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ECONOMIC ANALYSIS OF CASSAVA PROCESSING UNDER VALUE CHAIN DEVELOPMENT PROGRAMME (VCDP) IN WUSHISHI LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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Abstract

This study was carried out to analyse the economics of cassava processing under value chain development program in Wushishi Local Government area of Niger State, Nigeria. The research described the socio-economic characteristics of the cassava processors, identified methods used by the cassava processors, estimated the cost and returns to cassava processing as well as analysed the determinants of income of cassava processors. The study utilized multistage sampling technique in selecting 100 processors from the study area. Data were obtained through the use of structured questionnaire and interview schedule. The data were analysed using descriptive statistics, farm budgeting technique and regression model. The farm budgeting analysis revealed that cassava processing into garri was profitable with a net income of ₦103,485.33. Labour intensity, high cost of cassava tubers and time consumption were the major constraints faced by the farmers. The regression analysis showed that 67% of the variation of the output was explained by the variables included in the model. Age ($p<0.05$), processing experience ($p<0.01$), transportation cost ($p<0.05$), storage cost ($p<0.01$) and packaging cost ($p<0.01$) were significant factors that influenced the income of cassava farmers under VCDP in the study area.The study recommendsthat the VCDP/Government should introduce innovative equipment that will reduce the stress in processing and ensure timeliness in processing operations.

Keywords: Cassava, Processing, Value Chain, Processors, VCDP.

1. Introduction

Value chain is the actors (private and public, including service providers) and the sequence of value-adding activities involved in bringing a product from production to the end-consumer. In agriculture they can be thought of as a "farm-to-fork" set of inputs, processes and flow (Miller and de Silva, 2007). The value chain of a product describes the full range of activities which are required to bring a product or service from conception, through the different actors involved in the production, processing, and delivery to the final consumers (Adekunle*et al*., 2012).

The value chain development program is a Federal government programme inaugurated by international fund for Agricultural development (IFAD). It is a programme for rice and cassava in some middle belts states of Nigeria: Niger, Ogun, Anambra, Ebonyi, Taraba and Benue state. It is a programme put in place by the government to support rice and cassava value chains and hoping to take smallholder farmers to a different level of profit. This programme, aimed at boosting the economic status of smallholder farmers in rural areas, is implemented over a period of six years. The programme will strengthen farmer organization by building their capacity to take advantage of existing market, opportunities and overcome constraints along the value chain (VC). The programme will also improve rural infrastructure such as roads and water facilities. More than 200,000 poor rural households will benefit directly from the programme, which will have a particular focus on women and youth (Value Chain Development Programme (VCDP), 2015). The goal of the programme is to reduce rural poverty, increase food security and achieve accelerated economic growth on a sustainable basis.

Despite Nigeria's position as the world largest producer of cassava, Nigeria is yet to tap the full potential embedded in cassava. Before the inception of VCDP, cassava processing was done using traditional methods and rudimentary tools. Cassava processing using traditional methods and tools is tasking, ineffective, time- consuming and also inefficient. Also, lack of improved processing and storage technologies resulting in high rate of perishability in cassava tubers; non-availability of efficient processing equipment which raises unit of processing and marketing cost, and unreliable power supply to power the storage equipment compel most processors to depend on the expensive alternative use of generating sets thereby making them incur very high processing cost (Ezedimma*et al*, 2003). The VCDP is meant to improve cassava processing by providing modern equipment, sensitization, training, cassava processing centres to enhance cassava processing. Improved methods of processing are required to reduce cost and to minimize waste. It is therefore important to analyse the economics of cassava processing under the VCDP.

It is against this backdrop that this study seeks to analyse the economics of cassava processing under value chain development programme(VCDP) in Wushishi LGA in Niger State, Nigeria and to achieve this study, the research specifically:

i. describe the socio-economic characteristics of cassava processors under the value chain development program;
ii. identify the methods used by cassava processors in the study area;
iii. estimate the cost and returns on cassava processing in the study area and;
iv. analyse the determinants of income of cassava processors in the study area.

2. Methodology

The study was conducted inWushishi, Local Government Area in Niger State, Nigeria.It has a population of about 3,950,249 people (National Population Census, 2006). The projected population of the State for 2017 is 5,514,946 people at 3.2% growth according to (United Nations Funds for Population Activities (UNFPA), 2009).The State cover a total land area of 83,266,779 square kilometres.

Primary data were used for this study. These were collected with the aid of a well-structured questionnaire and interview schedule.A multi-stage sampling technique was used to select the processors in the study area. At the first stage, Wushishi local government area was purposively selected because it is one of the beneficiaries of the Value chain development programme (VCDP) under the International fund for Agricultural development (IFAD) project. At the second stage, all the four villages with five clusters that have benefited from VCDP were purposively selected. Finally a

simple random sampling was employed to select twenty of the twenty five cassava processors from each of the clusters giving a total of hundred cassava processors in the study area.

Descriptive statistics such as frequency distribution, percentage, mean were used to analyse objectives*i* and *ii*while objectives *iii* and *iv* were achieved using farm budgetary techniques and multiple regression analysis.

2.1 Model Specifications

2.1.1 Farm Budgetary Technique

NP = (TR-TVC) –TFC (1)

Where

NP = Net Income (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

TR-TVC = Gross Margin (₦)

TFC = Total Fixed Cost

TC = TFC + TVC (2)

Where;

TC = Total Cost (₦)

T0FC = Total Amount on Depreciation on Fixed Assets (₦)

TVC= Total Variable Cost (₦)

TR = TP x P (3)

Where TR = Total Revenue (₦)

TP = Total Output of Cassava processed (₦)

P = Price (Kg) of Cassava processed (₦)

The profitability index measures the profitability of a proposed business or project. It attempts to identify the relationship between costs and benefits of the business.

PI = Profitability Index = NI/TR

Where,

NI = Net income

TR = Total revenue

Rate of return on investment is the ratio of the profit and loss from an investment to the initial investment amount.

RRI = Rate of Return on Investment= (NI/TC) X 100

2.1.2 Multiple Regression Analysis

The model is specified in its implicit form as;

$Y = f(X_1, X_2, X_3, X_4\text{--------}X_{10}, e)$ (4)

Where Y = the income obtained from cassava processing (₦)

X_1 = Age (years)

X_2 = Household size (number of people in the household)

X_3 = Educational qualification (number of years spent in school)

X_4 =Processing experience (years)

X_5 = Labour cost (₦)

X_6 = Transportation cost (₦)

X_7 = Storage cost (₦)

X_8 = Maintenance cost (₦)

X_9= Packaging cost (₦)

X_{10} = Access to credit (yes=1, 0=otherwise)

Ui = Error term.

The explicit form of this equation in its functional form is expressed in equations 5 to 8 where Y and $X^{'S}$ are as defined in the explicit form. All the variables are as previously defined.

Linear: $Y = a + b_1x_1 + b_2x_2 + \cdots \ldots b_{10}x_{10} + e$ (5)

$$\text{Semi} - \text{Log: } Y = a + b_1 logx_1 + b_2 logx_2 + \cdots \ldots b_{10} logx_{10} + loge \quad (6)$$

$$\text{Cobb-Douglas: } \text{Log}Y = a + b_1 logx_1 + b_2 logx_2 + \cdots \ldots b_{10} logx_{10} + loge \quad (7)$$

$$\text{Exponential: Log Y} = a + b_1 x_1 + b_2 x_2 + \cdots \ldots b_{10} x_{10} + e \quad (8)$$

Where:
a = constant
b_1 - b_{10} = Regression coefficient of $X_1 - X_{10}$

2.1.3 Likert Scale

Three point Likert scale was used to examine the severity of constraints faced. Where;
Non severe = 1
Severe = 2
Very Severe = 3.
The cutoff point was 2 implying that a constraint that scored below 2 was not severe while any constraint that scored above 2 was severe.

3. Results and Discussion

3.1 Socio-Economic Characteristics of the Respondents

The socio-economic characteristics as presented in Table 1 shows thatthe mean age of the processors in thestudy area was 33 years. This suggests that they belong to the economically active population category; they can therefore put more effort into cassava processing in order to increase their output. This agreed with the research carried out by Muhammed *et.al* (2013) who also reported that cassava processors in Kwara state fell within that age. 100% of the cassava processors in the study area were females. This result indicates that female dominated cassava processing under VCDP.This could be because cassava processing maybe less tedious than the farming activities. More so, males often engage in other production activities such as, land preparation, weeding, harvesting while the females take care of the processing and marketing activities. This finding is in agreement with the findings ofOluwashola (2012), who revealed that women constituted 90% of processors in Oyo State.

The average household size of the processors in the study area was 6.All the respondents(100%) have had contact with extension agents. This shows the tendency of the cassava processors to be aware of new innovations in cassava processing.The mean years of experience of the processor was 15 years. This is \n indication that the respondents under study were relatively experienced in cassava processing.

The majority (91.0%) of the respondents have their source of capital from personal saving. This shows that majority of the firms depends largely on their own personal savings which limit their investment to small investments. This result agrees with Becvarova and Nahanga (2014) who stated that farmers in their study area had limited access to credit facilities.

Table 1. Summary of Socio-Economic Characteristics of the Respondents

Variables	**Mean**
Age (Years)	33
Household size (Number)	6
Processing experience(Years)	15
Other Variables	**Percentage**
Gender	100% female
Extension contact	100% had contact with extension agents
Source of capital	91% from personal savings
Educational qualification	75% had non-formal education
Marital status	96% were married

Source: Field survey, 2017

3.2 Processing Methods Used by the Processors

Processing of cassava has been done from time immemorial but the method used will determine the time, cost and quality of the by-products. From Table 2, 57.0% of the processors still used traditional method for their processing activities which is laborious and time consuming. It was observed that processors always receive sensitization and training from VCDP but due to the high level of illiteracy, understanding the relevance of modern methods of processing might be difficult to comprehend. However since about 22.0% of the processors used modern method and 21.0% used both traditional and modern method, it is believed that the processors were gradually migrating from this traditional method to a modern method of processing.

Table 2. Distribution of Processors Based on Processing Methods

Method	Frequency	Percentage
Traditional	57	57.0
Modern	22	22.0
Both	21	21.0
Total	100	100.0

Source: Field survey, 2017

Furthermore, Table 3 revealed that there was provision of equipment for the cassava processors in the study area as reported by 99.0% and 85.0% of the processors that VCDP provided Jack (Figure 1) and sieve.This indicates that the project wassupporting the processors with better technology to enhance theprocessing of cassava and hence income. There was an on-going building of an office and a cassava processing centre constructed by IFAD/FGN/VCDP and Niger State Government (Figure 2). The processors attested to the fact that even with the little that had been done by VCDP, the quality of their product increased, the processing cost reduced and processing activities became less tedious. This finding corroborates that of Odunaya (2013)who attested that provision of processing equipment increased the volume of cassava processed and lead to reduction in processing cost.

Figure 1. A Jack Given by VCDP in One of the Clusters in the Study Area, 2017

Figure 2.On-going Building by FGN/IFAD Value Chain Programme in Lokogoma Village in Wushishi Local Area, 2017

Table 3. Distribution of Processors Based on the Provision of Equipment by the VCDP

Equipment	*Frequency	Percentage
Jack	99	99.0
Sieve	85	85.0

Source: Field Survey, 2017
Note:*Multiple response were allowed

3.3 Cost and Returns to Cassava Processing in the Study Area

The costs structure and returns in garri, cassava flour and starch processing among cassava processors under VCDP is presented in Table 4. Findings indicate that variable cost items constitute the bulk (96.6%, 96.9% and 97.0% for garri, cassava flour and starch respectively) of the total cost in cassava processing. Therefore, the variable costs are crucial to the success ofgarri, cassava flour and starch processing in the study area.

Table 4. Cost and Returns to Cassava Processing

Items	Garri(₦)	Cassava flour(₦)	Starch (₦)
Cost of cassava	90,000	30,685	20,155
Cost of labour	10,000	3,420.23	2,461.87
Transportation cost	5,133.73	1,554.38	938.88
Storage cost	2,167.38	656.24	396.38
Packaging cost	2,396.24	725.53	438.24
Maintenance cost (for jack)	1,985.65	601.21	363.15
Firewood	5,000	_	_
Nylon spread	3,000	1,500	1,500
Water	1,000	353.08	213.27
Miscellaneous	500	300	200
A. Total Variable cost	121,183.00	39,795.67	25,666.73
B. Total Fixed cost (Depreciation on mortar, frying pan, basins, knives, sieve, grating machine.)	4,263.15	1,290.79	779.66
C. Total cost(A + B)	125,446.15	41,086.46	26,446.39
D. Total Revenue	228,931.48	69,334.02	41,874.82
E. Gross Margin(D-A)	107,748.48	29,538.35	16,208.09
F. Net income(D-C)	103,485.33	28,247.56	15,428.43
G. Profitability Index (F/TR)	0.45	0.41	0.37
H. Return on Investment (F/TC*100)	82.49	68.75	58.33

Source: Field Survey, 2017

Similarly, on the average, garri, cassava flour and starch processors made a net farm income of ₦103,485.33, ₦28,247.56 and ₦15,428.43 respectively in the study area, with gross margin of ₦107,748.48, ₦29,538.35 and ₦16,208.09 for garri, cassava flour and starch respectively. The rate of returns on investment for garri, cassava flour and starch were 82.5%, 68.8% and 58.3% respectively. This shows that for every ₦1 invested in garri, cassava flour and starch processing, a return of 82.50, 68.80 and 58.30 kobo was earned respectively. This also is an indication that garri, cassava flour and starch processing were profitable and viable enterprises in the study area.Garri gave the highest gross margin, net farm income, profitability index and rate of return on investment followed by cassava flour and starch respectively.This is in disagreement with Mohammed *et al*. (2013) who reported lower rate of return on investment of 30.8%, 41.3% and 20.9% on garri, cassava flour and starch respectively in Kwarra State. However, the finding is in line with the findings of Achoja (2015) who recorded a rate of return on investment of 89% and 81% for garri and fufu respectively in Delta State.

3.4 Determinants of Income of Cassava Processors in the Study Area

Four functional forms were estimated Linear, Double log, Semi log and Exponential, based on economic, statistical and econometric criteria, the Linear functional form was chosen as the best fit. As revealed in Table 5, the linear function was chosen as the lead equation based on the number and signs of the significant variables. The coefficient of determination (R^2) was 0.671. This implies that 67.10% of the variations observed in income level of the processors was explained by the included explanatory variableswhile the remaining 32.90% not explained may be due to variables not included in the model as well as errors in the estimation. The F-statistic (18.15) was significant at 1% and confirms the significance of the entire model.

Processing experience, storage cost and packaging cost were significant at 1% while age and transportation cost were significant at 5%. The positive regression coefficient of experience, packaging cost and storage cost showed that an increase in these variables will lead to an increase in the income of the processors whereas an increase in the transportation cost and age will reduce the income of processors in the study area. This conforms to the study of Oluwasola (2010) and Afolabi (2009). The coefficient of processing experience which was positively signed and statistically significant at 1% implies that the longer a processor stays in the business, the more experienced and efficient she becomes in handling the operations. Also, the more the experience the lesser the risk encountered and this will lead to greater profit which will automatically increase the income. This conforms to the study of Amao*et al.* (2007) that revealed that years of experience of garri processors showed a positive and significant relationshipwith income.

The coefficient for storage cost was positive and significant at 1%. This indicated that increase in storage cost brought about a corresponding increase in the income of the cassava processors. Proper storage increases the lifespan of a product preventing it from spoilage. This is also in line with the study of Afolabi (2009), who revealed that storage cost of garri marketers showed a positive relationship and was significant.

The coefficient of packaging cost was positively signed and significant at 1%. This indicated that an increase in this variable will lead to a corresponding increase in the income of the processors. Packaging adds value to a product and also increase the lifespan thereby leading to increase in the selling price which also increase the income of the cassava processors.

3.5 Constraints Encountered by the Processors

Table 6 shows the various constraints encountered by cassava processors in the study area. The study revealed that labour intensity (2.68) was the major constraint faced by the processors which ranked first followed by stress involved in cassava processing (2.67), high cost of cassava tubers (2.65), weather problems (2.52), inadequate supply of electricity (2.35), inadequate supply of water (2.24) and high labour cost (2.15), ranked 2nd, 3rd, 4th, 5th, 6th and 7th respectively.

Table 5. Determinants of Income of Cassava Processors under VCDP in Wushishi LGA

Explanatory Variables	Linear	Semi log	Exponential	Double log
Constant	164802.20 (4.76)***	- 920973.1 (- 3.93)***	12.1657 (103.75)***	8.7054 (11.51)***
Age	-3529.99 (-2.58)**	-87921.95 (-1.87)*	-0.0119 (-2.55)**	-0.2914 (-1.92)**
Household size	1159.49 (0.42)	5141.55 (0.33)	0.0091 (0.98)	0.0436 (0 .86)
Education	986.53 (0.71)	3361.04 (1.04)	0.0029 (0.61)	0.0102 (0.98)
Processing Experience	8765.63 (4.13)***	114077.3 (3.53)***	0.0279 (3.87)***	0.3633 (3.49)***
Labour	3.1810 (0.41)	-4127.25 (0.18)	3.93e-06 (0.12)	-0.0632 (-0.87)
Transportation cost	-2.4709 (-2.00)**	-28895.37 (-3.65)***	-5.78e-06 (-1.38)	-0.7615 (-2.99)***
Storage cost	25.24 (3.40)***	45683.51 (1.84)*	0.00008 (3.31)***	0.1899 (2.38)**
Maintenance cost	2.47906 (0.38)	35300.92 (1.80)*	3.46e-06 (0.15)	0.1135 (1.80) *
Packaging cost	21.38 (3.68)***	99840.38 (5.37)***	0.00005 (2.79) ***	0.2869 (4.78) ***
Access to credit	-18371.13 (-1.12)	-4798.96 (-0.68)	-0.0611 (-1.09)	-0.0140 (0.62)
R^2	0.671	0.665	0.604	0.635
F-value	18.15	17.63	13.56	15.46

Source: Field survey, 2017

Notes:* indicate significant at 10% level, ** indicate significant at 5% level, *** indicate significant at 1% level

Table 6. Constraints Encountered by the Processors

Constraints	NS F (%)	SV F (%)	VS F (%)	WS	MS	Rank	Remarks
Labour intensive	7(7)	18(18)	75(75)	268	2.68	1st	Severe
Time consuming	1(1)	31(31)	68(68)	267	2.67	2nd	Severe
Cost of tubers	2(2)	21(21)	67(67)	2.65	2.65	3rd	Severe
Weather problem	12(12)	24(24)	64(64)	252	2.52	4th	Severe
Electricity	16(16)	33(33)	51(51)	235	2.35	5th	Severe
Water	20(20)	36(36)	44(44)	224	2.24	6th	Severe
High labour cost	10(10)	65(65)	25(25)	215	2.15	7th	Severe
Transportation	40(40)	25(25)	35(35)	195	1.95	8th	Not severe
Perishability	43(43)	28(28)	29(29)	186	1.86	9th	Not severe
Processing technology	45(45)	32(32)	23(23)	178	1.78	10th	Not severe
Storage facilities	40(40)	42(42)	18(18)	178	1.78	10th	Not severe
Access to credit	48(48)	35(35)	17(17)	169	1.69	12th	Not severe
Poor market accessibility	37(37)	57(57)	6(6)	169	1.69	13th	Not severe
Lack of readily available market	76(76)	15(15)	9(9)	133	1.33	14th	Not severe
Poor demand for processed cassava	48(48)	45(45)	7(7)	116	1.16	15th	Not severe
High tax payment	96(96)	4(4)	0(0)	104	1.04	16th	Not severe
Training and sensitization	96(96)	4(4)	0(0)	104	1.04	16th	Not severe
Extension service	100(100)	0(0)	0(0)	100	1.00	18th	Not severe

Source: Field Survey, 2017

4. Conclusion and Recommendations

Cassava processing in the study area was a female dominated agro-enterprise that was operated mostly by the youthful and middle aged women which is the target of VCDP. Majority of the processors still use traditional method of processing but it is believed that the processors were gradually migrating from this traditional method to modern method of processing. The study revealed that there were variations in the gross margins to the various products of cassava processing in the study area butgarri was highest. Socio-economic attributes of the processors such as age, processing experience, plus other variables such as cost of transportation, storage and packaging cost significantly influence the income of the processors. The result also showed that the processors in the study area were constrained by labour intensity, stress involved in cassava processing, high cost of cassava tubers, weather problem, inadequate supply of electricity, inadequate supply of water and high labour cost.

It is therefore recommended that: The VCDP with the assistance of the Government should enhance support schemes through the provision of basic infrastructure such as water, electricity and storage facilities to cassava processors particularly in the study area, VCDP should identify more access and network the credible buyers or off-takers in the programme. The income of the processors was significantly and statistically affected by their socio-economic characteristics, therefore there should be more capacity building for the processors to improve their social wellbeing for profitable cassava processing in the study area and the cassava processors should be willing to participate.

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