



Determinants and Welfare Status of Farmers' Participation in Plantain Value Addition in Akwa Ibom State, Nigeria

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Abstract

The study analyzed the determinants and welfare status of farmers' participation in plantain value addition in Akwa Ibom State, Nigeria. Specifically, the study identified various forms of value addition on plantain by households involved in plantain value addition; estimated the level of participation in plantain value addition and its determinants and determined the welfare status of plantain value addition operators in the study area. The population of the study comprised all plantain value-addition household heads in Akwa Ibom State. However, a multistage sampling technique was used to select 120 respondents for the study. The study selected three agricultural zones in Akwa Ibom State, two clans from each zone, and twenty household heads for the study. Primary data were obtained from the selected samples using a structured questionnaire, which was administered to 120 respondents. Data were analysed with means, frequencies, percentages, MPCHE and ordered probit model. The results of the analysis showed that Plantain chips are the most prevalent form of value addition, constituting 72.5% of total value added, followed by plantain flour, roasted plantain, and porridge plantain, with market shares at 58.3%, 43.3%, and 27.5% respectively. Nearly half of the respondents (47.50%) engage in adding value to one plantain product or another, possibly due to resource constraints. Factors such as age ($P < 0.01$), education ($P < 0.01$), income ($P < 0.01$), marketable surplus ($P < 0.01$) and cooperative membership ($P < 0.01$) significantly influence participation in value addition. On average, food expenditure constitutes 42.0% of per-capita monthly expenditure, indicating a relatively higher standard of living, likely influenced by involvement in plantain value addition. Given the prevalence of plantain chips as the most common form of value addition, there should be targeted policies and programs aimed at promoting and supporting the production of plantain chips. This could involve training programs, access to financing, and infrastructure development to enhance processing capacity.

Keywords: *Determinants, welfare, status, household, participation, plantain, and value-addition*

Introduction

Plantain is an important staple food item in Nigeria belonging to the genus *Musa* and family *Musaceae* (Osalusi, 2019). Plantain is very nutritious and also contains starch, the main carbohydrate in green fruit. It offers certain necessary minerals as well as a significant amount of vitamin C and beta-carotene (pro-vitamin A), two of the six vitamins listed in the Food and Nutrition Board of the National Research Council's Recommended Daily Allowances (Osalusi, 2019). Nigeria produced 3,088,938 tons of plantains in 2016, placing her fourth in Africa after Ghana, Uganda, and Rwanda, according to trade records and related indices that are readily available (Salami *et al.*, 2022). In Akwa Ibom State, a significant number of plantains are produced and consumed. The surpluses are then transported to other states, such as Abia, Rivers, and Imo State, where there is a higher population and a correspondingly higher demand for plantains (Fatunji

and Ojo, 2016). Furthermore, women primarily handle plantain value addition in the State, which is primarily done on a small scale for family consumption, whereas men produce the majority of plantains (Ben-Chendo *et al.*, 2013).

Value addition is a tactic used by farmers to boost the economic worth of farm produce through specific manufacturing techniques or locally branded methods that appeal to consumers more and make them willing to pay more for the product (Asogwa *et al.*, 2021). It occurs when a plantain operator purchases raw plantains and, to increase margins, processes and adds ingredients to plantain to change its form and make it ready for consumer use (Asbaye *et al.*, 2017). For instance, cleaning and chilling, frying, packing, processing, distributing, cooking, mixing, churning, grinding, hulling, extracting, drying, smoking, and packaging of plantains can all increase a dealer's revenue.

In Akwa Ibom State, the economic value of plantains is enhanced by changing the form of the product to chips, roasted plantain, porridge plantain, and other products, which has increased plantain demand and revenue. Unripe mature fruits can be roasted, pounded, baked, boiled, steamed, or sliced and deep-fried to make chips that can be sold to customers for a fair price. Mature fruits (unripe) can be boiled, steamed, baked, pounded, roasted, or sliced and fried into chips which can be sold to consumers at a reasonable price. Ripe plantains can be ground into flour and utilized as dietary supplements for diabetics as well as composite flour in the baking industry (Egbedi and Bademosi, 2011). Ripe plantains are sweeter than unripe ones, which makes them more popular with women and kids in particular. Furthermore, plantain chips and flour are among many people's favourite snacks and staple foods in Akwa Ibom state (Udoka *et al.*, 2015). To help business owners, particularly those who deal in plantains, minimize waste and protect themselves from losses, the government has developed several initiatives.

Through several policies and initiatives, the state government of Akwa Ibom has demonstrated a stronger commitment to increasing plantain value addition. The state was added to the Federal Government's Fadama III, Intervention, and other financing programs in 2016, which boosted the development of small and medium-sized businesses and concentrated on the production of staple crops. To increase value addition along the staple crop production chain, the state government has also renovated three staple crop processing factories and equipped numerous agricultural program facilities. By providing loans to young people and women under the direction of the Ministry of Women Affairs and Social Welfare, it has demonstrated its dedication to the development of agriculture and entrepreneurship (Akpan *et al.*, 2017). Additionally, the state government established the technical committee on agriculture and food sufficiency to develop sustainable agricultural policies that will guarantee improved access to markets, farm input, and innovation, as well as food security and farmer welfare.

Households' welfare is defined as the degree of utility attained by a specific household, expressed as a function of the products and services they consume (Ademiluyi, 2014). Value-added plantains can improve the well-being and standard of living of farm households, bolster national food security, reduce rural poverty, and create more job opportunities. It has been observed to be essential to life sustenance by giving farm households access to sufficient and wholesome food, both of which are necessary for their well-being (Olayide, 2013).

Research on plantain value addition is crucial to the realization of various governments' economic agendas in Nigeria, which include raising the country's agricultural GDP and diversifying the country's economy away from the oil industry. The majority of plantain research conducted in Nigeria, specifically in Akwa Ibom State, focuses on plantain production

(Kainga and Seiyabo, 2012), agronomy (Shaibu, 2012), plantain marketing (Oladejo and Sanusi 2008), and post-harvest losses (Ladapo and Oladele 2011). Studies have not been conducted on the effect of households' participation in plantain value addition on their welfare status in Akwa Ibom State, Nigeria. This is the gap in the literature that this study intended to fill.

Materials and Methods

Study Area

The study was conducted in Akwa Ibom State, Nigeria. Akwa Ibom State can be found in the coastal southern part of the country, lying between latitudes 4°32'N and 5°33'N of Equator and longitudes 7°25'E and 8°25'E of Greenwich meridian. It is located in the South-South geopolitical zone, which is bordered on the east by Cross River State, on the west by Rivers State and Abia State, and on the south by the Atlantic Ocean and the southernmost tip of Cross River State. Akwa Ibom State occupies a total land area of 7,246 square kilometres, with a population of 5,482,200 people (NPC, 2016). It is a Niger Delta State and currently one of the highest oil- and gas-producing states in the country, which is prone to oil spillage, acid rain and increasing ocean encroachment (Udoh, 2010).

Selection of Respondents

A purposive multistage sampling technique as well as a stratified random sampling technique was used to select 120 respondents for the study. In the first stage, three (3) agricultural zones (Uyo, Ikot Ekpene and Eket) were purposely selected from the six (6) agricultural zones in Akwa Ibom State, owing to the number of plantain dealers available in the areas. In the second stage, two clans were randomly selected from each of the three (3) selected agricultural zones which gave a total of six (6) clans for the study. In the last stage, twenty (20) plantain dealers were randomly selected from the selected clans which gave a total of one hundred and twenty (120) respondents for the study. These respondents were stratified into three (3) groups. Group 1 are those who add value to plantain between 1 - 10 bunches per day; Group 2 are those who handle between 11 – 20 bunches per day while Group 3, is those who handle 20 bundles and above per day. Primary data were obtained from the selected samples using a structured questionnaire, which was administered to these 120 respondents.

Method of Data Analysis and Model Specifications

The various forms of value addition on plantain in the study area were analyzed with tables, frequencies and percentages. The level of participation in plantain value addition in the study area was analyzed with the participation index. The factors that influence household participation in plantain value addition were analyzed with an ordered probit model. The ordered probit model for this study was specified as follows;

$$Q_{i=0,1,\dots,j} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + u_i, \dots, 1$$

Where;

Q_i = Market participation (where i stand for subsistence households = 1, Transition households = 2, and commercial households = 3)

X_1 = Age in years

X_2 = Marital Status (1=Married, 0=Not married)
 X_3 = Educational status in years spent in school
 X_4 = Income in Naira
 X_5 = Farming experience in years
 X_6 = Household size (Number)
 X_7 = Amount of credit obtained in Naira
 X_8 = Marketable surplus (Kg)
 X_9 = Cooperative Membership (1= Yes, 0= No)
 β_i = Estimated parameters.
 u_i = Error term

The welfare status of plantain value addition operators was realized with mean per capita household expenditure. The model is stated as follows:

Results and Discussion

Various Forms of Value Addition on Plantain in the Study Area

The various forms of value addition on plantain in the study area are presented in Table 1. Table 1 illustrates the distribution of various forms of value addition on plantain in the study area. Plantain chips emerged as the most prevalent form of value addition, accounting for 72.5% of the total value added to plantain. This indicates a strong preference for plantain chips among consumers in the study area. This result is in tandem with Asogwa *et al.* (2021) who reported that most plantain value-addition operators in Enugu state specialized in the production of plantain chips. According to Ayanwale *et al.*, (2018), the production of chips has also formed a significant economic activity for income for both large and smallholder farmers; thus, their welfare. All these have led to increased demand for plantain chips. Furthermore, plantain flour, roasted plantain and porridge plantain, still hold considerable market shares at 58.3%, 43.3% and 27.5% respectively. The dominance of plantain chips suggests a lucrative market opportunity for producers and entrepreneurs. With its popularity among the respondents, investing in the production and marketing of plantain chips could yield significant returns.

$$MPCHE = \frac{\text{Total household monthly expenditure on food and non-food items}}{\text{Household size}} \dots\dots 2$$

Level of Participation in Plantain Value Addition

The level of participation in plantain value addition is presented in Table 2. The level of participation in plantain value addition is presented in Table 2. The result has shown that most of the respondents (47.50%) participated in adding value to one plantain product out of the four value-added plantain products in the study area. This finding might be attributed to a lack of the resources (such as time, money, equipment, or skills) to engage in value addition for multiple plantain products, as focusing on one product could be a practical decision due to constraints in resources. Abdullah *et al.*, (2019) reported that farm households in Nigeria mostly specialize in producing or adding value to a particular plantain product based on their expertise, experience, or access to markets. They may choose to focus on what they do best rather than spreading themselves thin across multiple products. Furthermore, the demand for certain plantain products might be higher compared to

others in the study area, thus, households adding value to plantain may prioritize value addition to the product with the highest market demand to maximize their profits and sales.

Factors that Influence Farmers' Participation in Plantain Value Addition

The factors that influence farmers' participation in plantain value addition are presented in Table 3. Ordered probit estimation of the factors that influence farmers' participation in plantain value addition is presented in Table 3. The marginal effects for the independent variables are also presented. Here marginal effects measure the response of the respondents' behaviour towards participation in plantain value addition when there is a unit change in the explanatory variables. According to Katchova (2013) and Oparinde *et al.*, (2018), the presence of two intercepts (δ_1 and δ_2) which are the threshold parameters indicates that there are three different categories considered in the ordered probit model. The probabilities of being subsistence farmers ($Q = 1$), transition farmers ($Q = 2$) and commercial farmers ($Q = 3$) were the three categories of level of participation considered in the study. As evidenced from the result, the threshold parameters δ_1 and δ_2 are each significant at a 1% level, implying that the ordered probit model with the 3 different participation levels is highly appropriate. The log-likelihood value of -221.700 indicates that the explanatory variables used in the ordered probit model are appropriate. The Chi-squared of 141.315 was significant at a 1% level and shows that at least one of the parameters of the variables included in the ordered probit model is different from zero. This means that the null hypothesis that all parameters equal to zero in the model is rejected. The empirical results from the analysis revealed that the age of respondents, educational status, income, marketable surplus and cooperative membership were the significant determinants of the level of participation in plantain value addition. There is a negative relationship between age and level of participation in plantain value addition at a 1% level of significance, indicating that an increase in the age of the respondents would bring about a higher likelihood of not participating in plantain value addition. This also means that the older an individual is, the less likely he/she will participate in plantain value addition. This is logical, as older individuals are likely to be less energetic and may therefore find it hard to engage in activities which require quite some energy, such as plantain value addition. This finding is consistent with the findings of Falola *et al.*, (2016) who reported a negative relationship between age participation in value addition in Kwara State, Nigeria. The marginal effects result shows that a unit rise in the age of respondents would increase the probability of being a subsistent plantain dealer by 10.4%, while it reduces the probability of being a transitional plantain dealer and commercial plantain dealer by 0.4% and 0.7% respectively. There is a positive relationship between educational status and the level of participation in plantain value addition at a 1% level of significance,

indicating that the respondents with a higher level of education would have a higher probability of participating in plantain value addition than less educated ones. Education is important and it has been found to influence other factors like management. Similarly, formal education helps one to grasp issues better, anticipate, appreciate and respond to production and market needs. This is consistent with the findings of Agwu *et al.*, (2015) who reported a positive relationship between education and value addition by agripreneurs in Abia State, Nigeria. The marginal effect result indicates that a unit increase in the level of education of the plantain entrepreneurs would decrease the probability of operating at the subsistence level by 6.2% but increase the probability of operating at transitional and commercial levels by 1.9% and 3.1% respectively. There is a positive relationship between income and level of participation in plantain value addition at a 1% level of significance, indicating that respondents with higher levels of income would have a higher probability of participating in plantain value addition. This is because most of the income generated from plantain value addition is likely not saved but is ploughed back or invested into the business for expansionary purposes. This is also understandable because increased income makes it possible for farmers to purchase value-added inputs and enhance their level of operation. This finding is in tandem with Adeyonu *et al.*, (2016) who reported a positive relationship between income and level of participation in value addition in Kwara State, Nigeria. The marginal effect result indicates that a unit increase in the level of income of the respondents would decrease the probability of operating at the subsistence level by 9.8% but increase the probability of operating at transitional and commercial levels by 2.6% and 7.6% respectively. The coefficient of marketable surplus obtained had a positive relationship with the level of participation in plantain value addition at a 1% level of significance, implying that an increase in the quantity of marketable surplus gathered increases the level of participation in plantain value addition. *Ceteris paribus*, operators with larger quantities of marketable surpluses are more likely to engage in higher levels of plantain value addition as they see it as profitable, unlike their colleagues who gather smaller quantities. The marginal effect for the quantity of marketable surplus gathered implies that if the respondents gather a higher quantity of marketable surplus, the likelihood of operating at the subsistence level will decrease by 9.2% but increase the probability of operating at the transitional and commercial level by 7.1% and 4.8% respectively. The coefficient of cooperative membership had a positive relationship with the level of participating in plantain value addition at a 1% level of significance, implying that cooperative membership increases the level of participating in plantain value addition. This is in line with the a priori expectation. This could be linked to the strength of the cooperative society (financially, informatively and socially) in bearing the problems faced by their members in participating in plantain value addition. This finding is in tandem with the findings of Adeyonu *et al.*, (2016) who report a positive

relationship between cooperative membership and participation in plantain value addition in Kwara State, Nigeria. The marginal effect result indicates that being a member of a farmers' association will reduce the likelihood of operating at the subsistence level by 16.2%, but the likelihood of operating at transitional and commercial levels by 2.7% and 9.6% respectively.

Welfare Status of Plantain Value Addition Operators in the Study Area

The welfare status of plantain value addition operators in the study area is shown in Table 4. Table 4 shows the farmers' average per-capita monthly expenditure. Households' average per-capita monthly expenditure breakdown reveals that food expenditure constitutes 42.0% while non-food items account for 58.0% of total expenditure. A higher proportion of expenditure on non-food items like housing, transportation, education, healthcare, clothing, entertainment, and other goods and services that contribute to overall well-being beyond basic sustenance suggests a relatively higher standard of living within the surveyed population which is consequent upon their involvement in plantain value addition. This implies that the respondents have progressed beyond subsistence living towards more discretionary spending, which is often associated with higher income gained from plantain value addition. This aligns with Engel's Law, indicating higher income leads to increased expenditure on non-food items.

Conclusion

Plantain business in Akwa Ibom state is profitable and could enhance the welfare status of the operators. Participation in plantain value addition is influenced by factors such as age, level of education, income, availability of surplus produce for sale and membership in cooperatives. Given the prevalence of plantain chips as the most common form of value addition, there should be targeted policies and programs aimed at promoting and supporting the production of plantain chips. This could involve training programs, access to financing, and infrastructure development to enhance processing capacity. Since resource constraints are a significant barrier to value addition, policies should focus on providing support to farm households participating in plantain value addition. This could include access to affordable credit, technical assistance, and training programs to improve production techniques and enhance product quality.

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Table 1: Distributions of Respondents according to various forms of value addition on plantain in the study area

Variables	Frequency*	Percentage	Rank
Plantain chips	87	72.5	1 st
Roasted plantain	52	43.3	3 rd
Porridge plantain	33	27.5	4 th
Plantain flour	70	58.3	2 nd

Source: Field Survey Data, 2023, * Multiple response

Table 2: The level of participation in plantain value addition

No of activities	Levels of participation	Frequency	Percentage
1	0.25	57	47.50
2	0.50	20	16.67
3	0.75	36	30.00
4	1.0	7	5.83
Total		120	100

Source: Field Survey Data, 2023

Table 3: Ordered probit estimation of the factors that influence farmers' participation in plantain value addition

Variables	Coefficients	T-value	Marginal Effects		
			Prob. (Q = 1)	Prob. (Q = 2)	Prob. (Q = 3)
Age of respondents	-0.418	4.467***	0.104	-0.004	-0.007
Marital status	-0.236	0.259	0.066	-0.008	-0.041
Educational status	0.150	6.379***	-0.062	0.019	0.031
Income	0.390	3.424***	-0.098	0.026	0.076
Experience	0.273	0.125	-0.089	0.005	0.052
Household size	0.417	1.523	-0.296	0.089	0.175
Credit	0.111	1.002	-0.085	0.013	0.053
Marketable surplus	1.105	3.614***	-0.992	0.071	0.048
Cooperative membership	0.225	3.576***	-0.162	0.027	0.096
δ_1	0.433	8.618***			
δ_2	0.314	6.119***			
h^2	141.315***				
Log-likelihood	-221.700				

Source: field survey data, 2023, * Significant at 10% level; ** Significant at 5% level; *** Significant at 1% level

Table 4: Mean per capita consumption household expenditure of the respondents

Welfare computation expenses	Monthly MPCHE(₦)	Percentage (%)
Food expenditure	22,223.11	42.0
Non-food expenditure	5,725.91	58.0
Total MPCHE	27,949.02	100
2/3MPCHE	18,632.68	
1/3MPCHE	9,316.34	

Source: Field Survey Data, 2022