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ECONOMIC ANALYSIS OF SELECTED CASSAVA PRODUCTS IN THE KULODI CASSAVA PROCESSING COMMUNITY AREA OF OYO STATE, NIGERIA

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Abstract. Cassava is mostly produced for food especially in the form of gari, lafun and fufu with little or no use in the agribusiness sector as an industrial raw material. Therefore, this study examined primary data obtained from 120 processors obtained through a multi-stage sampling procedure. These data were analyzed using descriptive statistics, ordinary least squares (OLS), gross margin analysis and a Likert scale. The objectives of the study were: to describe the socio-economic characteristics and method of processing used by the respondents in the study area; to determine returns to cassava processing; and to evaluate the socio-economic factors influencing the profitability of selected cassava products processing in the area in question. The socio-economic factors identified include age, sex, marital status, household size, method of processing, distance to market, market uncertainty, inadequate infrastructure and high cost of input. The study shows that the majority of processors were still of their economically active age and have a functional cassava processing association which can enable them to experience the benefits of group dynamics from government and non-government associations. Moreover, the majority of both cassava products still use the traditional processing method, which is both time-consuming and labour-intensive. Furthermore, processing fufu and garri were profitable in the study area but fufu is more profitable than garri in terms of the return on investment, which amounted to 1.12 and 1.03, respectively. For profitable returns, the study recommended cassava processors adopt a modern method of processing and government and non-government associations should help in the acquisition of modern processing equipment. Furthermore, cassava processors should be trained in using cassava waste for generating biogas to reduce processing costs.

Keywords: cassava, regression analysis, value addition, Nigeria

INTRODUCTION

Agriculture is the foundation of Nigeria's economy, despite the oil business being a significant sector. The agriculture sector in Nigeria provides food for its growing population, income for smallholders, employment for industrial development and also raw materials for industries. One of the potential sub-agricultural sectors in Nigeria is cassava production, as Nigeria is one of the largest producers in the world with a cassava root production of 268 million tons in 2014 (WorldAtlas, 2019).

Cassava is one of the most widely cultivated and consumed food crops in many parts of the world (Kouakou & Nanga Nanga, 2016). About 600 million people are dependent on cassava foods in Africa, according to the International Fund for Agricultural Development (IFAD, 2013). *Manihot esculenta* is a root tuber cultivated in rainforests and savannah zones, and it can also be grown in all the ecological zones in Nigeria; cassava is planted all year round, depending on the availability of moisture (Odoemenem and Otanwa, 2011). Cassava is more tolerant to low soil fertility and more resistant to drought, pests and diseases compared to grains (Obisesan, 2013).

Sanni et al. (2008) stated that cassava roots are perishable and contain potentially toxic glycoside, therefore

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some form of processing is needed. Moreover, IITA in 2005 proposed that processing cassava occurs prior to consumption, which is essential because of its cyanide content, and that cassava cannot be stored for a long time after being harvested. Cassava can be processed into food and non-food products. It passes through different processing stages aimed at reducing toxicity, improving palatability and converting perishable fresh roots into stable products like garri (the traditional product), fufu/akpu (which is consumed across Nigeria), cassava flour (lafun) – a very popular food among the Yoruba in the South-West, cassava chips, (mbuba/bobozi) boiled cassava; popular amidst the Ibos of the South-East, tapioca (a delicacy among the Urhobos, Itekiris and Ijaws of the Niger Delta) and lastly, starch also known as usi among the people of the Niger Delta (Omoregie, 2005).

Cassava is used as a source of biofuel as well as animal feed (Adekanye et al., 2013). Excluding livestock feed, cassava is used as industrial raw materials for production of adhesives, bakery products, dextrin, dextrose glucose, lactose and sucrose. Moreover, the food and beverage industries use cassava products in the production of jelly caramel, pharmaceuticals, ethanol in cosmetics and drugs (Obayelu et al., 2018).

Processing in Nigeria occurs in two ways; cottage-level and industrial processing (Nigeria Agriculture Promotion Policy [APP], 2016). The cottage level of the processing involves the use of semi-mechanized equipment and labour, which is time-consuming and labour-intensive. Also, most people involved in cassava processing are rural women (PIND, 2011). Cassava processing activities have an impact on the environment, which can either be positive or negative. The negative effect on the environment is in the form of a stench and microbial load, which may prove harmful to human health (Omueti, 2004). Furthermore, Ayoade and Adeola (2009) stated that unstable agricultural policies and a fluctuating power supply affect the processing of cassava products. They also mentioned that a lack of financial assistance and the high cost of processing cassava products are among the problems cassava processors are facing.

Value added to cassava creates opportunities such as job creation, income for households, opportunity to reduce post-harvest loss and a chance for international trade. This study attempts to: find out whether the selected cassava products (fufu and garri) is a profitable venture; examine the determinants of profitability level; identify some of the challenges facing the processors in the study area.

The main gap is to know if the cost and return of cassava product in the community is profitable. Conversely, the lack of value chain addition resulting from poor processing methods and techniques, as well as the lack of marketing industries to link farmers to consumers, could lead to low quality of life. Hence, poor or a lack of food production would lead to poor socioeconomic conditions and hindered national development.

MATERIALS AND METHODS

Study area

This study was carried out in Kulodi cassava processing community, which lies between 7°23'N and 4°01'E in Egbeda Local Government Area with its headquarters in town of Egbeda. Egbeda Local Government was carved out of Lagelu Local Government in 1989 with the administrative headquarters at Egbeda. This local government area covers almost 420 square kilometers with a relatively undulating topography of about 235 metres above sea level. Egbeda Local Government is a suburb of Ibadan metropolis, and there are about 195 settlements in the Area, over 60% of which are settlements are rural in nature, with a land mass of about 420 square kilometers. The majority of citizens and residents in the local government area are predominantly farmers, public and civil servants and artisans. The main sources of income of these people are agriculture, monthly wage and sales of farm produce.

Sampling procedure and sample size

A multi-stage sampling technique was used. At the first stage, a purposive sampling technique was used to select Kulodi cassava processing community as one of the CAVA II project centers in Oyo state. Stratified sampling techniques were used at the second stage to divide the population into two strata based on the type of cassava products they process, while simple random sampling was used at third stage to select 60 garri processors and 60 fufu processors, making a sample totalling 120 cassava processors in the study area.

Method of data collection

The data used in this study were obtained from primary sources with the aid of a structured questionnaire. This was designed to collect information on the

socio-economic characteristics of the processors, input costs and returns, the method of processing and constraints limiting cassava processing.

Analytical techniques

Descriptive statistics and inferential statistics were used in the study. Descriptive statistics such as frequency counts and percentages were used to describe the socio-economic characteristics, and the method of processing. A 3-point Likert scale was used for constraints on processing, while multiple regression and budgetary analytical techniques were used to analyze the profitability of cassava processing.

Budgetary analysis

Budgetary analysis was used to determine the costs and returns to factors involved in processing. It estimates the profitability of any particular business venture.

$$\text{Net Profit} = \text{TR} - \text{TC} \quad (1)$$

$$\text{TR} = \text{P} \times \text{Q} \quad (2)$$

where:

TR – total revenue accruable from the sales of cassava products

TVC – total variable cost incurred in processing e.g. labour, firewood, water, cassava tuber.

Total Cost (TR) = Total variable cost (TVC) + Depreciated fixed cost (DFC)

P – price per unit of processed cassava products.

Q – quantity of processed cassava products.

$$\text{Rate of return on investment (ROI)} = \text{TR/TVC} \cdot 100 \quad (3)$$

Regression model

A linear form of multiple regression was used to determine the socio-economic factors influencing the profitability level of the selected cassava product processors in the study area. The empirical model that was used in the study is specified as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10})$$

The explicit form is stated in equation 4:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \mu \quad (4)$$

where:

Y – represent the profitability level of *garri* and *fufu*, X_1 – is age of processors; X_2 – is sex (female 0, male 1); X_3 – is years spent in school (years); X_4 – is household size (number); X_5 – is marital status; X_6 – is method of processing (traditional 0, modern 1); X_7 – is distance to market (km); X_8 – is high cost of inputs; (Yes or No) X_9 – is market uncertainty; (Yes or No) X_{10} – is inadequate storage facilities; (Yes or No) X_{11} – is high transportation cost of point-of-sale product; (Yes or No) X_{12} – is problem of sun drying during rainy season; (Yes or No) β_0 – is constant term and β_1 to β_{12} are parameters to be estimated.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The socio-economic characteristics of interest in the study include age, sex marital status, household size, social groups, source of labour, and method of processing. The results Table 1) shows that most processors (48.33% and 46.67%) of both products (fufu and garri) were between 41-50 years of age and cassava processing was dominated by female farmers (100% of fufu processors and 90% of garri processors) in the study area. This supports the findings from FAO 2004 (Onyemauwa, 2012) research that women dominate cassava farming, marketing and processing activities in the south-west region of Nigeria. Also, the majority of fufu and garri processors use the traditional method of processing - 66.67% and 85% for both fufu and garri, respectively, which shows that the processors still use tedious, laborious and time-consuming methods of processing cassava. In addition, the majority of the processors (fufu and garri) belong to either a religious association, cooperative, Cassava Processing Association or a combination of one or two of the listed social groups, while about 3.33% of fufu processors and 8.33% of garri processors belongs to none of the social groups. Membership of these social groups allow processors to access benefits such as funds, empowerment programs and incentives from government and Non-Government Organizations as an association.

Cost and return in processing the selected cassava product

Table 2 shows the costs incurred and returns realized in processing the selected cassava product (fufu and garri), the average weekly costs of purchasing raw cassava tuber, transportation, labour, firewood, peeling, sieving, dewatering, water supply and packing material in the study were ₦14883.33, ₦2711.667, ₦2255, ₦1181.667,

Table 1. Socio-economic characteristics of the respondent

Variables	Frequency	Percentage	Frequency	Percentage
	FUFU		GARRI	
Age (years)				
Below 40	26	43.33	20	33.33
41–50	29	48.33	28	46.67
51–60	5	8.33	11	18.33
>60			1	1.67
Mean age	42.18333		43.93333	
Sex				
Female	60	100.00	54	90.00
Male			6	10.00
Marital status				
Married	39	65.00	49	81.67
Widow	15	25.00	7	11.67
Divorced	6	10.00	4	6.67
Household size				
4–6	14	23.33	49	81.67
7–9	43	71.67	11	18.33
10–12	3	5.00		
Mean household size	4.416667		5.166667	
Social group				
None	2	3.33	5	8.33
Cooperatives	22	36.67	6	10.00
Religion association	6	10.00	2	3.33
Cassava processing association	30	50.00	34	56.67
Cooperative and cassava processing			13	21.67
Source of labour				
Hired labour	40	66.67	32	53.33
Household and hired labour	20	33.33	28	46.67
Method of processing				
Traditional	40	66.67	51	85.00
Modern	20	33.33	9	15.00

Source: field survey, 2019.

₦1080, ₦598.3333, ₦535, and ₦500, respectively, for fufu , while the average weekly cost of purchasing raw cassava tuber, frying, transportation, labour, firewood, grating and sieving in the study area were ₦14908.33, ₦3361.667, ₦3196.667, ₦2703.333, ₦2141.667, ₦1345.833 and ₦1073.333, respectively, for garri processing. Furthermore, the weekly mean total variable cost incurred when processing garri was ₦31070.83 and the average total revenue 34274.5. The majority of the cost incurred in processing garri was the cost of purchasing raw cassava tuber, which amounted to 44.85% of the variable cost; the return on investment was 1.030911, while that weekly mean total variable cost incurred on processing fufu was ₦26845 and the average total revenue ₦34140. Although 49.07% of the processing cost was for cassava roots, which are the major input, the

Table 2. Cost and returns of processing of selected cassava products

Variables	Mean	Percentage	Mean	Percentage
	FUFU		GARRI	
Total revenue	34 140		34 275	
Variables cost				
Cost of cassava tuber	14 883.33	49.07	14 908.33	44.84
Cost of firewood	2255	7.43	2 141.667	6.44
Cost of labour	2 711.667	8.94	2 703.333	8.13
Cost of fuel			103.3333	0.31
Cost of transportation	3 100	10.22	3 196.667	9.61
Cost of peeling	1 181.667	3.90	1185	3.56
Cost of grating			1 345.833	4.05
Cost sieving	1080	3.56	1 073.333	3.23
Cost of dewatering	598.3333	1.97	483.3333	1.45
Cost of frying			3 361.667	10.11
Cost of water supply	535	1.76	343.3333	1.03
Cost of packing material/sealing	500	1.65	225	0.68
Total depreciated fixed cost (Grater, Sacks, knives, Big basins, Small basins, Weighing scale, sifter, Frying pots, Turning sticks/spoons)	3 488.673	11.50	2 175.979	6.54
Total cost	30 333.67	100.00	33 246.81	100.00
Profit	3 806.329		1 027.691	
Return on investment	1.126		1.030911	

Source: field survey, 2019.

return on investment was 1.126, indicating that every naira invested by fufu cassava processors gave a return of ₦1.126. These results are in line with the findings of Dorothy et al. (2019), who ascertained that processing cassava into different products is highly profitable with a good ROI.

Result of the regression analysis

Table 4 shows the socio-economic factors influencing the profitability of processing selected cassava products, in which a multiple linear form of the regression model was found to have the best fit. The result shows that the coefficients of age, years spent in school, marital status, inadequate capital and the problem of sun-drying during the rainy season are positively related to factors influencing the profitability of fufu processing, implying that a percentage increase in any of the positively related variables will impact on profitability. At the same time, the coefficients of age, market uncertainty, years spent in school, household size, and inadequate capital were negatively related to factors influencing the profitability of garri processing. Furthermore, age, method of processing, poor road networks and inadequate transport facilities are significant at 1% in fufu processing with an r-square of 0.5653, which indicates that 56.53% of the variation in the profitability of fufu processing was explained by the explanatory variables included in the model. Household size, inadequate storage facilities, the high transport of cost to point of sale, and market uncertainty are significant at 10%. In garri processing, an r-square of 0.4844 indicates that 48.44% of the variation in the profitability of garri was explained by the explanatory variable included in the model.

Constraints affecting processors of the selected cassava products

Table 4 shows various constraints faced by processors of the selected product in which a solution has been produced to minimize those constraints. Some of the constraints above the typical ones faced by both fufu

Table 3. Socio-economic factors influencing profitability of the selected cassava products processing

Profitability Variables	Co-efficient	T(value)	Co-efficient	T(value)
	FUFU		GARRI	
Age	.0049638***	4.10	–.0038658**	–2.12
Years spent in school	.0007957	0.50	–.0033552	–1.13
Household size	.0007121	0.11	–.0215727*	–1.98
Marital status	–.0013226	–0.07	.0149527	0.46
Method of processing	–.0525919***	–3.51	–.0211093	–0.65
Distance to market	–.0035636	–1.50	.0009785	0.20
Inadequate capital	.0080709	0.68	–.0048467	–0.22
Inadequate storage facilities			.0673195*	1.87
Poor road network and inadequate transport facilities	–.04066***	–2.83		
High cost of inputs	.0234077	1.62	.0282469	0.49
Market uncertainty	–.0157925	–1.35	–.0542842*	–1.80
High cost of input to point of sales of products	–.0260971**	–2.22	–.0437657*	–1.77
Problem of sun drying during rainy season	.0185114	1.33		
Constant	1.319962	7.36	1.278312	3.41
Number of observation	60		60	
R-Squared	0.5653		0.4844	
Adjusted R-squared	0.4544		0.4204	
Probability>F	0.0000		0.0941	

***Significant at 1%. **Significant at 5%. *Significant at 10%.
Source: field survey, 2019.

and garri processors were inadequate capital, lack of improved technology, inadequate storage facilities, poor road network and inadequate transport facilities.

CONCLUSION

The study investigated the processing of selected cassava products (fufu and garri) in Kulodi cassava processing community in Oyo state, Nigeria. The study shows that the majority of the processors were still in economically active age and the majority still use traditional methods of processing selected cassava products. The findings also revealed that the processors have a functional cassava processing association, therefore, they will be able to experience the benefits of group dynamics from government or non-government associations. Both processing fufu and garri were profitable in the study but fufu processing is more profitable than garri, as the ROI on fufu is 1.12, while for garri it is 1.03091. This is important for future investment and interested investors can regard these two products (garri and fufu) as a profitable enterprise. Cassava processing is also one of the enterprises that has the potential of adding value to our Gross Domestic Product (GDP) and also create employment opportunities for country's growing population. High sales/turnover are the key to profitability, hence market development is the key driver of the profitability we desire in the Nigerian cassava industry.

Table 4. Constraints faced by processors of the selected cassava products

Constraints	Major constraint	Minor constraint	Not a constraint	Major constraint	Minor constraint	Not a constraint
		FUFU			GARRRI	
Inadequate capital	35 (58.33)	24 (40.00)	1 (1.67)	33 (55.00)	27 (45.00)	0 (0.00)
Labour scarcity or supply problem	13 (21.67)	35 (58.33)	12 (20.00)	15 (25.00)	42 (70.00)	3 (5.00)
Problem of water supply	0 (0.00)	33 (55.00)	27 (45.00)	0 (0.00)	31 (51.67)	29 (48.33)
Poor road network and inadequate transport facilities	31 (51.67)	29 (48.33	0 (0.00)	59 (98.33)	1 (1.67	0 (0.00)
Fluctuation in price of cassava tuber	15 (25.00)	42 (70.00)	3 (5.00)	15 (25.00)	44 (73.33)	1 (1.67)
Lack of improved technology	45 (75.00)	13 (21.67)	2 (3.33)	48 (80.00)	6 (10.00)	6 (10.00)
Problem of sun drying during rainy season	0 (0.00)	22 (36.67)	38 (63.33)	1 (1.67)	37 (61.17)	22 (36.67)
Long period of fermentation during wet season	17 (28.33)	43 (71.67)	0 (0.00)	23 (38.33)	36 (60.00)	1 (1.67)
Inadequate storage facilities	24 (40.00)	35 (58.33)	1 (1.67)	50 (83.33)	10 (16.67)	0 (0.00)
High perishability of raw cassava tuber	24 (40.00)	34 (56.67)	2 (3.33)	27 (45.00)	33 (55.00)	0 (0.00)
Market uncertainty	31 (51.67)	28 (46.67)	1 (1.67)	52 (86.67)	7 (11.67)	1 (1.67)
High cost of inputs	43 (71.67)	17 28.33	0 (0.00)	57 (95.00)	3 (5.00)	0 (0.00)
Poor electricity	20 (33.33)	30 (50.00)	10 (16.67)	20 (33.33)	36 (60.00)	4 (6.67)
High transportation cost to point of sales of the products	8 (13.33)	42 (70.00)	10 (16.67)	43 (71.67)	16 (26.67)	1 (1.67)

Source: field survey, 2019.

RECOMMENDATION

It is therefore recommended that modern methods of processing should be adopted by the cassava processors to increase the profitability level of selected cassava products. Government and non-government associations should help the processors acquire the modern equipment used in processing to reduce the use of traditional methods, which are labour-intensive and time-consuming. Nigeria's government should subsidize input such as cassava tuber for processors in order to increase the profitability of selected cassava products. The high cost of raw materials used in processing cassava reduces the profitability of cassava processors, who should be trained in using cassava waste to generate biogas to reduce processing costs.

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