



Impact of Cassava Value Chain Intensification Intervention on Nigerian Economy: Evidence from Delta State, Nigeria

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Abstract

The development of cassava value chain is relevant in Nigerian economy. Cassava value chain intensification intervention through improved technology, has the capacity to expand cassava production, processing marketing and consumption. This ultimately translates to increased cassava output/ha, employment, food security and reduce poverty in Nigeria. This study evaluates the impact of cassava value chain intensification intervention on Nigerian economy with evidence from Delta state in 2012. Primary data collected from randomly selected 100 respondents with the aid of questionnaire, were analysed using descriptive statistics, regression technique and profit function. The result shows that average net returns added on fufu and gari processing per year are ₦105,750 and ₦107,835; with return on investment of 81% and 89% respectively. Cassava value chain intensification intervention created impact in terms of number of project beneficiaries: producers (111.43%), processors (186.76) and traders (688.89%); increased output of cassava/ha and increased volume of cassava root processed into gari and fufu (66.67-71.43%). It was recommended that government policies and programmes should border on significant factors such as the maintenance of existing processing machines, credit facilities, quality control measures, better access to domestic and foreign markets, since these will enhance sustainable growth in cassava value chain, and development in Nigerian economy.

Keywords: Cassava, processors, gari, fufu, intensification, intervention, value chain, ₦ = symbol of Nigerian currency

Introduction

Cassava production in the tropics has potentials for food security and income generation for millions of people in developing countries, including Nigeria. It is increasingly becoming a high valued crop with the emergence of its uses in various industries across the world as essential raw material. The importance of cassava to the livelihoods of many millions of poor people has made it a target for interventions.

Ezike, *et al.* (2011) posited that in Nigeria cassava supplies about 75% daily calorie intake to over 50 million Nigerians in cassava growing zones. It plays a major role in country's food security as 80% of Nigerians in the rural areas eat a cassava meal at least once a week and majority eat cassava products, at least once a day. It provides also one of the highest returns in value terms to effort invested.

Cassava gained national prominence in Nigeria following the pronouncement of presidential initiative on cassava in 2002. Nigeria's output of cassava is by far the largest in the world, a triple more than production in Brazil and doubles the production in Indonesia and Thailand. Nigeria's production accounts for 19% of world output and 34% of Africa's output (Ezike *et al.*, 2011).

International Institute of Tropical Agriculture (IITA) (2004), reported that, at national level, Benue and Kogi State in the North central zone are the largest producers of cassava while Edo, Cross River, Akwa-Ibom. Rivers and Delta States dominate in cassava production in the South-south zone of Nigeria. It is produced mainly by small scale farmers especially in south and central Nigeria and cultivated as food and a cash crop. Cassava has gone from minor to major crop that accounts for between 40–50% of all calories consumed in southern and central

Nigeria (Anonymous, 2010). With an annual production of about 44 million tons, Nigeria is currently the world's largest producer of cassava (Hartmann, 2011). The Nigerian demand for starch is estimated at 230,000 tonnes per year; with 60,000 tons of starch used by Nestle Unilever company alone (Anonymous, 2006).

Cassava value chain stakeholders can earn higher benefits from cassava industry if values are added to the fresh roots. Cassava needs to have a competitive and comparative advantage to be able to thrive in the global market (Ezike *et al*, 2011). Value chain in cassava industry is capable of turning out cassava floor, starch, bread, meal (gari and fufu) chin-chin, chips, flakes, etc, but gari and fufu are the most important and consumed products of cassava in Delta state, Nigeria. Gari is a widely consumed Nigeria food. Cassava value chain ranks first, yet it suffers from lack of adequate processing facilities, post-harvest spoilage, inadequate storage, poor infrastructures, poor market access and poor information networking. In addition, relatively poor quality content and container (packaging) tend to limit Nigeria's participation in cassava product exports opportunities. It is a paradox to note that Nigeria is presently an importer of some cassava-based products. There are indications that cassava value chain is underdeveloped in Nigeria.

Intensification intervention involves all the initiatives, efforts, actions, supports and campaigns put in place to bring about increase in production, demand, utilisation and marketing activities in cassava value chain. Political, financial and technical assistance provided to renovate abandoned and obsolete cassava processing facilities and training of processors on improved processing techniques are part and parcel of intensification intervention. This could have a great impact on reducing post-harvest losses. Production intensification refers to the level of technology application. Hence increase in cassava yield per hectare and the the quality and quantity of output of cassava processing mills are indicators of intensification. It is assumed that intensification interventions could double income of 1.8million farm families and average cassava productivity from 12 to 25 tons per hectare by 2014. The success of cassava intensification intervention in raising productivity requires the contribution of research and development of enabling technologies. Systematic interventions will invest significantly in the cassava sector through the introduction of high yielding, early maturing varieties, disease resistant

varieties, the development of new cassava products and market access.

According to Kaplinsky and Morris, (2001), a value chain is defined as a chain of activities required to add value as a product moves from production through delivery to the final consumer. Such value chain intensification creates divers utilities in an acceptable form to the consumers at the right time and place. Cassava value chain provides means of livelihood to many people through the profit derivable. Substantial profit will motivate more entrepreneurs to invest in the cassava business. Cassava value chain intensification will create more employment and bring about more development in Delta State, Nigeria. There is need to identify which factors are important to the expansion of cassava value chain and make it more profitable to agribusiness operators. More empirical information is required on the impact of intensification intervention to justify the huge resources already invested in cassava value chain in Delta State, Nigeria. This is the research gap that this study was designed to fill.

The specific objectives of the study were to:

- (i) Describe cassava value chain ;
- (ii) assess the profitability of cassava value chain in the study area;
- (iii) evaluate the impact of cassava value chain intensification intervention on Nigerian economy;
- (iv) identify the factors that significantly constrain or facilitate cassava value chain intensification.

H₀₁: The selected socio-economic variables do not have joint significant effect on cassava value chain intensification.

Materials and Methods

Study Area and Sampling Techniques

The study was carried out in Delta State, Nigeria. It has an estimated population of 4,112,445 (National Population Commission, 2006 (A two-stage sampling procedure was used in selecting 100 cassava farmers in the study area. Firstly, three major cassava producing communities namely: Oleh, Uzere and Olomoro in Delta state, Nigeria, were purposively selected due to their dominance in cassava production and processing in the study area. Secondly, 30, 35 and 35 cassava farmers were randomly selected from Oleh, Uzere and Olomoro communities respectively. A list of cassava producers, processors and traders association was used as the sample frame for the study.

Methods of Data Analysis

Primary data collected in 2012 and a 3 – year (2009 - 2012) secondary data published on cassava value , were used for this study. Primary data were obtained directly from cassava producers and processors, using a well-structured questionnaire. Secondary data were obtained from published information on cassava intervention campaign in Nigeria. Collected data were analysed using descriptive statistics, inferential statistics, net profit function and ordinary least square techniques of multiple regression. Specifically, the demographic characteristics of the respondents and constraints limiting the expansion of value chain in cassava processing in the study area were achieved using descriptive statistics such as frequency distribution table and percentages while multiple regression analysis was used in estimating the significant determinants of cassava value chain intensification in the study area.

This model is implicitly specified thus:

$$Y = F(X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + U) \quad (1)$$

The explicit form of the model is given as:

$$Y = \beta_0 + \beta_1 \text{LAB} + \beta_2 \text{TECH} + \beta_3 \text{MKTPR} + \beta_4 \text{CRT} + \beta_5 \text{MKTACC} + \beta_6 \text{QTYCONTR} + \beta_7 \text{INFO} + \mu \quad (2)$$

Where

Y = Cassava value chain intensification, defined as Value added by improved cassava production/processing technologies (₦/Kg)

β_0 = Constant term

$\beta_1 - \beta_7$ = Coefficients of parameter estimate

LAB = Labour in man day

TECH = Dummy of technology adopted in production and processing (1, if improved, 0 otherwise)

MKTPR = Market price of cassava product (₦)

CRT = Credit obtained (₦)

MKTACC = Market Access conditions (free access = 1; restricted access = 0)

QTYCONTR = Dummy of Quality Control Measures (1, if effective, 0 otherwise)

INFO = Dummy of accessibility of participants in cassava value chain to relevant information (1, if yes, 0 otherwise)

μ = Stochastic error term.

The regression was fitted for cassava value chain intensification using linear, semi-logarithm and double-logarithm functions. The lead equation from these three functional forms was chosen based on the value of the coefficient of determination (R^2) as well as sign and significance of the regression parameters.

The a priori expectation of the parameters is given as:

$$b_1 > 0, b_2 > 0 \dots b_7 > 0$$

And that of null hypothesis is given as:

$$H_0: b_1, b_2, b_3 \dots b_7 = 0$$

Profit model was used to determine the net profit accruing to entrepreneurs in cassava value chain in the study area (both for gari and fufu).

Net profit model is given as

$$\pi = PqQ - \sum P_1 X_1 - F \quad (3)$$

Where

π = profit (₦)

PqQ = revenue (₦), Pq = unit price of output (₦), Q

= quantity of output processed (gari and fufu),

$\sum P_1 X_1$ = variable cost, P_1 = unit price of input (₦),

X_1 = inputs used

F = fixed cost (₦)

Also returns on investment (ROI) was applied to determine the viability of cassava business.

$$ROI = \frac{\pi}{TC} \cdot 100\%$$

Where ROI = return on investment (%)

π = net profit (₦)

TC = total cost (₦)

Results and Discussion

Value Chain of Cassava Processing

The value chain in cassava processing into fufu and gari in the study area is schematically presented in Figures 1 and 2. The value addition follows a two pattern procedure. The figure shows that both fufu and gari processors source their raw materials (cassava tubers) from the farm gate. Farm gate is the meeting point between the cassava farmers and the cassava tubers buyers (processors) and are mostly located in the remote villages. After this point, the gari and fufu processors proceed into processing the fresh tubers into gari and fufu respectively (value addition) which passed through series of steps as described in Figure 2:

Figure 1: Value of Cassava Processing in the Study Area

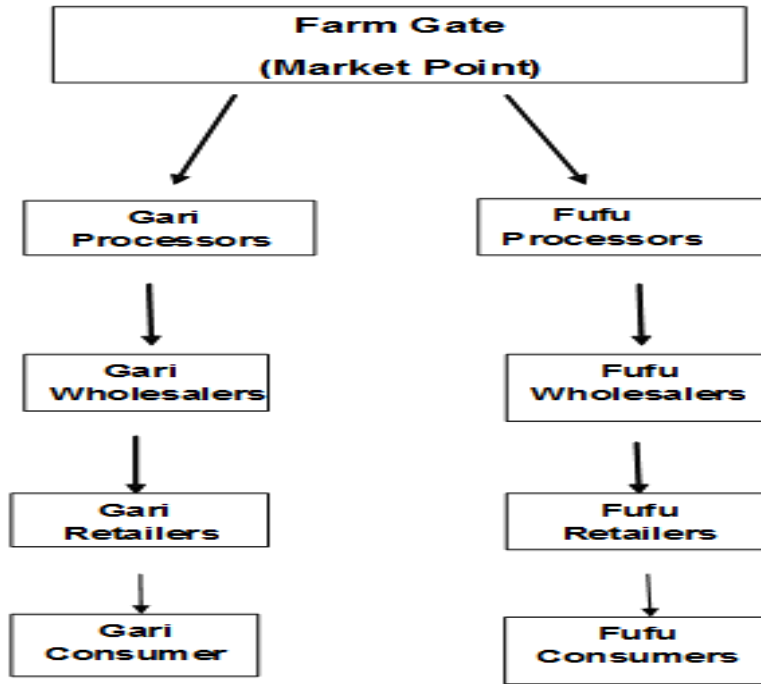


Figure 1. Schematic Description of Market Chain of Cassava Processing in the Study Area

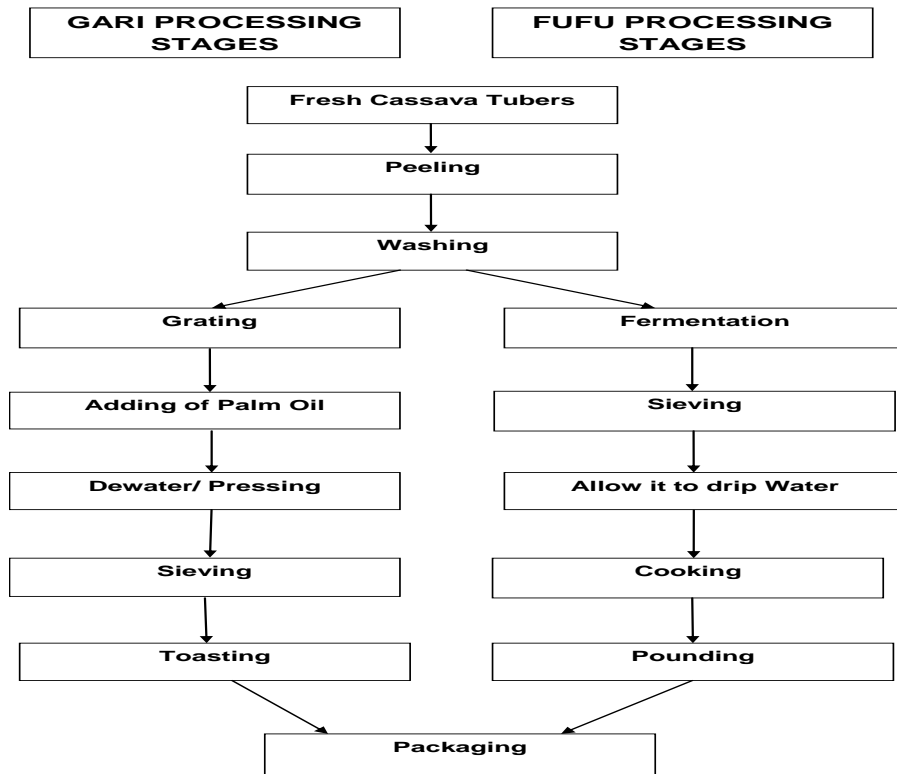


Figure 2. Processing stages of gari and fufu.

Table 1. Average Net Profit Analysis in Cassava Processing in the Study Area

Items	Fufu Processors			Gari Processors		
	Amount (₦)	% of Variable Cost	% of Total Cost	Amount (₦)	% of Variable Cost	% of Total Cost
Total Revenue (TR)	212,847.50			216,645		
Variable Cost (VC) Items						
Cassava tubers	103,450	67.73	48.61	10,3,250	48.20	36.89
Transportation cost	10,500	9.82	7.05	10,607	9.00	6.89
Cost of fire woods (energy)	10,000	5.00	3.00	10,918.67	21.62	16.43
Market charges (Tax)	1,065	1.28	0.92	1,096.00	1.42	1.09
Miscellaneous cost (bags, oil, water, etc)	279	0.48	0.93	588.33	0.73	0.68
Labour cost	10,800	15.70	11.27	101,283.33	19.03	14.57
Total Variable Cost (TVC)	105,094	100.01%	71.78%	106,742.83	100%	76.54%
Gross Margin (TR-TVC)	107,753.50			109,902.17		
Fixed Cost (FC) Annual	2003.13			2,067		
Depreciation on fixed cost items at 10%						
Interest on capital	203.01		2.22%	206.06		3.46%
Total Fixed Cost	2,003.13		26.00%	2,067		20.00%
Total Cost	107,097.13		100%	108,809.83		100%
Net Income (GM-TFC)	105,750.37			107,835.17		
ROI (NI/TC)	0.81 (81%)			0.89 (89%)		

Source: Field survey data

Average Net Profit Analysis of Processors in Cassava value chain

The costs structure and returns in both fufu and gari processing among small scale cassava processors is presented in Table 1.

Findings indicate that variable cost items constitute the bulk (71.78 and 76.54% for fufu and gari respectively) of the total cost in cassava processing. Therefore, they are very crucial to the success in both fufu and gari processing in the study area. Similarly, fresh cassava tubers accounted for about 67.73 and 48.20% of total variable cost (TVC) and 48.61 and 36.89% of total cost (TC) for both fufu and gari respectively and is therefore, important in the determination of the success of the cassava

processors under the prevailing environment. On the average, a fufu and gari processors made a net farm income of ₦105,750.37 and ₦107,835.17 respectively per year in the study area. The return on investment (ROI) in both fufu and gari processing is 0.81 and 0.89 respectively. This shows that for every ₦1 invested in fufu and gari processing, a return of 81 and 89 kobo is earned respectively. This is an indication that fufu and gari processing are profitable and viable enterprises in the study area. These findings agree with the earlier findings of Ezike, *et al.* (2011) who inferred that a basin of cassava purchased at five hundred naira (₦500) and processed into gari or fufu has the capacity to generate five thousand naira (₦5000), thereby

creating cash value addition of ₦4500 through improved processing technologies. Cassava value chain intensification has the capacity to boost rural cash economy.

Table 2. Number of Project Beneficiaries

Beneficiaries	Before			After			Percentage Impact
	Male	female	total	male	female	total	
Producers	29	41	70	71	176	148	111.43%
Processors	6	62	68	13	182	195	186.76%
Traders	2	7	9	8	63	71	688.89%

Table 2 shows the number of cassava project beneficiaries due to intensification campaign of the government in Delta state, Nigeria. The results show that total number of cassava producers increased from 70 to 147, (111.43%) number of processors increased from 68 to 195 (186.76%) and number of traders increased from 9 to 70 (688.89%). These results suggests that cassava intensification campaign highly benefitted cassava product marketers, followed by processors and producers. This result is possible due to the fact that marketing activities attracts more profit than production activities. Also, more females benefitted from cassava intensification campaign. This is possible because more women are involved in cassava industry in Delta state This finding agrees with Chukwuji (2006).

Table 3. Cassava Root Yield(tons)/ha Before and After Cassava Intensification Intervention.

Cassava root yield	Before	After	Percentage impact
Yield per ton	6-7	10 – 12	66.67% - 71.43%

Cassava root yield (tons)/ha before and after cassava production intensification intervention of Nigerian government is shown in Table 3. The result shows that cassava value chain intensification campaign resulted in 66.67% - 71.43% increase in the yield of cassava root in the study area. This is a measure of the impact created by cassava value chain intensification intervention through the adoption of improved methods of production such as high

Impact of Cassava Value Chain Intensification Intervention

The impact of intervention on cassava value chain was evaluated by comparing the impact indicators i.e number of project beneficiaries, cassava root yield and volume of cassava roots processed into gari and fufu products before and after intervention campaign of the government in Delta state, Nigeria as presented in Table2, Table 3, and Table 4.

yielding varieties, disease resistant cultivars and fertilizer application among smallscale farmers in the study area.

Table 4. Volume of Cassava Root Processed into Products (Tons per annum)

Product tons	Before	After	Percentage impact
Gari	670	3200	377.61%
Fufu	340	3740	1000%

Table 4 shows the volume of cassava tuber processed into fufu and gari. The result shows that 377.61% impact was created in gari processing and 1000% impact in fufu processing. This result shows that more cassava tubers were processed into fufu than gari in the study area. This further implies that there was increase in the demand for fufu in the study area. This result agrees with the earlier report of Hartmann (2011), that the establishment of cassava processing centres for the production of gari, fufu, cassava flour and starch is producing intended positive impact by offering new income streams to the beneficiaries.

Determinants of Impact of Intensification Intervention on Cassava Value Chain

Equation 3 shows the result of multiple regression of the factors affecting cassava value chain intensification in the study area. The linear form was chosen as the lead model on the basis of the value of coefficient of multiple determinant (R^2) of 0.68, its adjusted value of 0.66 and the number of significant variables. As a result, the semi-log and double log models were dropped from the report.

Hypothesis Testing

The t-statistics of the estimated regression equation was used to test the significant determinants of cassava value chain intensification.

$$\hat{Y} = 7132.971 + 666.71LAB + 0.5620TECH + 266.92MKTPR + 639.14CRT + 12.97MKTACC + 1634.93QTYCONT + 2.0611INFO + \mu \dots (3)$$

(5.499)* (1.052) (3.316)* (2.824)*
(4.369)* (3.141)* (2.210)** (2.308)**

The figures in paranthesis are the corresponding values of T- statistics.

* = significant at 1%

* = significant at 5%

The coefficient of multiple determination (R^2) value of 0.68 indicates that about 68% variation in impact of cassava value chain intensification intervention was explained by the explanatory variables captured in the model. The estimates showed that Technology, Market price for processed cassava products, amount of credit ($p < 0.05$) accessed and market access condition, quality control measures and access to market information had positive and significant relationship with cassava value chian intensification among small scale entrepreneurs in the cassava industry in Delta state, Nigeria. The positive and significant relationship ($p < 0.05$) between improved processing technology and cassava value chain intensification implies that better processing methods will enhance the volume of cassava root that can be processed at a time, increased output and btter quality of fufu and gari. The market price of the processed products of cassava turns out to be positively significant determinant of cassava value chain intensification ($p < 0.05$) in the model. This implies that increased selling price of fufu and gari can translate to cash value added (increased revenue) to cassava processing in the study area. This could be because higher marginal return tends to positively influence or motivate entrepreneurial expansion in the agricultural industry.

Market access condition (i.e free access or unrestricted access to market) positively and significantly ($p < 0.05$) influenced the value added to cassava processed products in the study area. Also quality control measures and access to market information positively and significantly ($p < 0.05$) influenced cassava value chain intensification in the study area. With the existence of quality control

measures processors would produce high quality cassava products that can meet global standards.

Constraints to Cassava Value Chain Intensification

The constraints to intensification of cassava value chain in the study area is presented in Table 6.

Table 6. Constraints to Cassava Value Chain Intensification

Constraints	Frequency	Percentages	Ranking
Inadequate finance	35	35	1 st
Poor Road Network	20	20	2 nd
High cost of cassava tubers	16	16	3 rd
High cost of transportation	14	14	4 th
Inadequate processing materials	10	10	5 th
Poor package facilities	-	-	-
Inadequate awareness	-	-	-
Total	100	100	

Source: Field survey Data

It reveals that the major constraining factors to intensification are inadequate finance (35%), poor road network (20%), high cost of cassava tubers (16%) and inadequate processing facilities (10%). Inadequate finance ranked the highest impediment to intensification of cassava value chain in Nigeria. This is in line with the findings of Makarau *et al.* (2011) who reported that inadequate capital ranked first among the major constraints to cassava production intensification. Provision of adequate financing with little or no interest for these cassava processors will not only boast their income generation and food supply in the market but also will have a sustainable and improved livelihood.

Conclusion and Policy Recommendations

The inability of Nigeria to maximize the benefits of the cassava industry called for urgent and comprehensive intensification intervention in the cassava value chain by the government in 2009. The impact of cassava value chain intensification intervention on the economy was investigated in 2012 in Delta State, Nigeria. The expansion path of cassava value chain is finance - and technology - driven. Increase in number of producers (111.43%),

increase in output/ha (66.67% - 71.43%), increase in processing activities (186.76%) and net income earned by entrepreneurs (₦105,750.37 - ₦107,835.17) per season in cassava value chain are a proof of the impact of the intensification intervention on the economy by stimulating more economic development through the creation of more job opportunities and poverty reduction among stakeholders in cassava value chain in Delta state, Nigeria. The available empirical evidence from the study indicates that there is bright prospect for cassava value chain in Nigeria.

It was recommended that, factors such as cassava product price, quality control measures, market access condition and market information should attract policy attention to give a boost to the cassava industry. Furthermore, impediments such as poor financial and infrastructural environments should be improved upon to enhance the performance of cassava value chain and sustainable development of Nigerian economy in general.

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