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. Successful 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...
are systematically reduced resulting in a short and long term.

Poverty reduction, according to Vanderschueren (1996:58),

refers to a situation where specific manifestations of poverty

is in this refined and extended such that it forms the background for

minimum necessities for the maintenance of physical

where the income of families was insufficient to obtain the

pioneers in this field of inquiry defined poverty as a situation

including participation, identity, dignity among others (Ali

material needs, encompassing food, water, clothing, shelter,

benefits to its farmers, processors, marketers and consumers.

No doubt, cassava is produced, processed and marketed in

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. Evbuomwan (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 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 unbalanced growth theory. End- run and subsequent advancement of the rural areas to place on the effectiveness of the social 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° 47’ and 10° 0’ East, Latitudes 6° 25’ and 8° 8’ North. It shares boundaries with five other states, namely, Nassara 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 Cameroon 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 retrieved.

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:

\[
GM = TR - TVC; \quad \pi = GM - TFC \quad (1)
\]

Where,

- \(GM\) = Gross Margin
- \(\pi\) = Profit
- \(TR\) = Total Revenue
- \(TVC\) = Total Variable Cost
- \(TFC\) = Total Fixed Cost

The rates of return were calculated as:

\[
\text{TV} \frac{\text{C in Gross Marg}}{... (2)}
\]

Percent profit were also calculated as:

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

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>
<thead>
<tr>
<th>Type of Processing Technology</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Technology</td>
<td>294</td>
<td>77.4</td>
</tr>
<tr>
<td>Modern Improved Technology</td>
<td>86</td>
<td>22.6</td>
</tr>
<tr>
<td>Total</td>
<td>380</td>
<td>100</td>
</tr>
</tbody>
</table>


Table 1 shows that 77.4% of the sampled respondents adopted the traditional processing technology, while 22.6% adopted the modern improved technology. 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>
<thead>
<tr>
<th>The Processing Technologies</th>
<th>Nev.</th>
<th>Sel.</th>
<th>Occ.</th>
<th>Freq</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Mechanical Peeler</td>
<td>368(96.8%)</td>
<td>12(3.2%)</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of Washing Machine</td>
<td>380(100%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of Grafting Machine</td>
<td>294(77.4%)</td>
<td>-</td>
<td>-</td>
<td>86(22.6%)</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of Hydraulic Press</td>
<td>294(77.4%)</td>
<td>-</td>
<td>-</td>
<td>86(22.6%)</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of Steeping tank for soaking</td>
<td>380(100%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of Aluminium/plastic made/basket sieve</td>
<td>-</td>
<td>-</td>
<td>22(5.8%)</td>
<td>358(94.2%)</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of sieving machine</td>
<td>373(98.2%)</td>
<td>7(1.8%)</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of tray fryer</td>
<td>373(98.2%)</td>
<td>7(1.8%)</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of motorized fryer</td>
<td>380(100%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of iron-made/earthen ware frying pot</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Drying on platform/tarpaulin</td>
<td>30(7.9%)</td>
<td>36(9.5%)</td>
<td>126(32.6%)</td>
<td>190(50%)</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of milling/grinding machine</td>
<td>294(77.4%)</td>
<td>-</td>
<td>-</td>
<td>86(22.6%)</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Use of packaging materials</td>
<td>380(100%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>380(100%)</td>
</tr>
<tr>
<td>Total</td>
<td>380</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Nev = Never used; Sel = Seldomly used; Occ = Occasionally used; Freq. = Frequently used

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 Summary of Ownership of Processing Machines 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

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>260</td>
<td>68.4%</td>
</tr>
<tr>
<td>Government</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non-Government</td>
<td>32</td>
<td>8.4%</td>
</tr>
<tr>
<td>Co-operative Societies</td>
<td>88</td>
<td>23.2%</td>
</tr>
<tr>
<td>Total</td>
<td>380</td>
<td>100%</td>
</tr>
</tbody>
</table>


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 Income Generation from 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

<table>
<thead>
<tr>
<th>Incremental Annual Income (₦)</th>
<th>Annual income before adopting cassava processing technologies</th>
<th>Annual income after adopting cassava processing technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>&lt;50,000</td>
<td>233</td>
<td>61.3%</td>
</tr>
<tr>
<td>50,000-100,000</td>
<td>72</td>
<td>18.9%</td>
</tr>
<tr>
<td>100,000-150,000</td>
<td>26</td>
<td>6.8%</td>
</tr>
<tr>
<td>150,000-200,000</td>
<td>19</td>
<td>5.0%</td>
</tr>
<tr>
<td>200,000-250,000</td>
<td>7</td>
<td>1.8%</td>
</tr>
<tr>
<td>250,000-300,000</td>
<td>5</td>
<td>1.3%</td>
</tr>
<tr>
<td>&gt;300,000</td>
<td>18</td>
<td>4.7%</td>
</tr>
<tr>
<td>Total</td>
<td>380</td>
<td>99.8%(100)</td>
</tr>
</tbody>
</table>


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

\[ R = \frac{60,000,000}{30,000,000} = 2 \]

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

<table>
<thead>
<tr>
<th>S/No</th>
<th>Description</th>
<th>Value (₦)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Variable Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>Cost of Labour</td>
<td>52,878.98</td>
<td>36.2%</td>
</tr>
<tr>
<td>ii</td>
<td>Cost of Transportation</td>
<td>13,809.40</td>
<td>9.5%</td>
</tr>
<tr>
<td>iii</td>
<td>Cost of raw materials</td>
<td>47,545.94</td>
<td>32.6%</td>
</tr>
<tr>
<td>iv</td>
<td>Total Variable Cost (TVC)</td>
<td>114,234.32</td>
<td>78.3%</td>
</tr>
<tr>
<td>(ii)</td>
<td>Fixed Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>Land rent</td>
<td>9,650.00</td>
<td>6.6%</td>
</tr>
<tr>
<td>vi</td>
<td>Implement cost</td>
<td>22,064.08</td>
<td>15.1%</td>
</tr>
<tr>
<td>vii</td>
<td>Total Fixed Cost (TFC)</td>
<td>31,714.08</td>
<td>21.7%</td>
</tr>
<tr>
<td>(viii)</td>
<td>Total Cost (TC)</td>
<td>145,948.40</td>
<td>100%</td>
</tr>
<tr>
<td>ix</td>
<td>Total Revenue (Income) (TR)</td>
<td>299,945.79</td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>Profit (TR-TC)</td>
<td>154,997.37</td>
<td></td>
</tr>
</tbody>
</table>

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

4.5 Profitability measures for the Gari enterprise

(a) Profit = Total Revenue – Total Cost

= 145,948.40 – 129,115.57

= 299,945.79 – 114,234.32 = 181,711.47

(b) Gross Margin = Total Revenue – Total Variable Cost

= 299,945.79 – 145,948.40

= 2.73

(c) Cost-Benefit Ratio = Total Revenue / Total Cost

= 114,234.32

= 0.37

(d) Gross Ratio = Total Cost / Total Revenue

= 145,948.40

= 0.37

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

= \( \frac{129,115.57}{145,948.40} \times 100 \)

= 172.7%

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

= \( \frac{283,829.65}{114,234.32} \)

= 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 Adeyemoet 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 252,115.57 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

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

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

= 118,744.64

= 0.44

(d) Gross Ratio = Total Cost / Total Revenue

= 130,640.42

= 2.30

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

= \( \frac{169,305.37}{130,640.42} \times 100 \)

= 129.6%

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

= \( \frac{130,640.42}{299,945.79} \)

= 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 N169,305.37 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 N1 would realize N2.30 as revenue, which implies that the processor and marketer would gain N1.30 on each N1 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

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

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

\[
\text{Profit} = 256,788.10 - 77,504.65 = 179,283.45
\]

(b) Gross Margin = Total Revenue – Total Variable Cost

\[
\text{Gross Margin} = 256,788.10 - 71,453.92 = 185,334.18
\]

(c) Cost-Benefit Ratio = Total Revenue / Total Cost

\[
\text{Cost-Benefit Ratio} = 256,788.10 / 77,504.65 = 3.3
\]

(d) Gross Ratio = Total Cost / Total Revenue

\[
\text{Gross Ratio} = 77,504.65 / 256,788.1 = 0.30
\]

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

\[
\text{Percent Profit} = \frac{179,283.45}{77,504.65} \times 100 = 231.3%
\]

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

\[
\begin{align*}
\text{Rates of Return} &= \frac{185,334.18}{71,453.92} \\
&= 2.6
\end{align*}
\]

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 N179,283.45 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 N3.30 as revenue, which also implies that the processor and marketer would gain N2.30 on each N1 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 N252,115.57 per processor and marketer, than the Akpu and Chips enterprises, with the profits of N169,305.37 and N179,283.45 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

<table>
<thead>
<tr>
<th>S/No</th>
<th>Constraints</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local processing technology or lack of modern processing equipment</td>
<td>294</td>
<td>77.4</td>
</tr>
<tr>
<td>2</td>
<td>High cost of processing due to high cost improved processing technologies</td>
<td>215</td>
<td>56.6</td>
</tr>
<tr>
<td>3</td>
<td>Lack of credit for processors</td>
<td>380</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Inadequate technical knowledge in the use of improved processing technologies</td>
<td>280</td>
<td>73.7</td>
</tr>
<tr>
<td>5</td>
<td>High seasonal fluctuations in demand for cassava products, uneven product quality and variation in cassava supply</td>
<td>350</td>
<td>92.1</td>
</tr>
<tr>
<td>6</td>
<td>No formal training for adoption technology innovation in cassava</td>
<td>360</td>
<td>94.7</td>
</tr>
</tbody>
</table>
was rejected and the alternative hypothesis accepted, it can
Based on the fact that the null hypothesis for this research
products (92.1%). 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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<table>
<thead>
<tr>
<th>Processing</th>
<th>Low prices and wide fluctuations in demand for cassava products.</th>
<th>380</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low returns from small-scale processing of cassava.</td>
<td>281</td>
<td>73.9</td>
</tr>
<tr>
<td></td>
<td>Poor market demand for products.</td>
<td>150</td>
<td>39.5</td>
</tr>
</tbody>
</table>


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%).


**Joseph Fefa** is an Assistant Lecturer in the department of economics at the Benue State University, Makurdi-Nigeria. He received his B.Sc. and M.Sc. in economics from the Benue State University, Makurdi-Nigeria in 2008 and 2012, respectively. He is currently a PhD student of the Department of Economics, at the Benue State University, Makurdi-Nigeria. His research interests include econometric analysis of data, poverty reduction strategies, and development Economics.