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ECONOMICS OF TRADITIONAL CASSAVA PROCESSING TECHNOLOGY AMONG SMALL-HOLDER FEMALE CASSAVA PROCESSORS IN DELTA NORTH AGRICULTURAL ZONE, DELTA STATE NIGERIA

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ABSTRACT

The study determined the economics of traditional cassava processing technology among small-holder female cassava processors in delta North Agricultural Zone, Delta State Nigeria. Multi-stage sampling procedure was used to select 60 cassava processors in the study area. Qualitative and quantitative techniques were used to analyze the information obtained from the questionnaire survey. To determine the profitability of traditional cassava processing among female cassava processors in the study area, average of 5,000kg of cassava tubers was measured and used per processors within the year under study. The result also indicated that the processors were well experienced (mean experience of 24.70 years) and were low income earners with a mean income of =N=333,383 ($952.52). The findings also revealed that the variable cost components constituted the major cost components the by-products obtained. The result also indicated that garri, starch, akpu and abacha were the main products obtained from processing cassava and that garri/starch was the most profitable by-product of cassava with a net profit of ₦71,191.50 ($203.44) followed byakpu ₦48,832 ($139.55) and abcha ₦60,452 ($172.73) respectively. The return on investment indicated that traditional cassava processing technology in the study area was profitable. Based on the finding of the study, it was recommended that traditional cassava processors in the study area should form co-operation societies pull their resources together in other to enjoy the benefits of economics of scale as well as benefits arising from government programmes. It also recommended that government-private sector intervention should be encouraged. Public enlightenment campaign on the profitability of cassava processing also recommended to be carried out.

Key words: Technology, processing, gross margin, net profit, akpu, abach, starch and garri.

I. INTRODUCTION

Cassava is a root crop that is wildly cultivated and accepted as one of the most important crops in Nigeria. Okunde *et al.,*(2005) reported that the most widely cultivated crop in southern part of Nigeria is cassava. This assertion was made in terms of area devoted to the production and number of farmers involved in cassava production. Brodrick and Sanzidur (2014) reported that cassava has the prospect to support agricultural growth in Nigeria due to its wide range of domestic and industrial use. Researches in the recent past has shown that 40–50% of the world cassava output is produced in Africa (Brodrick and Sanzidur 2014,Nang'ayo*et al.,* 2007and FAO, 2005). Ismaila *et al.,* (2010), Ayoade and Adeola, 2009; Knipscheer *et al*., 2007; Nweke, 2004 reported that Nigeria and Ghana are the leading producers of cassava in the world. On the other hand, Alabi and Oviasogie (2005) opined that cassava production in Nigeria accounted for about 35 percent of total cassava produced in Africa. This is why it is regarded as being very important in food security of the rural economy due to its inherent capacity to yield under marginal soil conditions where other crops cannot survive as well as its ability to tolerate drought conditions (Nweke 2002).

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Cassava is a major income generating crop among the rural small-holder farmers. Eze and Nwibo (2014) and Omonona (2009) opined that cassava production is in the hands of small holder farm families with low level income and production techniques. Traditional production technology is most common among small-holder farmers despite efforts made by various governments to encourage modern cassava production technology (Eze and Nwibo, 2014). Research has shown that cassava root cannot last long after harvesting and so should be processed immediately (Davies *et al.,*2008, and Abolaji *et al*., 2007). Onabowale (2008) in consonance with this stated that cassava roots after harvesting must be preserved, processed or stored to avoid decomposition. Cassava processing is therefore essential to extend its shelf life and provide utility.

Processing involves the conversion of agricultural produce, the raw form (input) to a finished and transformed product otherwise called output. This important post harvest operation leads to weight and size reduction (Kaine, 2018). Processed by-product of cassava include: *garri*, starch, *akpu (fufu)* and *abacha (bobozi).* Aminu *et al* (2017) opined that *garri* is the by-product of cassava that is most widely consumed in Nigeria. *Garri* can either be consumed as a major meal (eba) with soup, vegetable and stew. It can also be consumed as snacks. As snacks, it is usually soaked in cold water with sugar, milk and beverages or sugar and salt added to it and consumed with either roasted ground nut, coconut and sometimes dried fish (Komolafe and Arawande, 2010). *Garri* is consumed as daily diet up to 2 – 3 times daily among most households in rural areas where it is mostly produced.

Akpu (fufu) is a pasty product obtained or processed from cassava roots through the process of fermentation. The product obtained is either boiled or cooked to give it a more palatable, pasty consistency needed for consumption. *Apku (fufu)* can be consumed with either *egusi* (melon) soup, stew or served with vegetables (Kaine, 2011). *Abacha (bobozi)* is another by – product of cassava obtained from cassava roots by peeling, washing, cooking, slicing and drying. The product obtained is consumed as snacks.

Cassava processing has been carried out in the study area by small-holder processors using traditional technology. Studies have also been conducted in various areas of cassava including production, processing and marketing. It is not certain that adequate information on economics of traditional cassava processing among small-holder cassava processors in Delta North Agricultural Zone, Delta State, Nigeria exist.It is not also positive that small-holder cassava processors in the study area were maximizing profit. It is against this background that the study was conducted. Specifically, the study sought to determine the socioeconomic characteristics cassava processors, ascertain the cassava processing enterprise variables, by- products of cassava as well as cost and return of cassava processing in the study area.

II. METHODOLOGY

This study was conducted in Delta North Agricultural Zone; Delta State, Nigeria.Delta North Agricultural Zone is one of the three Zones that make up Delta State Agricultural Zones and thus corresponding to the three geopolitical Zones in the State. The study area has a total population of 1,236,840 people representing thirty percent (30%) of the total population of Delta State, Nigeria. This is composed of 614,534 males and 622306 females out of the total population of Delta State of 4,112,445 people (National Population Commission, 2006). Multi-stage random sampling technique was used to select processors that were used for the study. First, six (6) Local Government Areas (LGA) from nine LGA that made up the study area were randomly selected

and used for this study. Stage two involved the selection of communities. Three (3) communities were randomly selected from each of the selected LGA given a total of twelve (12) communities that were selected and used for the study. The third stage involved selection of cassava processors. From the list of the communities drawn, five (5) cassava processors were randomly selected given a sample size of sixty (60) that were selected and used for the study. Both quantitative and qualitative statistical techniques were used to code and analyze the data generated for the study. Descriptive statistic (such as frequency distribution, means and percentages) were used to determine the socioeconomic characteristics, ascertain cassava processing enterprise variables, identify and by - products of processed cassava. The profitability of traditional technology was determined using Net Profit and Gross Margin Analysis.

Determination of Gross Margin and Net Profit

The modern specification is stated below.

GM = Total Revenue (TR) – Total Variable Cost (TVC)
TC = Total Variable Cost (TVC) + Total Fixed Cost (TFC)
NPM = Gross Margin – Depreciation

Where
GM = Gross Margin
TR = Total Revenue (N)
VC = Variable Cost (N)
FC = Fixed Cost (N)
NPM = Net Profit Margin

III. RESULT AND DISCUSSION

Socioeconomic characteristics of the respondents

The socio-economic characteristics of small-holder female cassava processors in the study area were presented in Table 1. The result revealed that most, 90% of the processors were within the age range of 30 – 59 years while 38.33% of them fell within the age range of 40 – 49 years. The mean age of the processors was 52.17 years. This result however negates the mean age of 37.50 years observed by Kaine and Ume (2017) and the mean age of 43 years observed by Kaine (2018) among rural households in Delta North Agricultural Zone, Delta State, Nigeria as well as the mean age of 29 years observed by Olatinwo *et al.,* (2017). Mean age of 52.17 years observed in this study indicated that cassava processors in the study area were in their mid-age. The marital status as indicated in Table 1 also showed that 78.33% of the processors were married. A detailed analysis of the marital status indicated that 10% of the processors were single (not married), while 6.67% and 5% were divorced/separated and widow/ widower respectively. Further analysis of the educational attainment indicated that literacy level was high as 96.67% had formal education. The importance of education in national and rural development had been documented. Olatinwo *et al.,* (2017) established that education is a very important ingredient in overpowering development challenges among rural dwellers. The analysis of the household size determined revealed that household size among cassava processor in the study area was large. The study showed that the mean household size was 10.96 persons. A detailed analysis of the household size indicated that 18.33% of the processors had household size of less than four (4) persons, 46.67% had household size range of 5 – 9 persons while 28.33% and 28.33% had a household size range of 11 – 15 and above 16 persons respectively. This result was inconsonance with that obtained by Mbah *et al.,*

(2016) among farm families in Benue State, Nigeria. The authors opined that large household size could serve as a source of labour to the farm families.

Table 1: Socio-economic characteristics of cassava processors(∑n=60)

Variable	Frequency	Percentage	Mean
Age			
30-39	12	20.00	
40-49	23	38.33	
50-59	19	31.70	
Above 60	06	10.00	52.17 years
Marital Status			
Single	06	10.00	
Married	47	78.33	
Divorced/separated	04	6.67	
Widow/widower	03	5.00	
Educational attainment			
No formal education	02	3.33	
Primary education	17	28.33	
Secondary education	38	63.33	
Post-secondary education	03	5.00	
Household size			
Less than 4	11	18.33	
5 - 9	28	46.67	
10 -15	17	28.33	
Above16	04	6.67	10.96 persons

Source: *Field survey, 2018.*

Enterprise statistics of cassava processors

The enterprise statistics of cassava processors are presented in Table 2. The result indicated that the processors were well experienced with a mean processing experience of 25 years. Forty-five percent of the processors fell within the processing experience range of 11 – 15 years. A further analysis of the sources of finance revealed that 86.67% of the processors financed their processing activities through personal savings. The result also showed that 80% of them were engaged in cassava processing on full time basis. Fifty seven percent of the processors as indicated in Table 2 sourced their cassava tubers used for processing into different products (by-products) from their personal farms while 30% and 13.33% purchased their cassava tubers from farm gate and the market respectively. Analysis of the income level of the processors showed that they were low income earner with a mean annual income of =N=333,383 ($952.52). The detailed analysis of the income level showed that majority, 76.67% were within the income range of =N= 201,000 - =N=400,000 ($574.29 – $1142.86) while 18.33% and 10% fell within the income range of =N= 100,000 - =N= 200,000 ($285.71 – $571.43) and above =N=400,000 ($1142.86) respectively.

Table 2: Enterprises statistics of cassava processors (n=60)

Variable	Frequency	Percentage	Mean
Processing experience (years)			
Less than 5	04.00	6.67	
6-10	15.00	25.00	
11-15	27.00	45.00	
16-20	14.00	23.33	24.70 years
Source of finance			
Personal savings	52.00	86.67	
Loan	05.00	8.33	
Assistance from friends and relative	03.00	5.00	
Status of cassava processors			
Full time	48.00	80.00	
Part time	12.00	20.00	
Sources of input (cassava)			
Personal farm	34.00	56.67	
Purchased at farm gate	18.00	30.00	
Purchased from the market	08.00	13.33	
Income level (Naira)			
₦100,000-200,000	11.00	18.33	
₦201,000-300,000	15.00	21.67	
₦301,000-400,000	28.00	46.67	
Above ₦400,000	06.00	10.00	=N=333,383.33

Source: *Field survey, 2018.*

Determination of cassava processed by-products

Processed cassava by-product was determined and presented in Table 3. The result established that *garri, akpu (fufu), starch, abacha (bobozi)* and cassava flour were the major by-product produced from cassava in the study area.The detailed analysis revealed that majority seventy-eight (78) (130%) produced *garri* from cassava. The result also showed that forty-two (42) (70%) produced akpu (fufu), twelve (12) (20%) produced starch while thirty-three (33) (55%) and seventeen (17) (28.33%) produced *Abacha (bobozi)* and cassava flour respectively. The result implies that cassava can be put into many uses.

Table 3: Percentage distribution of processed cassava bye-products (n = 60)

Product	Frequency*	Percentage
Garri	58	98.00
Akpu (fufu)	42	70.00
Starch	12	20.00
Abacha (bobozi)	33	55.00
Cassava flour	17	28.33

*****Multiple responses*

Source: *Field survey, 2018.*

Profitability of cassava processing

The cost implication of processing 5,000kg of cassava to obtain different by-product was determined and presented in Table 4. The result showed that the total variable cost formed the major cost items for all the by-products of cassava. The result further showed that to obtain *garri, akpu and abacha (bobozi)*, the variable cost were ₦592,224, ₦676,947 and ₦753,742 respectively. The fixed cost for processing *garri* was ₦71,192, for *akpu* was ₦48,832 ($139.52) while for *abacha* was ₦753,742 representing 56.70%, 40.13% and 38.56% of the total cost of production respectively.

The cost and return of cassava processing were determined and presented in Table 5. The result showed that cassava processing in the study area was a profitable enterprise. Further analysis of the result revealed that the net profit obtained from producing *garri* was ₦71,192 ($203.44), *akpu* was ₦48,832 ($139.55) while *abcha* was ₦60,457 ($172.73). Profit obtained from processing cassava to produce *garri* was higher than that obtained from obtaining other by – products. This result was not inconsonance with the study conducted by Adeniyi and Olufunmilola (2015) who reported that the net benefit obtained from *akpu (fufu)* was higher than that obtained from *garri.* The return on investment also showed that the by-product *garri* (5.67%) was the most profitable cassava by-product. Brodrick and Sanzidur (2014) observed an overall profit margin of 1.93. Ebuikiba (2010) on the other hand reported a benefit cost profitability of ₦ 1.9:1.0 among cassava farmer in Akwa Ibom State, Nigeria.

The result of 5.67% (return on investment) implied that for every one hundred naira (₦100) invested to obtain *garri*, there was a return of five-naira sixty-seven kobo (₦5.67k). This also implied that the by-product *garri* was a profitable business enterprise. The result further showed that the return on investment for *akpu* was 4.01% while that of *abacha* was 3.86%. This implied that processing cassava to obtain *akpu* and *abacha* was profitable. It also implied that for every one hundred naira invested in cassava processing to obtain the two by-products *(akpu and abacha)*, there was a return of four naira and one kobo (₦4.01k) and three-naira, eighty-six kobo (₦3.86k) respectively.

Table 4: Cost of processing cassava (5,000 kg) to obtain the by-products

Cost items	*Garri and Starch*	*Akpu*	*Abacha*
Cassava tubers	428,893	372,000	463256
Labour	29,760	37,703	43,453
Transportation	133,571	45,245	147,033
Total Variable Cost	592,224	676,947	753,742
Total Fixed Cost	71,192	48,832	60,457
Total Cost	1,255,640	1,216,726	1,567,940

Source: *Field survey, 2018*

Table 5: Summary of net return for processing 5,000kg of cassava tubers to different bye-products

Cost items	*Garri and Starch*	*Akpu*	*Abacha*
Net Profit	71,192	48,832	60,457
Total Variable Cost	1,184,448	1167894	1,507,484
Total Fixed Cost	71,192	48,832	60,457
Total Cost	1,255,640	1,216,726	1,567,940
Return on Investment	5.67	4.01	3.86

Source: *Field survey, 2018.*

IV. CONCLUSION AND RECOMMENDATION

The study examined the economics of traditional cassava processing technology among small-holder female cassava processors in Delta North Agricultural Zone, Delta State. The result of the study literacy level as was indicated by the findings was high among the processors. The study also established that house-hold size among cassava processors in the study area was high. The result revealed that the processors were well experienced in cassava processing enterprise and that majority of the processors were engaged as full-time processors. The study further indicated that the processors sourced their input (cassava tubers) form their personal farms. The result was able to establish that cassava processors were operating at low income level. The by-products of cassava as was indicated in this study were *garri, starch, akpu* and *abacha* with being the most profitable by-product. The cost and return analysis determined established that cassava processing in the study area was profitable.

Arising from the findings of the study, a number of policy implications arose appropriate recommendations were made: (I) the processors should form cooperative society, pull their resources together in order to enjoy the benefits of economics of scale as well as benefits arising from government programmes, (II) Government-private sector intervention should be encouraged. It also recommended that public enlightenment campaign on the profitability of cassava processing should be carried out. If this is done will encourage most people (including the youth) to venture into cassava processing, reduce rural urban migration, ensure food sufficiency and security.

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