

# **TECHNOLOGY CONSTRAINTS TO SMALL HOLDER CASSAVA PRODUCTION IN IMO STATE NIGERIA**

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## **ABSTRACT**

Slow growth in staple food production in Nigeria and other sub-saharan Africa as well as low growth in per capita income necessitated the need for this study. Potential positive impact of technology in agricultural production also formed part of the basis for this study.

Two hundred and ten (210) farmers whose major food production was cassava were selected from the three zones of Imo State. Budgetary and Econometric analysis were utilized to determine the technological constraints in the established cropping system. The results show poor performance of current technologies, absence of mechanical and chemical technologies. This study also found that farmers utilized modern \*(improved) biological technologies which minimized labour input and, Maximized. Remedial measures include the development of species that are location-specific, do not require chemical fertilizers because they are unaffordable and unavailable. Labour enhancing technologies and the development of cultivars that are labour-reducing are

recommended because lack of labour was found to be a significant constraints.

**KEY WORDS:** Technologies Cassava, Constraints

## **INTRODUCTION:**

Slow growth in staple food production in Nigeria and other sub-Saharan Africa continues to attract attention in the scientific community as well as in the political sphere, [Onyegbula, 1999] Low level of economic production which leads to slow growth of per capital income portends poverty and the attendant social and political consequences which in turn cuts across national boundaries. Therefore, research that has the potential for improvement in the income of small-holder farmers, the main producers of food in Africa and Nigeria are justified, (Poison and Spencer, 1992).

Technological change is the main route for increasing agricultural productivity and production, (Ahmed, 1981). However, technological change alone may not achieve the desired objectives if cognizance is not taken of other important objectives such as incomes and equity. For Example, studies

from Mexico and South-East Asia, (Norman, 1978, Binswinger and Ryan, 1977), have shown that the improved hybrid maize and rice which required fertilization was not adopted by low income farmers. Technologies which take cognizance of the income status of the farmers and their ability to employ purchased inputs will increase the chances of adoption and eventual increase in income. The justification for this research is also derived from the current drive to privatize agricultural input supply and production due to the poor performance of agricultural parastatals in Nigeria and commercialization of existing parastatals, (Chukuigwe, 1997). Current environmental-concerns also calls for technologies that are environmentally-friendly. Technologies that increase output and at the same time take cognizance of the socio-economic and other environmental concerns have high potency for adoption and ultimate income enhancement, (Kang, 1968). However, technology policy adoption re-

quires optimum knowledge of available technologies and constraints to adoption by small-holder farmers. Research efforts by the scientific community led by the International Institute of Tropical Agriculture (I.I.T.A). Ibadan, Nigeria and the National Root Crops Research Institute (NRCRI), Umudike, Nigeria have led to the development of improved cassava cultivars capable of boosting cassava output by 7% per hectare of land, (I.I.T.A., 1994). In addition, the National Seed Service (N.S.S.) has several programmes for cassava, maize, sorghum and other cereals aimed at multiplying the improved varieties in order to meet the demands of State Ministries of Agriculture.

Despite these efforts per hectare, cassava production continues to decline (Sarma and Kunchai, 1991). The situation is made worse by the encroachment of urbanization and industrialization (Orupabo, 1999; Brundtland 2987). In Imo State, in South-Eastern Nigeria, Cassava producers income is not only low but uncertain and farmers are generally indebted to friends, relatives and thrift associa-

tions (Onyegbula, 1997). It is therefore necessary to identify available technologies to the same-holder farmers and the constraints to cassava technological transfer to the farmers in Imo State in South-Eastern Nigeria.

### *Research Objective*

The research objectives are (a) the identification of available technologies to the small-holder farmers in the survey area; (b) the performance of available technologies through the analysis of average net income of the small-holder cassava producers and (c) to identify and analyze the technology constraints to small-holder cassava production in the survey area.

### *The concept of Agricultural Technology in a Developing Economy*

Evenson (1973) conceptualized agricultural technology as input into agriculture production process in which output (Q) is a function of biological input  $X_b$  ( $Ex_{bi}$ ) and mechanical input  $X$  ( $Ex_m$ ) as well as labour and other production input. There is factor substitution with mechanical

input but the mechanical input in this production process is limited to hand-held implements such as knives, cutlass, hoes, etc. Tractorisation or fuel powered technology is absent. Mathematically,  $Q = f\{b(\sum X_{bi}), m(\sum X_{mi}), N, L, \} + e_i$  where  $X_{bi}$  are biological, chemical inputs such as improved cassava cultivars, seeds, fertilizer and agrochemicals and  $X_{mi}$  are mechanical inputs such as farm tools (knives, cutlass, hoes),  $N$  = Labour,  $L$  = land and  $e_i$  = error factor. The positive impact of land and labour on the traditional farming systems is well known (see Chukuigwe, 1994; Olayide et al, 1980).

## METHODOLOGY

Imo State lies on latitude  $5^{\circ}$  north of the equator in South-Eastern Nigeria surrounded by Anambra, Enugu, Abia and Rivers States. The state is divided into three zones namely Okigwe, Owerri and Orlu more for administrative reasons than for agroecological or farming systems basis. The topography is generally undulating with conspicuous soil loss due to gully erosion in many areas. The State has high agricultural potential with available arable land for the growth

of tropical crops as yams, Cassava, maize, cocoyams, Plantains and bananas. Cassava is a staple food generally produced in the survey area. (Anuebunwa, 1990).

The Sample frame consisted of farmers served by the Agricultural Development programme (ADP). The data for this study were collected for 1998/99 farming season. Two hundred and ten (210) farmers whose major production was cassava were selected. The sample was drawn from a stratified population essentially according to the zones. Output in fresh tuber weight was measured by the yield-plot technique and in metric tones per hectare (Spencer, 1972). The yield plot technique involves the identification and measurement of a  $10 \times 10 m^2$  planted farm having same population of crop mixtures as the planted farm making it representative of the farm. Later the farmer is contacted to give a total yield in baskets similar to the baskets used in weighing the sample plots. This give a measure of consistency. Where there is wide disparity between the calculated yield and the farmers' report we opted for the calculated rather than the one offered by the farmer, which

might not be correct due to memory lapses or misinformation or falsification on the part of the farmer. This approach was not foolproof but the best in the circumstances of the farming systems not at regular spacing. Data collection technique utilized a combination of structured questionnaire administration and personal interview. Two hundred and

fifty questionnaire were administered but two hundred and ten were analyzed after discarding forty of them due to poor completion and inconsistencies giving seventy percent response rate. The Agrochemicals, fertilizer were evaluated in kilogrammes per hectare while the cost of farm tools were measured at cost and depreciated by straight

**Table 1 : Types of Technologies Transferred to Farmers from 1990 – 1999 (Vrops).**

Dissemination

1	Introduction of improved cassava variety (TSM 30572.6050, 30553 and 50395.	+	+	+	+	+	+
	Cassava/Maize Intercrop	+	+	+	+	+	+
3	Yam Minisett followed by Cowpea	+	+	+	+	+	+
4	Yam/Cassava/Telfaria/ Maize Intercrop	+	+	+	+	+	+
5	Plantain/Cocoyam Intercrop	+	+	+	+	+	+
6	Use of fertilizer	+	+	+	+	+	+
7	Cowpea/Cassava/Maize Intercrop	+	+	+	+	+	+
8	Cowpea Sole	+	+	+	+	+	+

Source: Adopted from Imo State Agric. Development Programme

line method for two years.

**Analytical Procedure**

Available technologies to the smallholder farmer were tabulated (See table 1) while the performance of the available technologies was analyzed us-

ing the average income statement of the farmers. (see table 2).

**Briefs on Activities of 1990-1999**

Key ++ Active Disseminated  
Constraints to the system

**Table 2: Average Income Statement for Cassava Producers in Imo State**

Revenue From Sales of Cassava Tuber	15.375
Value of Home Consumed Tubers	11.436
Total Revenue	26.815
Less	
Cost of Labour	2.800
Hired Labour	4.915
Family Labour	4.161
Cassava Cuttings (Market)	680
Cassava Cuttings (Own Farm)	1.632
Marketing Expenses	2.820
Depreciation of Production Tolls and Equipment	2.840
Total Cost	22.848
Net farm Income	3.967

Source: Survey Data 1999

were econometrically analyzed. The Cobb-Douglas form in logarithm,  $Y = AX_1^a X_2^b X_3^c X_4^d + e$  was fitted after several functional forms such as the linear and the quadratic were tried. The Cobb-Douglas was chosen on the grounds of the robustness of the parameters and the F. statistic. The model is explicitly given as  $\text{Log } Y = \text{Log } A + \text{Log } X_1 + \text{Log } X_2 + \text{Log } X_3 + \text{Log } X_4 + \text{Log } e$

Where  $Y$  = Value of output in naira

$X_1$  = Extension service in contact hours

$X_2$  = Cassava cultivars (in bundles)

$X_3$  = Fertilizer in Kilogrammes

$X_4$  = Tools and Equipment in naira (depreciated)

$e$  = error term

## RESULTS AND DISCUSSION

### *Available Technologies*

Available technologies were classified as biological, chemical and mechanical. Mechanical technologies such as tractorisation were absent. Chemi-

cal technologies such as pesticides were not specific on cassava. Biological technologies were in the form of improved cassava varieties (Cultivars).

The most popular varieties were TMS 30572 and 60506 though not necessarily in that order. There were eight varieties but the TMS 20572 and TMS 60506 were the most preferred. The reasons given by the farmers were that these varieties were early-maturing (6 months), non-branching, high-yielding, less water and of high garri-conversion quality. The disadvantage was they rot easily in hydromorphic soils. The 60506 had the additional advantage of being cooked and eaten like yam. The other available cultivars are said to contain a lot of water though their fresh tuber yield were high.

### *The other desirable.*

Qualities preferred by the farmers were low fibre content of the tubers and ability to stay in the soil without deterioration after sixteen months.

### *Performance of Technologies:*

The second objective of the

study, which sought to establish the economic performance of current technologies, was through the analysis of the average income statement of the farmers. Output performance alone was insufficient to assess performance necessary for adoption. Table 2 shows the average income statement of the farmers in the survey area. Farmers worked on an average size of one-tenth of an hectare (0.1ha) per plot though some had as much as five plots over 70% of cassava produced was consumed within the household while 80% of the cassava cutting were derived from the farmers' farm.

With a revenue of twenty-six thousand, eight hundred and fifteen naira (N2,6815) and a total cost of Twenty-two thousand, eight hundred and forty-eight naira, the cost recovery rate was barely unity. More important was the low net farm income of three thousand, nine hundred and sixty-seven naira which compared poorly with the minimum wage of over five thousand naira. At a total cost of twenty-two thousand eight hundred and eight-eight naira, the cost recovery rate was barely one.

### *Technological constraints to small-holder cassava production in Imo State*

To identify and analyze the technology constraints in the small-holder cassava production in the survey area, an econometric model was established. The model explains output as a function of biological, chemical and mechanical inputs. Mechanical inputs were virtually absent, other inputs were the traditional inputs of land labour. The result of the econometric analysis which was statistically ( $F=19.4$ ) is given below.

$$\text{Log } Y = \text{Log } 3.05 + 0.09 \text{Log} X_1 + 0.34 \text{Log} X_2 + 0.02 \text{Log} X_3 + 0.07 \text{Log} X_4$$

$$(17.70) \quad (2.34) \quad (7.45) \quad (-0.42) \quad (2.02).$$

\*\* \*\* \*

F- statistic = 19.4

$$R^2 = 0.33$$

\*\* = Significant at 5%

The significant F – statistic of 19.4 implies structural satisfaction of the model but the  $R^2$  of 0.33 is low which implies that there were more to cassava production than the variables included. Land and



labour variable contributions to production of cassava were well-known but were excluded to reduce the number of variables in the estimation. Land and labour are known to contribute significantly to output of cassava in small-farmer cassava production (Chukuigwe, 1994) but these variables were in short supply in the survey area. The positive significant coefficient of biological technical variable (Cultivars, X<sub>2</sub>) is noteworthy. Though significant, the level of improved cultivar utilization was low. Increase in the use of improved cultivars can significantly increase cassava output in the survey area. However, most of the current improved cultivars also depended on fertilizer application. Therefore there is the need to develop cultivars that are less dependent on chemical fertilizers. Agriculture extension though significant was also at a very low level of utilization. The importance of agricultural extension needs to be amplified in view of correlation between fertilizer consumption and agricultural extension. Increase in agricultural extension combined with local-stable, non-chemical using cultivars seem to be a combination that could signifi-

cantly increase cassava output in the survey area. Unfortunately, agricultural extension in the area seemed to be on the decline with declining farm visits.

Chemical fertilizers (X<sub>3</sub>) negatively correlated and had no significant contribution to the farming system. Cost and non-availability were contributory factors in the non-performance of chemical fertilizers in the farming system. Tools and equipment (x<sub>4</sub>) were understandably significant. However, the tools utilized were still the hand-held tools such as knives and hoes with the absence of motorized or fuel-driven implements. The reduction of the drudgery involved in their use will significantly increase output in the survey area.

## **SUMMARY OF RESULTS CONCLUSION AND RECOMMENDATIONS**

Slow growth in staple food production in Nigeria and other sub-saharan Africa as well as low growth in per capital income necessitated this study using Imo State as the study area. Potential impact of technology in agricultural pro-

duction also added impetus to this study. Available technologies were identified and performance ascertained by the use of the income statement analysis while the constraints were analyzed using econometric analysis. The results from both the income statement analysis and econometric analysis showed poor performance of the farming systems. A significant outcome of the study is the need to develop cassava cultivars that use

minimum quantity of fertilizers and the implied extension requirement activities in the survey area.

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