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Cassava Processing Technology Adoption and Poverty Reduction among Operators in Benue State, Nigeria

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Abstract: ***This paper examined cassava processing technology adoption and poverty reduction among operators in Benue State, Nigeria. The vicious circle of poverty and unbalanced growth theory were adopted for this study. A survey design was used to obtain cross-sectional data through questionnaires, focused group discussions (FGDs) and oral interviews. The research adopted the multistage random and purposive sampling techniques and obtained a sample size of 380.The study used descriptive statistical tools and Budgetary Analysis of Profitability to analyze the data for this research. The study specifically found that cassava processing technologies adopted in Benue State were basically traditional and manual but these were profitable and as such provided income for respondents which helped them in accessing basic needs of life for poverty to be reduced. The study also showed that adoption of improved cassava processing technologies in Benue State was faced with several constraints such as inadequacy of modern processing equipment; high cost of improved technologies; and lack of credit for processors among others. The study recommended the following based on the findings: provision of improved technologies for processing and infrastructural support for the rural areas; provision of microfinance institutions that could be a source of credit to small-scale rural cassava processing units; and employment of extension agents to train processors on the use and adoption of modern technologies among others.***

Keywords: Poverty Reduction, Cassava Processing Technologies, Income, Profitability

1. Introduction

The poverty situation in Nigeria is quite severe. Both the qualitative and quantitative measurements attest to the growing incidence and depth of poverty in the country (NBS, 2004; Okunmadewa, 2002). Recent evidence from the National Bureau of Statistics (NBS) supports the fact that poverty in Nigeria is on the increase. According to NBS (2010), the national poverty rate of Nigeria increased from 28.1 per cent in 1980 to 54.4 per cent in 2004, and 69.0 per cent in 2010. In addition, the UNDP report of 2009 estimated the Human Poverty Index (HPI) value of Nigeria at 36.2 per cent, ranking the country 114 out of 135 countries measured. This implies that Nigeria is becoming poorer with the passage of time.

To underscore the international concern for this problem, the United Nations declared 1996 as the "International Year for the Eradication of Poverty". Also, October 17 each year has been set aside as "International Day for the Eradication of Poverty" worldwide. The decade 1997 – 2006 was also declared "United Nations Decade for Eradication of Poverty". In Nigeria, both the government and civil societies have become increasingly aware of the poverty problem. Successive Nigerian governments made several efforts to alleviate poverty, apparently with limited success as the depth and severity of the problem are still at their worst (Hammer and Nasehold, 2000; Barbier, 2000; Okunmadewa, 2002). Poverty in Nigeria is a paradox considering the vast human and physical resources that the country is endowed with. It is even more disturbing given the huge human and material resources that have been devoted to poverty reduction by successive governments. Hence, the need to establish a framework/measure of poverty reduction that can take care of the socio-cultural and economic peculiarities of the target group has become a necessity.

Benue State is predominantly agrarian and poor. The limited success recorded by previous poverty reduction programmes suggests that the state requires a carefully targeted agricultural strategy to address the problem of poverty. According to Ekpebu (2002), about 80 per cent of the population of Benue State is directly involved in agriculture, producing varieties of food and cash crops like yams, cassava, rice, beniseed, soybeans, mango, and citrus among others. In spite of the fact that Benue State is naturally endowed, the State's poverty indices are quite disturbing. Poverty has been on the increase, with 21% extremely poor and 39% moderately poor in 1996, and only a small fraction of 36% being able to meet basic human needs and save (BENSEEDS, 2004). Although there is paucity of data on the current poverty status of the state, evidence suggests that poverty is growing, as the state is classified among the poorest states in Nigeria with more people living in extreme poverty than the national average. The National Consumer Survey (2007) cited in Fefa (2012) which analysed of poverty by state using the 36 states structure and the Federal Capital Territory (FCT) ranked Benue State the 13th poorest state with poverty incidence of 64.2%. NBS (2012) confirmed this by placing the incidence of poverty in Benue at 73.1 per cent in 2010.

For poverty reduction programmes in Benue State to yield the desired results, they should be based on agriculture. This, however, depends on the value chain of the crops being produced and their relative importance to incomes and

expenditures of households. Olomola (2007), in analyzing the value chain of cassava, cotton, maize, rice, soybeans and sugarcane industries, placed cassava third after rice and maize based on operating profit. In terms of yield, cassava is far ahead of other crops. It is observed that cassava is a competitive commercial agricultural crop with attendant benefits to its farmers, processors, marketers and consumers.

No doubt, cassava is produced, processed and marketed in Benue State of Nigeria using various forms of technologies. In spite of this, there is dearth of information about the extent of adoption of cassava processing technologies, the profitability of the crop and the levels of income generated. The basic question that arises is: to what extent has cassava processing technology adoption contributed to household poverty reduction among operators in Benue State?

It is against this background that the paper seeks to investigate the extent to which cassava processing technology adoption generates income and profit to help reduce poverty among operators in Benue State. The specific objectives of the study are to:
i. examine the processing technologies used by cassava processors in Benue State;
ii. examine the income generated by cassava processing in Benue State;
iii. examine the profitability of cassava processing in Benue State; and
iv. identify major constraints on the adoption of cassava processing technologies in Benue State.

2. Conceptual Literature

2.1 Poverty and Poverty Reduction

A review of the massive literature on poverty shows that there is no standard concept or definition of poverty because of its multidimensional nature as well as its dynamic properties. In the words of Aboyade (1995) cited in Fefa (2012), "Poverty is like an elephant, it is more easily recognized than defined". But as Anyanwu (1997) points out, any study of poverty must begin with a definition of poverty in order to provide a focus by which one can determine the limits of understanding.

Most economists define poverty as a situation of low income or low consumption (Obadan, 1997), while some adopt a broader definition such as being unable to meet basic material needs, encompassing food, water, clothing, shelter, education, health as well as basic non-material needs including participation, identity, dignity among others (Ali and Thorbecke, 1998; Romer, 2005). Specifically, the pioneers in this field of inquiry defined poverty as a situation where the income of families was insufficient to obtain the minimum necessities for the maintenance of physical efficiency (Ravallion, 1994). This definition has been refined and extended such that it forms the background for the basic needs approach to the study of poverty. It is in this context that the concept of absolute poverty emerged.

Poverty reduction, according to Vanderschueren (1996:58), refers to a situation where specific manifestations of poverty are systematically reduced resulting in a short and long term condition. Evbuomwam (1997:48), opined that "poverty reduction does not simply mean short-term relief and satisfaction of basic needs, but also the development of strategies for increasing the long-term productive potential and therefore, the incomes of the poor in order to achieve the long-term goal" (Okumedewa (1999:15), adds that economic growth alone is not sufficient for poverty reduction, growth must be accompanied with equity promoted by participation of the poor themselves in the activities that would "push" or "pull" them out of poverty as being the key to global poverty reduction. He further adds that dole out from the "national cake" does not alleviate poverty." Poverty cannot be alleviated through a short term piece meal approach (D'silva and Bysouth, 1992).

According to Evbuomwan (2006), the overriding objective of government poverty reduction policy is to broaden the opportunities available to the poor and ensure that every citizen has access to the basic needs of life; food, services, and nutrition, basic education and communication".

2.2 Cassava Processing Technologies

Processing is important for the marketing of cassava, and reduces the bulk, extends shelf life thereby reducing transportation cost. Fresh cassava roots have low value per unit weight; whereas processing adds value to it and therefore increases the market value. In addition, fresh roots of some cassava cultivars contain cyanogens which are reduced or eliminated through processing (Fefa, 2012).

In response to growing labour shortages in Nigeria, researchers have developed a wide array of simple mechanical processing technologies that reduce labour requirements and facilitate the commercial production and processing of cassava. Research Institutes such as Product Development Agency (PRODA), Federal Institute of Industrial Research Oshodi (FIIRO), and International Institute of Tropical Agriculture (IITA), as well as the Agricultural Engineering Departments in several Universities and Polytechnics in the country, have developed many mechanized units designed to remove the constraints that cassava processors face. Thus, several models and variations of cassava processing technologies are available in the market (Taiwo, 2006).These include among others the following: Peeling Machine, Cassava Chipping Machine, Grating Machine, Hammer Mill, Hydraulic Press, Dryers and Pelletizer.

2.3 Theoretical Literature

The Vicious Circle of poverty and the Unbalanced Growth theories are the major theories adopted for this study. The vicious circle of poverty presupposes that poverty is a serious human problem that is self-perpetuating which, if not properly handled, can become intergenerational as well as capable of affecting the prosperity of another person. As noted earlier, Benue State is predominantly agrarian. It has abundant agricultural resources, and an overwhelming proportion of the population is engaged in agricultural activities. Consequently, any result-oriented poverty alleviation programme necessarily has to be based on agriculture so that development will be communicated to

other sectors of the economy. This is the thrust of the unbalanced growth theory of development.

Given the resource constraints in developing countries, the unbalanced growth theory specifies that the key sectors for initial investment should be determined on the basis of industrial backward and forward linkages (Hirschman, 1958). Resources are therefore concentrated on strategic industries with significant forward and backward linkages. Cassava processing and marketing are agro-allied activities with substantial backward and forward linkages which can enhance income generation and employment creation capable of breaking the vicious cycle of poverty in the study area.

2.4 A Re view and E valuation o f Po verty Al leviation Programmes and Institutions

Efforts at improving the rural areas of Nigeria predated the independence of the country in 1960. The major efforts made in pre-independence and the early days of independent Nigeria according to Omale and Molem (2003) were in the area of farm settlement schemes. The aim of these farm settlements was to bring scattered small communities together so that they could take advantage of economies of scale in farm inputs, agro services, marketing, etc. These schemes recorded little or no achievement because the target beneficiaries were not involved at the planning stages. Since then, a number of government programmes have been put in place to improve basic services, infrastructure and housing facilities for the rural population, extending access to credit and farm inputs, and creating employment.

Ilori (1999) categorized rural poverty-related programmes into three: development programmes, palliative measures popularly known as the Social Dimension of Adjustment (SDA), and the sector-specific poverty related programmes. Examples of development programmes are: rural electrification schemes; rural banking scheme; and Operation Feed the Nation (OFN), later re-named Green Revolution. Palliative measures include programmes such as the Directorate of Food, Roads and Rural Infrastructure (DFRRI), the National Directorate of Employment (NDE), Family Support Programme (FSP) the National Agricultural Land Development Programme (NALDA), NEEDS, SURE-P, as well as micro credit schemes such as Peoples Bank, and Community Bank among others. All the programmes put together were meant to provide a catalytic impetus for the take-off and subsequent advancement of the rural areas towards:

a. Linking them to the national and international economic systems;
b. Increasing rural household income;
c. Providing basic socio-economic and physical infrastructure;
d. Efficient resource allocation to shift attention and interest of the private sector towards investment in rural areas to enhance rural development; and,
e. Enhancing rural welfare.

3. Methodology

3.1 Area of Study

Benue State lies within the lower Benue River trough in the middle-belt region of Nigeria. Its geographic coordinates are longitude 7^{o} 47' and 10^{o} 0' East, Latitudes 6^{o} 25' and 8^{o} 8' North. It shares boundaries with five other states, namely, Nassarawa to the north, Taraba to the east, Cross River to the south, Enugu to the south-west and Kogi to the west. The state also shares an international boundary with the Republic of Cameroun on the south-east. Benue State has a population of 4,244,219 (2006 Census) and occupies a landmass of 32,518 square kilometers.

3.2 Population of the Study

This study covered only people participating in cassava processing and marketing in the study area. A pre-survey of the area showed that cassava processors were the same as marketers. The pre-survey using Vandeikya, Makurdi and Otukpo Local Government Areas as a case study indicated that there were a total of 1400 processing centres; each owned by an individual household, which for the purpose of this research have been considered as processors with 386, 182 and 245 cassava processing centres in Vandeikya, Makurdi and Otukpo Local Government Areas respectively. Cassava was processed and marketed in virtually all the local government areas of Benue State at the time of the pre-survey. The choice of Vandeikya, Makurdi and Otukpo Local Government Areas to represent the three geo-political zones of the State – Benue North-East (Zone A), Benue North-West (Zone B) and Benue South (Zone C) respectively was due to information that in each zone cassava processing was greatest in these local government areas

3.3 Sampling Technique and Sample Size

The study made use of the multistage random and purposive sampling procedures to select a sample size of 420 respondents. The population under study was considered homogeneous as earlier stated. First, the local government areas were purposively selected because they had the highest number of cassava processing centres as shown by the pre-survey. Secondly, six locations were purposively selected, two from each of the three local government areas because they constituted the nucleus of cassava processing enterprises in the local government areas. In each of the six locations, ten (10) villages were randomly selected and in each village, seven (7) cassava processing households were randomly selected for the study. In all, 420 respondents were sampled. Questionnaires were distributed to all the respondents, but only 380 were retrived.

3.4 Method of Data Collection

The data required for this study were basically primary and were collected through an open-ended and structured questionnaire, oral interview, personal observations and Focused Group Discussions (FGDs). These instruments helped in obtaining information for the study.

3.5 Method of Data Analysis

Data were analyzed using descriptive statistics, and budgetary analysis. Descriptive statistics, including frequency counts, tables, charts, percentages and means were used to analyze the socio-economic characteristics of the respondents. Also, the Headcount Index and Poverty Gap Index were used to measure the poverty status of the respondent.

3.6 Model Specification

Fefa (2012) provided a more flexible framework for analyzing cassava processing technology adoption and the extent to which these are income generating and profitable among operators to enhance poverty reduction in Benue State. The profitability analysis models or functions are presented below.

The budgetary technique for analysing profitability of cassava processing technologies was expressed as follows:
GM = TR – TVC; π = GM – TFC … (1)
Where,
GM = Gross Margin
π = Profit
TR = Total Revenue
TVC = Total Variable Cost
TFC = Total Fixed Cost
The rates of return were calculated as:

$$\frac{Gross\,M\,\arg in}{TVC} \quad \ldots (2)$$

Percent profit were also calculated as:

$$\text{Percent Profit} = \frac{profit}{Total\ Cost} \times 100\% \quad \ldots (3)$$

4. Results and Analysis

4.1 Processing technology adopted by cassava processors

Data on the sampled respondents by the type of processing technology they adopted in the study area are presented in Table 1.

Table 1: Distribution of sampled respondents by the type of processing technology.

Type of Processing Technology	Frequency	Percentage (%)
Traditional Technology	294	77.4
Modern Improved Technology	86	22.6
Total	380	100

Source: Fefa, 2012.

Table 1 shows that 77.4% of the sampled respondents adopted the traditional processing technology, while 22.6% adopted the modern improved technology in the study area. This finding is in line with Oyewole and Sanni (1995) who reported that one of the constraints in cassava processing in Nigeria was that majority of processors tended to use the traditional processing techniques.

4.2 Frequency of use of modern or improved processing techniques by the respondents

Data on sampled respondents by frequency of their use of modern cassava processing technologies is presented in Table 2.

Table 2: Distribution of the sampled respondents by the frequency of using modern equipment

The Processing Technologies	Nev.	Sel.	Occ.	Freq	Total
U1se of Mechanical Peeler	368(96.8%)	12(3.2%)	-	-	380(100%)
Use of Washing Machine	380(100%)	-	-	-	380(100%)
Use of Grafting Machine	294(77.4%)	-	-	86(22.6%)	380(100%)
Use of Hydraulic Press	294(77.4%)	-	-	86(22.6%)	380(100%)
Use of Steeping tank for soaking	380(100%)	-	-	-	380(100%)
Use of Aluminium/plastic made/basket sieve	-	-	22(5.8%)	358(94.2%)	380(100%)
Use of sieving machine	373(98.2%)	7(1.8%)	-	-	380(100%)
Use of tray fryer	373(98.2%)	7(1.8%)	-	-	380(100%)
Use of motorized fryer	380(100%)	-	-	-	380(100%)
Use of iron-made/earthen ware frying pot	-	-	-	380(100%)	380(100%)
Drying on platform/tarpaulin	30(7.9%)	36(9.5%)	126(32.6%)	190(50%)	380(100%)
Use of milling/grinding machine	294(77.4%)	-	-	86(22.6%)	380(100%)
Use of packaging materials	380(100%)	-	-	-	380(100%)
Total	380				100

Note: Nev = Never used; Sel = Seldomly used; Occ = Occasionally used; Freq. = Frequently used
Source: Fefa, 2012.

Table 2 shows that all the sampled respondents that were found to have adopted improved cassava processing technologies indicated by 22.6% in Table 1, also adopted the use of grating machines, hydraulic or mechanical press and milling/grinding machine. Data in Table 2 also show that the use of washing machine, steeping tank for soaking, motorized fryer and packing materials has never been adopted by any of the sampled respondents. This finding is in line with that of Davies *et al* (2008) who reported that in Oyo State which had 48 processing centres, a total of 212 cassava processing machines were observed, prominent among the machines in use being the grater (37.6%), hydraulic press (28.8%) and milling machine (24.1%). The processing technologies adopted by operators in the study area are basically traditional.

4.3 A Sum mary of Ow nership of Pr ocessing M achines and Centres

Data on the sampled respondents by the summary of ownership of processing centres and machines are presented in Table 3.

Table 3: Distribution of the sampled respondents by the summary of ownership of processing machines

Ownership	Frequency	Percentage (%)
Individual	260	68.4
Government	-	-
Non-Government	32	8.4
Co-operative Societies	88	23.2
Total	380	100

Source: Fefa, 2012.

Table 3 shows that individual ownership of processing machines was predominant as 68.4% were owned by individuals, while 23.2% were owned by co-operative bodies and 8.4% were sponsored by non-governmental organizations. This finding also agrees with that of Davies et al (2008), who reported that of the 212 observed in a sampled area in Oyo State, 65% were owned by individuals, 32% owned by co-operative bodies and 3% owned by non-governmental organizations. This indicates that government currently does not provide processing centres and machines to boost cassava processing in the study area and even beyond.

4.4 Assessment of Inco me Genera tion f rom Cassava Processing in Benue State

Data on respondents by income generated before and after adopting cassava processing technologies are presented in Table 4.

Table 4: Distribution of respondents by average annual incomes before and during adoption of cassava processing technologies

Incremental Annual Income (₦)	Annual income before adopting cassava processing technologies		Annual income after adopting cassava processing technologies	
	Frequency	Percentage	Frequency	Percentage
<50,000	233	61.3	20	5.3
50,000-100,000	72	18.9	43	11.3
100,000-150,000	26	6.8	18	4.7
150-000-200,000	19	5.0	77	20.3
200,000-250,000	7	1.8	140	36.8
250,000-300,000	5	1.3	40	10.5
>300,000	18	4.7	42	11.1
Total	380	99.8(100)	380	100

Source: Fefa, 2012.

Table 4 shows that 61.3% of the respondents earned an average annual income of less than ₦50,000 before they joined cassava processing and marketing. But only 5.3% of the respondents indicated that they earned an annual income of less than ₦50,000 after they embraced cassava processing and marketing. On the other hand, 18.9% of the sampled respondents earned an average annual income of ₦50,000 – ₦100,000 before joining cassava processing and marketing, while the proportion reduced to 11.3% when they joined cassava processing and marketing. Given an exchange rate of US$1/₦160 the category of respondents who earned less than ₦50,000, earned less than US$1.5 (₦240) per day. This implies that the proportion of respondents living below poverty line fell from 61.3% before they embarked on cassava processing and marketing to only 5.3% after they embraced the business. In other words, cassava processing and marketing enterprises have been able to generate income capable of moving up 91% of the respondents previously living below the poverty line.

Generally, cassava processing and marketing has increased the proportion of respondents earning up to ₦150,000 per annum. For instance, only 5% of the respondents earned between ₦150,000 and ₦200,000 before joining cassava processing and marketing. But after taking to the venture, the figure rose to 20.3%. The corresponding figures for annual income brackets of ₦200,000- ₦250,000 are 1.8% and 36.8% respectively.

A poverty line of ₦240 a day corresponds to a poverty line of ₦87, 600 per annum. This may be approximated to ₦100,000 (the current exchange rate is actually higher than US$1/₦160). Thus, before taking up cassava processing and marketing 80.2% of the respondents lived below the poverty line. But on embracing the business, only 16.6% of the respondents lived below the poverty line. Clearly, cassava processing and marketing have had a significant effect on poverty status of the respondents. This finding is consistent with that of Akighir (2011).

To determine by how much cassava processing and marketing have actually increased the income of the sampled respondents, the ratio of the aggregate income of the respondents before they joined cassava processing and marketing to their aggregate income when they joined cassava processing and marketing was computed. Data obtained indicate that aggregate annual income before cassava processing and marketing was ₦30,000,000.00 while the aggregate income of the sampled respondents after they joined cassava processing and marketing was ₦60,000,000.00.

$$\text{The ratio (R)} = \frac{aggregate\ income\ during\ cassava\ processing\ and\ marketing}{aggregate\ income\ before\ cassava\ processing\ and\ marketing}$$

$$R = \frac{N60,000,000}{N30,000,000}$$

$$= 2$$

This ratio indicates that getting involved in cassava processing and marketing has doubled the respondents' income. This increase in income undoubtedly has improved the quality of life of the respondents and hence has reduced poverty. This finding of 100% increase in income is consistent with Akighir (2011), who reported that aggregate income of respondents increased by 104% when they were involved in rice processing and marketing.

4.5 Profitability (Cost and Returns) of Cassava Processing Technologies and the Cassava Enterprise for a typical processor

Data on the sampled respondents by profitability of cassava processing technologies and the cassava enterprise for a typical processor by products are presented in Tables 5, 6 and 7.

Table 5: Budgetary analysis (averages) for *Gari* enterprise measured in 100kg bags

S/No	Description	Value (₦)	Percentage
	Variable Costs		
i	Cost of Labour	52,878.98	36.2
ii	Cost of Transportation	13,809.40	9.5
iii	Cost of raw materials	47,545.94	32.6
iv	Total Variable Cost (TVC)	114,234.32	78.3
	Fixed Costs		
v	Land rent	9,650.00	6.6
vi	Implement cost	22,064.08	15.1
vii	Total Fixed Cost (TFC)	31,714.08	21.7
Viii	Total Cost (TC)	145,948.40	100
ix	Total Revenue (Income) (TR)	398,063.97	-
x	Profit (TR-TC)	252,115.57	-

Source: Author's Computations from Field Survey, 2012.

4.5 Profitability measures for the *Gari* enterprise

(a) Profit = Total Revenue – Total Cost
₦398,063.97 - ₦145,948.40
= ₦252,115.57

(b) Gross Margin = Total Revenue – Total Variable Cost
₦398,063.97 – ₦114,234.32
= ₦283,829.65

(c) Cost-Benefit Ratio = Total Revenue ÷ Total Cost
₦398,063.97÷₦145,948.40
= 2.73

(d) Gross Ratio = Total Cost ÷ Total Revenue
₦145,948.40÷₦398,063.97
= 0.37

(e) Percent Profit = $\frac{\text{Pr}\,ofit}{Total\ Cost} \times 100$

$= \frac{252{,}115.57}{145{,}948.40} \times 100$

= 172.7%

(f) Rates of Return = $\frac{Gross\ M\ \text{arg}\,in}{Total\ Variable\ Cost}$

$= \frac{283{,}829.65}{114{,}234.32}$

= 2.48

The budgetary analysis (Table 5) shows that the TVC forms the bulk 78.3% of the TC while TFC is indicated by 21.7%. This implies that processors and marketers who want to be cost efficient have to reduce TVC especially the cost of labour and raw materials that is more than half (68.8%) of the total cost. Total Fixed Cost, TFC is small (21.7%) probably because of very low cost of land rent (6.6%) in the study area. This is typical of most communities in the study area where processing locations are inherited and payment of rents is absent. This finding agrees with that of Adeyemo*et al.* (2010), who reported that considering economic efficiency of small scale farmers in Ogun State, Nigeria, TVC formed 91.6% of TC while TFC was just 8.4%. The average total profit of ₦252,115.57 for a respondent and percentage profit of 172.70% indicated that *Gari* processing and marketing were highly profitable ventures in the study area. Other things remaining the same, *Gari* processors and marketers should be able to collect and pay back loans even at commercial bank interest rates of up to 50% per annum. The Cost-Benefit ratio shows a processor and marketer that invests ₦1 would realize ₦2.73 as revenue, which implies that the processor and marketer would gain ₦1.73 on each ₦1 expended in the processing and marketing exercise. The rates of return of 2.48 further indicate the level of profitability of cassava processing and marketing enterprise. This indicates that a unit cost of production would generate more than 2 times gain.

Table 6: Budgetary analysis (averages) for *Akpu* enterprise measured in 100kg bags

S/No	Description	Value (₦)	Percentage
	Variable Costs		
i	Cost of Labour	21,843.94	16.7
ii	Cost of Transportation	43,090.50	33.0
iii	Cost of raw materials	53,810.20	41.2
iv	Total Variable Cost (TVC)	118,744.64	90.9
	Fixed Costs		
v	Land rent	-	-
vi	Implement cost	11,895.78	9.1
vii	Total Fixed Cost (TFC)	11,895.78	9.1*
viii	Total Cost (TC)	130,640.42	100
ix	Total Revenue (Income) (TR)	299,945.79	-
x	Profit (TR-TC)	169,305.37	-

Source: Author's Computations from Field Survey, 2012.
* Total Fixed Cost is negligible.

4.6 Profitability measures for the *Akpu* (wet paste) enterprise

(a) Profit = Total Revenue – Total Cost
₦299,945.79 – ₦130,640.42
= ₦169,305.37

(b) Gross Margin = Total Revenue – Total Variable Cost
₦299,945.79 – ₦118,744.64
= ₦181,201.15

(c) Cost-Benefit Ratio = Total Revenue ÷ Total Cost
₦299,945.79÷₦130,640.42
= 2.30

(d) Gross Ratio = Total Cost ÷ Total Revenue
₦130,640.42÷₦299,945.79
= 0.44

(e) Percent Profit = $\frac{\text{Pr}\,ofit}{Total\ Cost} \times 100$

$= \frac{N169{,}305.37}{N130{,}640.42} \times 100$

= 129.6%

(f) Rates of Return = $\frac{Gross\ M\ \text{arg}\,in}{Total\ Variable\ Cost}$

$= \frac{N181{,}201.15}{N118{,}744.64}$

= 1.53

The budgetary analysis of the *Akpu* (wet paste) enterprise (Table 6) shows that TVC forms the bulk (90.8%) of the TC while TFC is indicated by a negligible 9.1%. This means that processors and marketers of *Akpu* who want to be cost efficient have to reduce TVC especially the cost of raw materials and transportation that is more than half (74.2%) of the total cost. Transportation cost is higher in this enterprise as compared with the *Gari* enterprise because, *Akpu* is heavier to transport than *Gari*. Total Fixed Cost, TFC is negligible (9.1%) because of absence of land rent and low cost of implements. The total profit of ₦169,305.37 for a typical *Akpu* processor and marketer and percent profit of 129.6% indicate that this enterprise was also profitable in the study area. In a similar vein as in the *Gari* enterprise, a typical *Akpu* processor and marketer should be able to collect and pay back loans at commercial bank interest rates of up to 50% per annum, other things remaining the same. The Cost-Benefit Ratio of 2.30 shows that a typical *Akpu* processor and marketer that invests ₦1 would realize ₦2.30 as revenue, which implies that the processor and marketer would gain ₦1.30 on each ₦1 expended in the processing and marketing exercise. The rates of return of 1.53 further indicate the level of profitability of the *Akpu* enterprise.

Table 7: Budgetary analysis (averages) for Chips enterprise measured in 100kg bags

S/No	Description	Value (₦)	Percentage
	Variable Costs		
i	Cost of Labour	16,021.80	20.7
ii	Cost of Transportation	25,351.91	33.8
iii	Cost of raw materials	30,080.21	38.8
iv	Total Variable Cost (TVC)	71,453.92	93.3
	Fixed Costs		
v	Land rent	-	-
vi	Implement cost	6,050.73	-
vii	Total Fixed Cost (TFC)	6,050.73	6.7*
viii	Total Cost (TC)	77,504.65	100
ix	Total Revenue (Income) (TR)	256,788.10	-
x	Profit (TR-TC)	179,283.45	-

Source: Author's Computations from Field Survey, 2012.
* Total Fixed Cost is negligible.

4.7 Profitability measures for the Chips enterprise

(a) Profit = Total Revenue – Total Cost
₦256,788.10 – ₦77,504.65
= ₦179,283.45

(b) Gross Margin = Total Revenue – Total Variable Cost
₦256,788.10 – ₦71,453.92
= ₦185,334.18

(c) Cost-Benefit Ratio = Total Revenue ÷ Total Cost
₦256,788.1÷₦77,504.65
= 3.3

(d) Gross Ratio = Total Cost ÷ Total Revenue
₦77,504.65÷ ₦256,788.1
= 0.30

(e) Percent Profit = $\frac{Profit}{Total\ Cost} \times 100$

$= \frac{N179,283.45}{N77,504.65} \times 100$

= 231.3%

(f) Rates of Return = $\frac{Gross\ Margin}{Total\ Variable\ Cost}$

$= \frac{N185,334.18}{N71,453.92}$

= 2.6

The budgetary analysis of the Chips enterprise (Table 7) shows also that TVC forms the bulk (93.3%) of the TC while TFC is negligible (6.7%). This implies that processors and marketers of Chips who want to be cost efficient would have to reduce TVC especially cost of transportation and raw materials that is more than half (72.6%) of the total cost. The total profit of ₦179,283.45 for a typical Chips processor and marketer and percentage profit of 231.3% indicate that this enterprise is also quite profitable in the study area. The Cost-Benefit Ratio of 3.3 shows that a typical Chips processor and marketer that invests N1 would realize ₦3.30 as revenue, which also implies that the processor and marketer would gain ₦2.30 on each ₦1 expended in the processing and marketing exercise. The rates of return of 2.6 further show how profitable the Chips enterprise is.

By these budgetary analyses, the *Gari* enterprise is more profitable in absolute monetary terms, generating a profit of ₦252,115.57 per processor and marketer, than the *Akpu* and Chips enterprises, with the profits of ₦169,305.37 and ₦179,283.45 respectively. However, in terms of percent profit, Chips enterprise, with percentage of 231.3, is far more profitable than both the *Gari* and *Akpu* enterprises. This may be due to low Total Cost (TC) of processing and marketing observed in the Chips enterprise. But generally, the enterprise is profitable. This finding is consistent with that of Olomola (2007), who reported in an analysis of profitability and value chain in cassava in Nigeria that cassava enterprises are quite profitable and can be poverty-alleviating.

4.8 The Constraints on the adoption of Modern Cassava Processing Technologies among operators in Benue State

Data on the constraints on adoption of cassava processing technologies in Benue State were collected and are presented in Table 8.

Table 8: Distribution of respondents by constraints on the adoption of cassava processing technologies in Benue State

S/No.	Constraints	Frequency	Percentage (%)
1	Local processing technology or lack of modern processing equipment.	294	77.4
2	High cost of processing due to high cost improved processing technologies.	215	56.6
3	Lack of credit for processors.	380	100
4	Inadequate technical knowledge in the use of improved processing technologies.	280	73.7
5	High seasonal fluctuations in demand for cassava products, uneven product quality and variation in cassava supply.	350	92.1
6	No formal training for adoption technology innovation in cassava	360	94.7

	processing.		
7	Low prices and wide fluctuations in demand for cassava products.	380	100
8	Low returns from small-scale processing of cassava.	281	73.9
9	Poor market demand for products.	150	39.5

Source: Fefa, 2012.

Table 8 shows 9 constraints on cassava processing technology adoption in Benue State mentioned by respondents. The last column shows the proportion of respondents who have mentioned the constraints. The most frequently cited challenges are inadequate credit (100%) and low prices and wide fluctuations in demand for cassava products (100%). Other problems cited by nearly all respondents are lack of training for adoption of technology innovation (94.7%) and seasonal fluctuations in demand for cassava products (92.1%).

5. Conclusion and Recommendations

Based on the fact that the null hypothesis for this research was rejected and the alternative hypothesis accepted, it can be concluded that cassava processing and marketing operations have reduced poverty and have the potential for achieving the objective of poverty reduction in Benue State. This is because the research found overwhelming evidence that cassava processing and marketing have generated income for respondents in the study area (Benue State). The study also found overwhelming evidence that the cassava processing technologies adopted in Benue State were predominantly traditional and manual but were also highly profitable. It can be concluded further that for the purpose of achieving poverty reduction to be realized, the constraints identified by the research should be addressed. To this end, the study recommended the provision of improved technologies for processing and infrastructural support for the rural areas, and microfinance institutions that could be a source of credit to small-scale rural cassava processing units. It also recommended the development of rural infrastructure such as access roads to enhance accessibility of processors to market centres for sale of their products; the provision of modern processing technologies in key cassava production zones to help convert large quantity of tubers to processed products; and the employment of extension agents to train processors on the use and adoption of modern technologies among others.

Prospective researchers on this subject can expand the scope to cover the whole of Benue state and examine the technology adoption pattern exhibited by cassava processors in the study area. Again since information available indicate that Benue State is the largest producer of cassava, researchers can also open up and investigate the influence of cassava output on poverty status of cassava farmers in the state.

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