



Environmental Effect of Value Addition on Cassava Processing in Etche Local Government Area, Rivers State, Nigeria.

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ABSTRACT

This study was conducted to examine the environmental effects of value addition of cassava processing in Etche local government area of Rivers state. A total of 80 cassava farmers were sampled using purposive sampling technique. Simple descriptive statistics and bivariate logistic regression models were used in the assessment. Results show that mean age and household size were 43 years and 5 persons respectively. Also mean annual income was ₦346,815. Majority (60%) engaged in trading as an alternative income source. The result for the logit regression model showed that only farming experience in years (0.092101), household sizes in numbers (0.018994) were statistically positive while age in years (-0.005669), annual income in naira (-8.68E-07) and quantity of cassava harvested in kg (-0.000371) were all statistically negative in responding to the environmental effects of value addition of cassava processing in the study area. It was also learnt that the major constraint encountered by the cassava farmers was unavailability of modern machines for processing and lack of technical knowhow. This study therefore recommends that cassava based farmers should be encouraged to form cooperative societies in order to pull their resources together. Also government should play an active role by establishing modern processing units that are environmentally friendly in all the rural areas of the states.

1. INTRODUCTION

Agricultural production in Nigeria is still basically categorized by production from the farms and direct sale of farm produce in its raw form. Cassava, a root tuber, has served, and will continue to serve as a major source of food to majority of the people living within the West African sub-region (Hann, 1997). Some of the value added products from cassava tubers that affect the environment are garri, fufu, tapioca, starch, cassava flour to cassava bread and chips. This value addition on cassava generates solid and liquid residues that are hazardous to the environment. The two important biological wastes from cassava that cause damage to the environment are cassava peels and liquid effluent squeezed out from the fermented parenchyma mash (Obueh, Odesiri-Eruteyan 2016). The toxicity of cassava is caused by the presence of the cyanogenic glucoside; linamarin together with much smaller amount of the closely related lotaustralin. These are the two major cyanogenic glucosides. They are small but of significant amount in the cassava tuber (Hann, 1997). This effluent when discharged on soil causes physiochemical and microbiological changes in the soil which calls for serious concern. It is clear that most of these cassava mills are sited near residential areas. Also cassava effluents and its peels that are usually discharged on land or water channels as wastes results to health and environmental hazards. They have serious environmental impact causing acidification due to the hydrolysis of cassava glucoside, linamarin and lotaustralin (methyl linamarin) producing hydrogen cyanide, which is also toxic to household animals, fisheries and other organisms Obueh, Odesiri-Eruteyan (2016). This waste water from cassava processing that are normally discharged beyond the factory wall into roadside ditches or fields, flow freely and sometimes settle in shallow depressions. Eventually, it percolates into the subsoil or flow into streams, resulting to serious environmental pollution, foul odor, contamination of surface soil and underground water. Also effluent released directly into streams and rivers, causes rapid growth of bacteria, resulting in oxygen depletion and death of fish and other aquatic life. (Oladele Kolawole, 2014). Also cassava contains disease-causing pathogens like bacteria and fungi. (Eze, Onyilide, 2015). It is important to note that villages where large scale garri production is carried out, cyanide can be smelled in the air and exposure to 100 – 200 ppm IICN in air for 30 – 60 minutes can cause death. (Obueh and Odesiri-Eruteyan, 2016). At this point we ask the following research questions: (1) what is the socio-economics characteristics of the cassava farmers in the study area? (2) What are the socio-economic characteristics that affect their responses on the effect of value addition in the study area? (3) What is the different value addition of cassava carried out by the farmers in the study area? (4) What are the constraints encountered in the study area? This study will give answers to these questions.

2. MATERIALS AND METHODS

This study was conducted in Etche Local Government Area of Rivers State. Etche is made up of several communities such as Aku/Obuol, Eberi, Amaji, Opiro, Chococho, Igbo, Egwi, Afala, Mba, Igbo, Ofe, Ohimogo, Obiohia Umuogba, Umuajuroke Okehi, Obibi, Odufor, Nihi, Okomoko, Ulakwo, Umuakonu, Umuuanyag, Okoroag, Obite, Umuoe, Ibo, Umkem, Egbeke. Etche has over 250 oil wells and various flow stations. It is also said to have the largest natural gas deposit in Niger delta region. Residents of Etche are primarily engaged in agriculture, earning it the nickname "the food basket" of the state. They specialize in growing crops as: Cassava, plantain, banana, yam, gum, palm oil, pineapple. Etche L.G.A. is geographically located in the northeastern part of Rivers State, Nigeria. It lies within latitude 4045'N – 5017'N and longitude 6055'E – 7017'E. Sample sizes of 80 respondents were selected using a multistage sampling technique.

Stage 1: Four communities of Chokocho, Egwi, Nini and Umuoye were randomly selected. Stage 2: Twenty cassava processors were also randomly selected from each of the four communities, making a total of 80 cassava processors for the study.

Model Specification:

Logit regression Model

Logit Regression expressed as;

$$Z_i = p_1/1-p_1 = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8B_9X_9.... B_iX_i + U_i$$

The respondents were classified into two categories; those who respond that value addition of fresh cassava tubers pollutes the environment and those who respond otherwise. The response variable was in binomial regression taking values of 1 to represent those who respond that value addition pollutes the environment and to those who responds otherwise.

If the disturbance term (U_i) is taken into account, the Logit Model becomes:

$$Z_i = \sum B_iX_i$$

Where;

P_i = Probability that a cassava farmer will respond positively or otherwise. Given as X_i ; (1 = responds positively; 0 = responded negatively).

B_i = Coefficient of Parameter

U_i = Error term or Disturbance term

X_1 = Age (Years)

X_2 = House size (numbers)

X_3 = Farming experience (in years)

X_4 = Estimated annual income (naira)

X_5 = Quantity produced (kg)

X_6 = Farm size (hectares)

β = Constant

3. RESULTS AND DISCUSSIONS

3.1 Socio-economic characteristics of the cassava farmers

Table 1 below shows that majority (80%) of the respondents are female. The result suggests that more females are involved in processing cassava than the males in the study area and cassava processing requires more skills and attention which can only be produced efficiently by female folks. This confirms the findings of Onyemauwa, (2012) who reported that women play a central role in cassava production, harvesting, processing and marketing, contributing about 58 percent of the total agricultural labour in the Southwest, 67 percent in the Southeast and 58 percent in the central zones. Most (60%) of the cassava farmers fell into the age range between 25-54 years showing activeness and innovativeness. This is also shown by their mean age of 43 years. Majority (80%) are married while most (56.3%) had primary school education showing that respondents can adopt an innovation to reduce environmental

pollution by employing best practices and techniques in cassava production and processing. This is in consonance with the findings of Fapojuno (2010), who stated that education is an important variable that influences individual and household's rate of adoption of new and improved technology as well as their choices of food commodities. It also implies that the more years a producer spend in attaining formal education, the more the increase in their output and this confirms the findings of Onoja and Emodi (2012) who reported that education has the power of giving traders an edge over their counter parts as their level of awareness of the use of efficient technology and market information will enhance their output thereby increasing their productive capacities. Majority (60%) of the respondents has household size of 3-5 persons with an average household size of 5 persons and 26 years as average farming experience. Average annual income of the respondents was 346,815 Naira. This implies that the cassava farmers sampled realized a substantial amount of income annually with majority (60%) engaging in trading as an alternative source of income.

Table 1: Showing the frequency distribution of respondents' socioeconomic characteristics in the study area.

Socio-economics Characteristics	Frequency	Percentage	Mean
Gender			
Male	12	15.0	
Female	68	85.0	
Total	80	100	
Age			
0 – 14	0	0.0	
15 – 24	9	11.3	
25 – 54	48	60.0	43
55 – 64	20	25.0	
Above 64	3	3.8	
Total	80	100	
Marital Status			
Single	2	2.5	
Married	64	80.0	
Divorced	2	2.5	
Widowed	9	11.3	
Widower	3	3.8	
Total	80	100	
Educational level			
0	28	35	
1-6	45	56.3	
6-12	5	6.3	
>12	2	2.5	
Total	80	100	
Household size			
0-2	6	7.5	
3-5	48	60.0	
6-8	20	25.0	5
9-11	5	6.3	
Above 11	1	1.3	
Total	80	100	
Farming Experience			
1-20	21	26.3	
21-30	30	37.5	
31-40	23	28.8	26
Above 41	6	7.5	
Total	80	100	
Income Status			
₦100,000-₦300,000	49	61.3	
₦400,000-₦600,000	26	32.5	
₦700,000-₦1000000	3	3.8	₦346,815
Above ₦1000000	2	2.5	
Total	80	100	
Other Income Sources			
Hunting	9	11.3	
Fishing	12	15.0	
Artisan	11	13.8	
Trading	48	60.0	
Total	80	100	

Source: Field Survey, 2023

3.2. How farmers socio-economic characteristics affects their responses on the environmental effects of value addition of cassava processing in the study area.

Table 2: shows the bivariate logit regression on how farmer's socio-economic characteristic affects their responses on environmental effects of value addition.

The probability of respondents responding to environmental effects of value addition of cassava processing in the study area in terms of their farming experience in years (0.092101) and households' size in numbers (0.018994) was positive. Their positive response could be deduced from the facts that as respondents farming experience and household size increase, the more they will be more knowledgeable

in cassava processing and their respective environmental effects. Likewise, the probability of respondents retorting to environmental effects of cassava processing in terms of their age in years (-0.005669), farm size in hectares (-2.035579), annual income in naira (-8.68E-07), quantity of cassava harvested in kg (-0.000371) and number of years spent in formal schooling in years (-0.570650) are all statistically significant but negative. Their negative

response on age could be that as their age increases they, will not be responsive and energetic to indulge in cassava processing due to its drudgery nature. Also as respondents' farm size, annual income and quantity harvested increases, the more their commercialization index increases and purchasing power. With this development they will be less responsive in cassava process.

Table 2. Bivariate logit regression depicting how farmer's socio-economic characteristic affects their responses on the environmental effects of value addition of cassava processing in the study area.

Dependent Variable: Y

Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)

Date: 08/19/23 Time: 18:02

Sample: 1 80

Included observations: 80

Convergence achieved after 7 iterations

Coefficient covariance computed using observed Hessian

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	7.206876	3.271016	2.203253	0.0276
AGE	-0.005669	0.058431	-0.097018	0.9227
FMEXP	0.092101	0.053616	1.717774	0.0858
FRM_SIZE	-2.035579	2.585061	-0.787440	0.4310
HHS	0.018994	0.336550	0.056436	0.9550
INCME	-8.68E-07	5.46E-07	-1.589104	0.1120
QTY	-0.000371	0.000487	-0.760765	0.4468
SCH	-0.570650	0.507221	-1.125051	0.2606
McFadden R-squared	0.356111	Mean dependent var	0.887500	
S.D. dependent var	0.317974	S.E. of regression	0.278724	
Akaike info criterion	0.652925	Sum squared resid	5.593451	
Schwarz criterion	0.891127	Log likelihood	-18.11699	
Hannan-Quinn criter.	0.748427	Deviance	36.23398	
Restr. deviance	56.27368	Restr. log likelihood	-28.13684	
LR statistic	20.03969	Avg. log likelihood	-0.226462	
Prob(LR statistic)	0.005485			
Obs with Dep=0	9	Total obs	80	
Obs with Dep=1	71			

Source: Field survey, 2023

3.3. Different value addition on cassava processing in the study area

Table 3, recorded multiple responses and demonstrated that most (27.9%) of the respondents asserted that garri was the most common products from cassava. This supported the findings of Muhammed-Lawal (2013) who established that garri

was the most profitable products from cassava. Recently, attentions are given to research centers on how to produce cassava flour in order to substitutes wheat flour to reduce cost. However, multiple responses were recorded as respondents produced more than one product from cassava.

Table 3: Showing frequency distribution of respondents according to different value addition of cassava processing carried out in the study area.

Number	Different Value Addition of Cassava	Frequency	Percentages
1	Garri	80	27.9
2	Fufu	75	26.2
3	Tapioca	68	23.8
4	Starch	12	4.2
5	Flour	3	1.0
6	Abacha	48	16.8
7	Total	286	100

Multiple responses recorded.

Source: Field Survey, 2023

3.4. Effects of carrying out value addition processes in the study area

In table 4, multiple responses were recorded. It revealed that majority (30.9%) of the respondents observed environmental effects as the major negative consequences of cassava processing, with health related issues (29.1%). This implies that farmers in the study area who indulged in cassava processing experienced environmental and health related

problems. These findings are in consonance with the findings of Reinhardt Howler (2018) who stated that cassava processing is generally considered to contribute significantly to depletion of water resources and the environment as a result of unpleasant odor and the waste generated. Also, Fasoyiro (2012) stated that the smoke from wood during garri processing results to lung, kidney and eye sight health challenges, especially nursing mothers who carry their young babes on their back.

Table 4. Showing frequency distribution of respondents according to effects of carrying out value addition processes in the study area.

Effects of Value Addition Processes	Frequency	Percentage
Health related issues	80	29.1
Environmental effects	85	30.9
Drudgery related issues	78	28.4
Cultural issues	24	8.7
Others	8	2.9
Total	275	100

Multiple responses recorded.

Source: Field Survey, 2023

3.5. Different processing methods used for value addition in the study area

Table 5 Shows different processing methods used in adding value to cassava in the study area. Multiple responses were recorded. The study revealed that majority (61.0%) of respondents employed traditional methods of cassava processing. It was only (36.6%) and (1.5%) that employed semi and modern mechanized method respectively. This implies that majority of the respondents in the study area use traditional method of processing. This involves peeling cassava roots, soaking roots in streams, grating cassava, and pressing grated

cassava, and frying in oven. This findings was supported by Etejere, (1985) and Oluchi Chibuzor (2021) who stated that the bulk (about 90%) of the fresh cassava roots are processed into garri and channeled into the traditional sector while about 10% of total FCR goes into the industrial sector. However FAO (2014) asserted that manual or traditional methods of cassava processing is time consuming and tedious. It is believed as technology advances, total manual cassava processing will gradually be replaced by some small scale machines. Since it can efficiently save time and get high quality cassava final products.

Table 5. Showing frequency Distribution of respondents according to different processing methods employed in the study area.

Different processing methods used in the study area	Frequency	Percentages
Traditional (manual)	80	61.0
Semi mechanized	48	36.6
Modern (mechanized)	2	1.5
Others	1	0.8
Total	131	100

Multiple responses recorded.

Source: Field Survey, 2023

3.6 Constraints encountered in the study area

Table 6 revealed that majority (59.8%) of the respondents complained that lack of machines for processing was their major problem. This findings supports, Ayodele et al., (2011) who stated that cassava value chain addition was characterized by long chains of pre-modern intermediate processes and infrastructural deficiencies which have generated successions of low value addition. Also another major

problem faced by the farmers was lack of technical knowhow (23%). This finding further validates Nguyen et al (2012) assertion that the availability and accessibility of credit facilities among rural poor cassava processors in Africa has been hampered by numerous challenges ranging from high level of illiteracy, unfavorable government or institutional policies, low level of upgrading and relevant information in both production and processing.

Table 6. Showing frequency distribution of respondents according to constraints encountered in the study area.

Constraints Encountered	Frequency	Percentage
Lack of capital	3	3.5
Lack of availability of machines for processing	52	59.8
Lack of access to market	4	4.6
Lack of transportation	8	9.2
Lack of technical know-how	20	23.0
Total	87	100

Multiple responses recorded.

Source: Field Survey, 2023

4. CONCLUSION AND RECOMMENDATION

Cassava processing at the rural level pollutes the environment and becomes a burden to natural resources. The study revealed that respondents were literate enough to adopt an innovation with mean household size of 5 persons and average farming experience of 26 years. Among all the socio economic indicators considered in influencing their responses, on value addition, only farming experience and household size were statically significant and positive. Majority of the respondents employed traditional methods of processing. It is true that considerable constraints remain; it is obvious that there is significant scope for the realization of enhanced productivity and diversification of cassava through local processing. Necessary steps have to be taken to promote integration of cassava into the manufacturing industries as a reliable raw material or its promotion as an export crop in order to achieve economic growth for a significant number of primary producers, processors and traders. Cassava based farmers should be encouraged to form cooperative societies in order to pull their resources together and obtain loan

to acquire machines for effective processing. Also effective strategies that will enhance the livelihood opportunities of the rural poor must be sustained for the ecosystem services. Cassava processing must be designed to increase economic, social, and ecological resilience to climate change. Cassava processors must adopt the use of clean energy to prevent the effects of global warming.

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