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**Achoja, F. O.** (Department of Agricultural Economics and Extension, Delta State University, Asaba Campus, Nigeria)

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**Author(s)**

**Achoja, F. O.**
Department of Agricultural Economics and Extension, Delta State University, Asaba Campus, Nigeria
*Email:* lixmero40@yahoo.com

**Idoge, D. E.**
Department of Agricultural Economics and Extension, Delta State University, Asaba Campus, Nigeria

**Ukwuaba, S. I.**
Department of Agricultural Economics and Extension, Delta State University, Asaba Campus, Nigeria

**Esowhode, A. E.**
Department of Agricultural Economics and Extension, Delta State University, Asaba Campus, Nigeria

**Abstract**

Determinants of export-led cassava production intensification among small-holder farmers were investigated. Primary data collected with structured questionnaire from randomly selected 60 respondents, were analysed using appropriate statistics. The result showed a slow increasing trend in response to export opportunities. Farm size, credit availability, cassava product domestic prices, labour and frequency of extension contact had positive effect on cassava output while existence of efficient marketing system has negative effect on cassava output. Inadequate finance and high cost of labour were the problems facing cassava production intensification. Policy instrument on cassava production intensification should capture the significant determinants identified in the study.

## Introduction

Besides the need to meet the food demands of the ever increasing Nigeria population, industrial requirements such as for the production of laundry starch and livestock feeds have made the establishment of large-scale cassava farm holding desirable outfits to which any farmer and industrialist have opted and will opt for. Nigeria's output of cassava is by far the largest in the world, a third more than production in Brazil and double the production in Indonesia and Thailand. By the year 2000, estimate of cassava output was put at about 34 million tones, but by 2002 the output rose to about 37 million tones (CBN, 2002; FAO, 2004). FAO (2004) also reported that Nigeria is ranked low in terms of yield of cassava production (kilogram per hectare) relative to such countries as Brazil, Thailand and Indonesia who are major producers of cassava after Nigeria with yield per hectare at 10.8, 13.43, 16.84 and 12.02 tonnes for Nigeria, Brazil, Thailand and Indonesia respectively. According to FAO,. (2004) global cassava production is expected to rise with increasing demand for cassava based industrial products. In Nigeria alone, in order to actualize the President's Initiative of US$5 billion a year by 2007, 150 million tonnes of cassava would be needed by the end of 2006. With production being a function of area and yield, this target requires an expansion from 2 million hectares (ha) of land To 3 to 5 million ha and an average yield of 30 tonnes per ha.

However in Nigeria, according to IITA (2004) report, at national lend, Benue and Kogi States in the North Central zone are the largest producers of cassava, while Edo, Cross River, Akwa-Ibom, Rivers and Delta States dominate cassava production the South –South zone. In Nigeria, the bulk of cassava output is produced by semi-subsistence and small holder family farms that generally use traditional farming methods (Okuneye, 1997; Upton, 1997; Nweke, 1997). Before presidential cassava initiative, cassava was domestic-market dependent as a result, producers earn very little for their effort. Government is of the opinion that if cassava can gain entrance into international market in the right form, producers will earn more returns and cassava sub-sector will contribute more to Gross Domestic Product (GDP).

In this study, it was assumed that cassava sub-sector in Nigeria has assumed a new challenge of satisfying both domestic and international markets. There is therefore the need for cassava production intensification in Nigeria. It is assumed that cassava production intensification will depend on some variables. Before now, the determinants of export-led cassava production intensification have not been investigated to the best our knowledge. Identifying

these variables is critical in handling the new challenges facing the cassava sub-sector in Nigeria. This is the research gap that this investigation was designed to fill. Specifically, the study described the demographic characteristics of the cassava producers in the study area; describe the cassava production system adopted by the farmers, examine cassava production intensification trend in the study area; identify the socio-economic determinants of cassava production among the small holder farmers, identify the major problems facing cassava production intensification among the small holder farmers.

**Research Hypothesis:**
$H_0$: The selected factors have no joint significant effect on cassava production intensification in the study area.

## Materials and Methods

### Study Area and Sampling Techniques
The study was carried out in Delta State, Nigeria. It has an estimated population of 4112445 (NPC, 2006). It lies approximately between longitude 5° 00 E and 6°45' E of the Greenwich Meridian and latitude 5 °00' N and 6°30' in the N of the Equator. The vegetation of the area ranges from mangrove swamps along the coast to freshwater swamp forest and a derived savannah in the northern extremities with annual rainfall ranging from 1750 – 2000mm and land area of 17,698 km$^2$ (Delta State Meteorological Station, Asaba). Data used for this study were mainly primary and were obtained from small holder cassava farmers using well-structured questionnaire and interview schedule. Specifically, a two-stage sampling procedure was used in randomly selecting 60 cassava farmers from three villages and was purposely selected for their well known in cassava production.

### Data Analysis Techniques
Data were analysed using descriptive statistics and multiple regression models. Specifically, the demographic characteristics of the small holder cassava farmers, production system adopted by the farmer, cassava production intensification in the study area and major problems challenging cassava production intensification were achieved using descriptive statistics such as frequency counts and percentage while multiple regression model was used in achieving the socio-economic determinants of export-led cassava production intensification among small holder farmers in the study area. The model is implicitly specified thus:

$Y = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, U)$ …………. (1)

Where:

Y = Output of cassava (Kg/ha)
$b_0$: Constant term.

$b_s$ = vector of exogenous variables.
$X_1$ = Farm size (ha)
$X_2$ = Credit (Naira)
$X_3$ = Cassava product domestic prices (Naira)
$X_4$ = Labour used (man day/hr)
$X_5$ = Use of agro-chemicals
$X_6$ = Educational attainments
$X_7$ = Frequency of extension contact
$X_8$ = existence of efficient marketing system
$X_9$ = years of experience
U = stochastic disturbance term.

The regression was fitted for small holder cassava output using the linear, semi-logarithm and double logarithm functions. The lead equation from the three functional forms was chosen based on the value of multiple coefficients at determination ($R^2$) as well as sign and significance of the regression parameters. The prior expectation of the regression parameters is given as $b_1 > 0$, $b_2 > 0$ …… $b_9 > 0$ and that of null hypothesis is $H_o$: $b_1 = 0$.

## Results

### Demographic Characteristics of smallholder cassava Farmers
Various demographic variables of cassava farmers which could be relevant in influencing output were described in Table 1. The result indicates that 11.7, 18.3, 43.4, 21.6 and 5.0% of the respondents fall within the age ranges of less than 30, 30-39, 40-49, 50-59 and 60 years and above respectively. This implies that majority of cassava producers in the study area fall within the work force which is also a reflection of the population distribution in the study area. More than fifty six (56.7) percent were females while 43.3% were males. This shows the dominance of female cassava farmers over males in the study area. Majority (46.7%) of the respondents were married which could be responsible for the additional supply of labour to complement their personal efforts. Majority (47%) of the respondents received formal education. This therefore could be due to the closeness of the study area to an urban centre. Table 1 also indicates that 66.7% of the respondents have been farming up to ten years while 33.3% have been into cassava farming for up to 20 years. Since the level of farming experience is an index of efficiency, it could be adduced that cassava farmers in the study area were experienced. This could translate to production intensification in terms of acreage cultivated.

### Cassava Production System
The result of cassava production system in the study area is presented in Table 2. It shows that 85% of the respondents practiced mixed production system while 15% practiced solo cropping system. This finding is in line with the findings of Ezumah and Okigbo (1980) who reported that intercropping acts as insurance against crop

failures, provides better and more efficient use of labour and land resources. Also, Karikari (1981) reported that intercropping of cassava guarantee a higher land equivalent ratio (LER) especially with species of highly different habit.

## Cassava Production Intensification Trend

Table 3 shows cassava production intensification trend in the study area. In general observation from Table 3, cassava output in Delta State increased from 1994 with an output of 738.46 metric tones to 1995 then decreasing from 1996-1997. Then from 1998 it increased slowly with an output of 795.38 metric tones to 2004 with output of 961.46m.mt. This increase in cassava output in Delta State in the 2000s could be attributed to the presidential initiative on cassava in the year 2000 which seeks to earn 5 billion US dollars from value added cassava exports by 2007.

## Determinants of Cassava Production Intensification among Smallholder Farmers

Table 4 presents the result of multiple regression analysis. The double log functional form was chosen as the lead equation given the value of coefficient of multiple determination ($R^2$) of 0.87 its adjusted value ($R^2$) of 0.85, F statistics of 39.295 and the significance of the regression parameters.

The estimated regression equation is given as:

$$Log\ \hat{Y} = 10.805\ log + 40.793\ log\ X_1 + 1.854\ log\ X_2 + 1.732\ log$$
$$\qquad\qquad (59.92)^* \qquad (7.98)^* \qquad (2.90)^* \qquad (2.53)^*$$
$$X_3 + 0.160\ log\ X_4 + 3.942\ log\ X_5 - 1.16\ log\ X_6 + 2.183\ log\ X_7$$
$$\quad (2.56)^* \qquad (0.56) \qquad (0.17) \qquad (3.16)^*$$
$$- 2.929\ log\ X_8 + 7.50\ log\ X_9 + U$$
$$\quad (0.48) \qquad (1.23)$$

Where the variables are as defined in equation (1) and the figures in parenthesis are t- ratios. The coefficient of multiple determination ($R^2$) of 0.87 indicates that 87% variations in cassava output were explained by the explanatory variables captured in the model and F-ratio of 39.295 measures the joint impact of the regressors on the regressand thus testing the joint significance of the model. The estimates showed that farm size, credit, cassava product domestic prices, labour used and frequency of extension contact had positive relationship with cassava output.

The significance (P<0.01) and positive relationship between **farm size** and cassava output intensification implies that cassava outputs in the study area are more likely to increase if the farm size increases on hectare basis. This is in conformity with rational economic principles which states that "the larger the farm size, the more the output. The coefficient of **credit accessibility** is

positive, significant (P<0.01) and in conformity with a priori expectation that cassava output per hectare would increase as the credit accessibility of the farmers increases. Credit accessibility would enable the farmers acquire more productive resources such as land, fertilizers labour, etc. which would translate to increase in cassava output.

A positive and significant (P<0.01) relationship exist between **cassava product domestic prices** and cassava output per hectare. This is evident based on the fact that as prices of cassava products increase, the small holder cassava farmers would generate more revenue which encourages farmers to intensify cassava production in the study area. **Labour use intensification** influenced cassava output intensification positively and significantly (P<0.01) in the study area. This could be because as the labour used per man day increases, the available needs in the farm plots that hinder output will be reduced and output increases. **Educational attainment** had a negative effect on the output of cassava farmers which implies that educational attainment does not necessarily determine the output of cassava farmers in the study area. However, it is possible to hypothesize that when a farmer becomes highly educated he/she may pull out of farming to pick up a government job.

**Frequency of extension contact** had a positive and significant (P<0.01) relationship with cassava output. This implies that output of cassava per hectare of small holder farmers in the study area would depend on the volume and frequency of information they got from the extension agents.

**Existence of efficient marketing system** though not significant had a negative relationship with cassava output. This could be due to lack of access feeder roads and the distance of the farm locations from the market. Also the inefficient marketing system for cassava products (gari, fufu, starch) at present does not encourage cassava producers to intensify production in the study area. Cassava producers do not get value for their production efforts. This is quite a disturbing situation and does not stimulate the growth of cassava industry on the aggregate. The solution to the problem in our opinion, is for Nigerian cassava to secure an alternative market outlets in the form of exports.

## Hypothesis Testing

The regression ANOVA result presented in Table 5, indicates that using a one-tail test at 1% level of significance, the F-calculated is 39.29 while F-tabulated is 2.82. Since the value of F-calculated is greater than the corresponding value of F-tabulated, we reject the null hypothesis ($H_0$: bs = 0, e P<0.01) which states that the

selected determinants have no joint significant effect on cassava production intensification by small holder cassava farmers and accepted the alternative hypothesis. The implication of this finding is that cassava production intensification will depend the collective relationship between the significant variables in the model but not individual variables. Therefore an intensification policy should ordinarily encapsulate these variables.

**Major Problems Facing Cassava Production Intensification among Smallholder Farm**
Table 6 presents the major constraining factors facing cassava production intensification in the study area. It shows that majority of the farmers indicated that inadequate finance (35%), land fragmentation (27%), and high cost of labour (15%) were the major problems challenging export-led cassava production intensification in Delta State, Nigeria. It is this lack of access to finance that could be the possible reason that limits the scale of cassava production in the study area to small scale.

## Discussion

The result showed that cassava output over the period increased but slowly. This result could be due to the fact that cassava producers are now aware of the opportunities that exist in the global market for cassava products and they are responding by adjusting their production pattern accordingly. But it seems that the adjustment is slow. They must be facing some adjustment challenges which require policy instrument and government attention. This finding collaborates with Esowhode, (2006) earlier report that cassava producers are responding slowly to export opportunities.

From the result of the study it is clear that cassava production intensification is a function of farm size, credit accessibility, labour use, cassava product domestic price and frequency of extension contact. There is the need for intensification of these factors by way of more cassava acreage and cheap credit. Because the farmer will cultivate more plots of cassava to satisfy export demand, more capital will be required to finance land acquisition and to acquire purchased inputs such as labour and agro-chemicals. Chukwuji (2006) has earlier reported that cassava output per hectare will respond more to increase in farm size other than increase in the productivity of factors of production. Cassava product domestic price positively affected cassava output in this study. This is in line with a priori expectation and economic theory that higher price will stimulate more supply of the product at a given point in time. Another important factor that will stimulate cassava production intensification as shown in the result is the frequency of extension contact with cassava producers. More contact is expected to encourage

cassava producers to benefit from export-led cassava intensification.

Inadequate finance turned out to be the major constraint confronting export-led cassava production intensification. This is because majority of cassava producers are resource-poor farmers and finance is a major challenge. Export-led cassava production intensification is capital intensive in the sense that producers need to acquire more processing equipment that will enable the quality of their products to harmonize with international standard.

## Conclusion and Recommendations

Export-led cassava production intensification was investigated in Delta State, Nigeria. For cassava production to satisfy the export demand, some determining factors must be put into consideration. These factors include farm size, credit accessibility, cassava product domestic price, labour use and frequency of extension contact. Intensification of these factors will translate to intensified cassava supply and export. It is therefore recommended that those factors that positively affected cassava output should attract policy instrument that can stimulate export-led cassava regime. Government should design special credit scheme for cassava producers to enhance their output.

## References

**Central Bank of Nigeria (2002)** Annual Report and Statement of Accounts, Central Bank of Nigeria, Abuja

**Chukwuji, C. O. (2006)** "Resource use Efficiency in Cassava Production in Delta State of Nigeria", Ph. D Thesis, Department of Agricultural Economics and Extension, Delta State University, Asaba Campus.

**Esowhode A. E. (2006)** "Determinant of Cassava Production Intensification among Smallholder Farmers in Ika North East Local Government Area of Delta State. Unpublished B. Agric Project

**Ezumah, H. C.** and **P. N. Okigbo (1980) "**Cropping System and Related Research in Africa", AASA Occasional Publication Series.

**Food** and **Agriculture Organization (2004)** "Food and Agriculture Organization online Statistical data base", Rome, Italy: Food and Agriculture Organization of United Nations. www.fao.org

**International Institute for Tropical Agriculture (2004)** "Nigeria's Cassava Industry: Statistical Handbook"

**Karikari, S. K. (1981)** "Intercropping of Plantain, Cocoyam and Cassava",

**National Population Commission (2006)** Nigeria Population Census Figures, Abuja National Population Commission Publication

**Nweke, F. I. (1997)** "Cassava is a Cash Crop in Africa: A viewpoint". IITA Research, S/No. 14/15:PP. 26-27.

**Okuneye, P. A. (1997)** Poverty Eradication and the role of Family Economic Advancement Programme (FEAP) Paper Presented at the Workshop on FEAP and Poverty

Alleviation, May, (1997) Abeokuta, Ogun State, Nigeria. Phillips T.P., D. S. Taylor, L. Sanniand M. O.

**Akoroda (2004)** "A Cassava Industrial Revolution in Nigeria: The potential for a new industrial crop", International Institute of Tropical Agriculture, Ibadan, Nigeria. International Fund for Agricultural Development, Food and Agriculture Organization of the United Nations, Rome, Italy.

**Upton, M (1997)** "The Economics of Tropical Farming Systems", Cambridge University Press New York, USA

## Appendix

**Table 1: Socio-economic Characteristics of the Respondents**

| Characteristics | Frequency (n=60) | Percentage (100%) |
|---|---|---|
| AGE | | |
| Less than 30 | 7 | 11.7 |
| 30-39 | 11 | 18.3 |
| 40-49 | 26 | 43.4 |
| 50-59 | 13 | 21.6 |
| 60 and above | 3 | 5.0 |
| GENDER | | |
| Male | 26 | 43.3 |
| Female | 34 | 56.7 |
| EDUCATIONAL LEVEL | | |
| No formal education | 13 | 21.7 |
| Primary education | 14 | 23.3 |
| Secondary education | 25 | 41.7 |
| Tertiary education | 8 | 13.3 |
| MARITAL STATUS | | |
| Single | 17 | 28.3 |
| Married | 28 | 46.7 |
| Others | 15 | 25.0 |
| FARMING EXPERIENCE | | |
| 1-5 | 7 | 11.7 |
| 6-10 | 33 | 55.0 |
| 11-15 | 17 | 28.3 |
| 16-20 | 3 | 5.0 |
| 20 and above | - | - |

**Source:** Authors' computation

**Table 2: Cassava Production System**

| Type of Farming | Frequency (n=60) | Percentage (100%) |
|---|---|---|
| Mono cropping | 9 | 15 |
| Mixed cropping | 51 | 85 |
| Total | 60 | 100 |

**Source:** Authors' computation

**Table 3: Trend of Total Output of Cassava by Smallholder Farmers in Delta State1994-2004 ('000mt)**

| Year | Output ('000mt) | Percentage Intensification (100%) |
|---|---|---|
| 1994 | 738.46 | |
| 1995 | 855.11 | 15.8 |
| 1996 | 802.25 | -6.2 |

| | | |
|---|---|---|
| 1997 | 755.60 | -5.2 |
| 1998 | 794.82 | 5.2 |
| 1999 | 795.38 | 0.1 |
| 2000 | 818.01 | 2.8 |
| 2001 | 872.14 | 6.6 |
| 2002 | 902.59 | 3.5 |
| 2003 | 902.00 | -0.1 |
| 2004 | 961.46 | 6.6 |

**Source:** Authors' computation

**Table 5: Analysis of Variance (ANOVA) Result**

| Sources | DF | Sum of Square | MS | F.Cal | F.Tab | Sig. |
|---|---|---|---|---|---|---|
| Regression | 9 | 6.875 | 0.764 | 39.295 | 2.82 | 0.001 |
| Residual | 50 | 0.972 | 1.944E-02 | | | |
| Total | 59 | 7.847 | | | | |

**Source:** Authors' computation

**Table 6: Major Problems Facing Cassava Production Intensification in the Study Area**

| Problems | Percentage (100%) |
|---|---|
| Inadequate finance | 35 |
| High cost of labour | 15 |
| Land fragmentation | 27 |
| Losses experienced | 10 |
| Other production constraints | 13 |
| Total | 100 |

**Source:** Authors' computation

**Table 4: Multiple Regression Analysis of Cassava Output**

| Parameters | Linear | | | | Semi-logarithm | | | | Double logarithm | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | Std error | t-value | Sig. | Coefficient | Std error | t-value | Sig. | Coefficient | Std error | t-value | Sig. |
| Constant | 5473.078 | 5202.152 | 1.052 | 0.298 | 58462.385 | 11039.843 | 5.296 | .000 | 10.805 | 0.180 | 59.921 | .000 |
| Farm size | 21615.780 | 2905.376 | 7.440 | .000 | 40911.736 | 6081.417 | 6.727 | .000 | .793 | .099 | 7.979 | |
| Credit | 6305.957 | 2375.989 | 2.654 | .011 | 1157.286 | 390.970 | 2.960 | .005 | 1.854E-02 | 0.006 | 2.904 | .005 |
| Domestic price | 3823.852 | 2657.101 | 1.439 | .156 | 945.872 | 418.861 | 2.258 | .028 | 1.732E-02 | 0.007 | 2.532 | 0.015 |
| Labour | 375.850 | 255.410 | 1.472 | .147 | 10603.79 | 3813.261 | 2.781 | .008 | 0.160 | 0.062 | 2.564 | 0.013 |
| Agro-chemical | 1563.709 | 2418.181 | 0.647 | .521 | -35.852 | 432.699 | -.083 | .934 | 3.942E-03 | 0.007 | -0.167 | 0.868 |
| Education | -213.394 | 1181.279 | -.181 | .857 | -306.452 | 424.817 | -.721 | .474 | -1.161E-03 | 0.007 | -0.167 | 0.868 |
| Extension | 5581.110 | 1446.494 | 3.858 | .000 | 1582.4599 | 423.230 | 3.739 | .000 | 2.183E-02 | 0.007 | 3.158 | 0.003 |
| EEMS | -588.702 | 2222.988 | -.265 | .792 | -315.115 | 377.124 | -.836 | .407 | -2.929E-03 | 0.006 | -0.476 | 0.636 |
| Experience | 263.674 | 344.556 | .765 | .448 | 4385.910 | 3614.615 | 1.213 | .213 | 7.250E-02 | 0.059 | 1.228 | 0.228 |
| $R^2$ | | 0.883 | | | | 0.848 | | | | 0.876 | | |
| $R^2$ (adj) | | 0.862 | | | | 0.820 | | | | 0.854 | | |

**Source**: Authors' computation