized from yam processing to yam flour will reduce by ₦34.60, the coefficient of cost of storage and packaging revealed that increase in cost storage and packaging reduces the profit of the processors and it is significant at 1% ($p<0.01$) probability level, this implies that if the cost of cost of storage and packaging increases by ₦1 the profit realized from yam processing to yam flour will reduce by ₦29.73, the coefficient of years of experience revealed that increase in years of experience increases the profit of the processors and it is significant at 1% ($p<0.01$) probability level, this implies that if the years of experience increases by 1year the profit realized from yam processing to yam flour will increases by ₦39,7676.36, the coefficient of distance to market revealed that increase in distance to market reduces the profit of the processors and it is significant at 1% ($p<0.01$) probability level, this implies that if the distance to market increases by 1Kilometer the profit realized from yam processing to yam flour will reduces by ₦11,503.431, the coefficient of membership of processing association revealed that the profit of processors that belong to processing association increases and it is significant at 5% ($p<0.05$) probability level, this implies that the profit processors that belong to processing association are more likely to realize profit of ₦55,705.497 when compared with their counterparts that does not belong to processing association.

Table 4: Factors affecting the profitability of yam flour processing

Variable	Coefficient	Standard Error	t-value
Constant	-98872.286	55404.626	-1.785
Cost of yam tubers	-0.583	0.838	-0.695
Labour cost	-4.460**	2.064	-2.161
Transportation cost	-34.598***	4.701	-7.359
Cost of storage and packaging	-29.725***	10.185	-2.98
Sex	33230.260	27358.400	1.215
Age	610.918	1632.330	0.374
Household size	2605.583	4088.473	0.637
Years of experience	39676.366***	1503.233	2.645
Years spent in school	571.015	1644.968	0.347
Distance to market	-11503.431***	2784,186	-4.132
Membership of Association	55705.497**	22089.262	2.522
Diagnostic Statistics			
Probability >F	0.00		
R-Squared	0.51		
Adjusted R-Squared	0.45		

Source: Field survey, 2018.

***($p<0.01$), **($p<0.05$)

Constraints Facing Yam flour Processing

One of the objectives of this study is to identify the constraints facing yam flour producers in the study area, the result of the analysis is presented below;

Majority (64.9%) of the yam flour processors said lack of transportation was not a problem facing them in yam processing to yam flour while 35.1% said it was a problem facing them in yam processing to yam flour, majority (66.7%) of the yam flour processors said climate change was a problem facing them in yam processing to yam flour while 33.3% said it was not a problem facing them in yam processing to yam flour, majority (82.9%) of the yam flour processors said inadequate capital and finance was a problem facing them in yam processing to yam flour while 17.1% said it was not a problem facing them in yam processing to yam flour, majority (75.7%) of the yam flour processors said lack of infrastructural facilities was a problem facing them in yam processing to yam flour while 24.32% said it was not a problem facing them in yam processing to yam flour, majority (72.1%) of the yam flour processors said lack of improved technology was not a problem facing them in yam processing to yam flour while 27.9% said it was a problem facing them in yam processing to yam flour, majority (83.8%) of the yam flour processors said poor communication network was not a problem facing them in yam processing to yam flour while 16.2% said it was a problem facing them in yam processing to yam flour, Majority (73.9%) of the yam flour processors said changes in government policies was not a problem facing them in yam processing to yam flour while 26.1% said it was a problem facing them in yam processing to yam flour, Majority (73.8%) of the yam flour processors said inadequate storage facilities was a problem facing them in yam processing to yam flour while 26.1% said it was a problem facing them in yam processing to yam flour.

Table 5: Constraints facing the yam flour processors

Constraints	Frequency	Percentage
Lack of transportation		
No	72	64.86
Yes	39	35.14
Total	111	100.00
Problem associated with climate change		
No	37	33.33
Yes	74	66.67
Total	111	100.00
Inadequate capital and finance		
No	19	17.12
Yes	92	82.88
Total	111	100.00
Lack of infrastructural facilities		
No	27	24.32
Yes	84	75.68
Total	111	100.00

Lack of improved technology		
No	80	72.07
Yes	31	27.93
Total	111	100.00
Poor communication network		
No	93	83.78
Yes	18	16.22
Total	111	100.00
Changes in government policies		
No	82	73.87
Yes	29	26.13
Total	111	100.00
Inadequate storage facilities		
No	29	26.13
Yes	82	73.87
Total	111	100.00

Source: Field survey, 2018

CONCLUSION

The results of this study revealed that yam flour processing was profitable in the study area. The study also revealed that household size, membership of association, distance to market, cost of yam tubers, as well as cost of storage and packaging of yam flour have significant effects on the profitability of yam flour p processing.

Finally, the problems facing the yam flour processing in the study area are inadequate capital and finance, lack of infrastructural facilities, problem associated with climatic change inadequate storage facilities.

RECOMMENDATIONS

The study revealed that cost of storage and packaging of yam flour are significant on the profitability of yam flour processing, hence intervention should focus on improving storage facilities and other packaging materials to reduce post-harvest lost.

Based on the findings of the study, government at all level should help in good road network construction that will ensure easy passage of the processors product from their production site to the market should all be put in place as these will increase their profitability and also ensure efficiency.

Awareness on the impact of extension services should be made known to the farmers and yam processors so as to get proper information on climate change as well as appropriate varieties to cultivate in other to get optimum yield in their production.

Processing experience was found to have significant effect on the profitability of the processors Therefore processors should continue to engage in yam processing to gain more experience so that in the long-run, output and profit can be maximized.
Since the return on investment is very high that is, yam processing in the study area is profitable. Thus, campaign on the profitability of yam flour processing in the study area should be advocated and intensified with emphasis on the efficient use of resources.

Suggestion for further study

The scope of the study was limited to yam processors who major in flour (Elubo), further researches if carried out should cover other major product from processing yam in South West, Nigeria.

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