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# Comparative Analysis of Determinants of Income of Cassava Farmers in Rural and Urban Areas of Abia State, Nigeria

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**Abstract:** The broad objective of this study was to determine and comparatively analyze the factors that influence the income of cassava farmers in rural and urban areas of Abia state, Nigeria. Primary data used for the study were collected using a questionnaire. Data analysis involved the use of descriptive statistics such as means and percentages t-test, the ordinary least squares regression technique and chow's test. In Abia state, women are the dominant producers of cassava and cassava products. Cassava farmers in rural areas on the average earned higher incomes than those in the urban areas. Farm size was the only significant determinant of income of cassava farmers in rural areas, while labour, value of capital inputs and sex were significant determinants of the income of cassava farmers in urban areas. Access to credit for cassava farmers in both rural and urban areas was poor. Lack of capital, poor rural roads, lack of storage and processing facilities, theft of produce incidence of pests and diseases and high cost of inputs were the major constraints faced by cassava farmers in the state. Interventions that will lead to increased output and improve the income of cassava farmers such as women friendly production and processing innovations improved access to land and credit, provision of rural infrastructure and a comprehensive crop insurance scheme are needed.

**Key words:** Income, cassava, rural, urban, determinants, farmers

## INTRODUCTION

Cassava is an important staple in Nigeria and perhaps the most versatile staple in terms of the variety of products derived from it and the uses to which these products can be put. Garri is the major food product derived from cassava. Cassava pellet is an important animal feed, while starch, another derivative is important industrially. Cassava leaves are also consumed as vegetable (Jones, 1959; Fresco, 1986; Dostie *et al*., 1999; Haggblade and Gelson, 2003). In spite of its usefulness, cassava is considered an inferior crop (Nweke, 2004), produced mainly by resource limited small holder farmers under subsistence based farming systems constrained by low external inputs due to capital constraints. For these resource limited, subsistence oriented farmers, cassava is more or less an insurance for food security. It is the major crop in the mix of crops cultivated by these farmers and the only crop still in the field long after other crops have been harvested. Some times the crop remains in the field until the next farming season and is known as Katamanka in some parts of the South East. While in the field, it is harvested periodically depending on the consumption needs of the family. Sometimes some of the crop is harvested and sold in the local market to raise cash income with which to settle other financial obligations of the farm family in terms of education, clothing, health etc. As a major crop in the mixture, cassava is therefore important not only in terms of the consumption needs of the farm household but also in terms of the provision of cash income for the numerous resource limited smallholder farmers who produce the bulk of cassava out put in Nigeria. Consequently, this study was undertaken to determine and comparatively analyze the factors that influence the income of cassava farmers in rural and urban areas of Abia state. The specific objectives were to compare the socioeconomic characteristics of cassava farmers in rural and urban areas of the state, identify factors that determine the income of these cassava farmers, identify and prioritize the constraints to cassava production in the state and make recommendations on intervention measures that will lead to an increase in output and improve the income of cassava farmers.

**Literature review:** Nigeria is a world leader in cassava production a third more than Brazil and almost twice the output of Thailand and Indonesia (Phillips *et al*., 2004). Between 1991 and 2001, cassava output in Nigeria

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increased by over 46% from 26-38 million tones. However, relative to the total output of staples, cassava output decreased from about 38% in 1991 to about 36% in 2001 (Onyebinama, 2004). In 2002, Nigeria's cassava output was estimated at approximately 34 million tones (FAO, 2004). The Food and Agriculture Organization (FAO) report indicated that in the same year, relative to other staples, cassava output was highest followed by yam (27 million tones), Sorghum (7 million tones) and rice (5 million tones). The South East zone accounted for about 5.8 million tones of the cassava output in 2002 behind the North Central Zone (7.4 million tones), South South zone (6.3 million tones) and South West zone (5.9 million tones) (PCU, 2003). Per capita production was highest in the North Central zone (0.72 tones person$^{-1}$) followed by the South East zone at 0.56 tones person$^{-1}$. In the North Central zone, Benue and Kogi states are the largest producers of cassava, while Enugu and Imo states are the largest producers in the South East (IITA, 2004).

In spite of its leadership position in cassava production, Nigeria accounts for a small proportion (0.001%) of the world export market (Oyewole and Phillip, 2006). The dismal performance in the export market may have informed the Cassava Initiative (CI) project, launched in 2002 with the aim of generating US $5 billion in export revenue by 2007.

Locally, cassava generates the largest income for the largest number of farming households in Nigeria (Dipeolu *et al*., 2001). Nweke (2004) report that cassava proves financially profitable for small holders in a wide variety of settings. According to them it requires no purchased inputs and its flexible planting and harvesting calendar enables households to fit in labour requirements around other obligations. Cassava production is a major employer of rural labour and has improved the economic well being of rural communities through farm income stabilization and occupational mobilization derived from processing and marketing of its products in urban centers (Osemeobo, 1993). The contention however is that most of the profits from cassava production, processing and marketing accrue to wholesalers, processors and retailers (Dipeolu *et al*., 2001), while farmers who provide the bulk of the labour in the production chain make less profit (Oyewole and phillip, 2006).

At the farm level, production costs for cassava are high relative to other industries. Production is not oriented towards commercialization but instead farmers produce and process cassava as a subsistence crop. Labour was found to be the main cost absorbing component, representing 85.6 and 86.2% of total cost in savanna and rainforest zones but relatively higher in the rainforest zone (Osemeobo, 1993).

## MATERIALS AND METHODS

The study was conducted in Abia state. The state is located within the forest belt of Nigeria between longitude 04°45' and 06°17'North and latitude 07°00' and 08°10'East. It has a landmass of 5,833.77 km$^2$. The temperature ranges between 20 and 36°C. There are two seasons the rainy season (April-October) and the dry season (Mid October-March) (ASPC, 2005).

The total population of the state is 1,913,917 consisting of about 933,039 males and 980,878 females, according to the 1991 population census. At an annual growth rate of 2.83%, the population is projected at about 3.2 million in 2004. About 30% of the population lives in major urban areas. The population density is about 580 persons km$^{-2}$. The major urban local governments are Aba South, Aba North and Umuahia North. Other LGAS are mostly rural (ASPC, 2005).

Agriculture is the major occupation of the people especially in the rural areas involving over 70% of the population. The soils are acidic. There are three agricultural zones; Ohafia, Umuahia and Aba. Crops grown include oil palm, cocoa, rubber, coffee, coconut, cassava, yam, rice, plantain and maize. Abia state is within the southeast agro ecological zone, which is a cassava-growing belt. The zone is in the humid tropics. The soils are ferraltic-rich in free Iron but low in mineral reserves and consequently low in fertility.

Two LGAs were purposively selected for the study on the basis of location i.e., rural or urban. The selected LGAs were Ikwuano (rural) and Umuahia North (urban). Two communities were randomly selected from each selected LGA-Ihim and Ndoro from Ikwuano and Ossah Ibeku and Afaraukwu from Umuahia North. Cassava farmers in each of the selected communities formed the sampling frame from which a random sample of 20 farmers was taken from each community to give a total sample size of 80 farmers. Primary data were used for the study. Data were collected using a questionnaire. Data analysis involved the use of descriptive statistics such as means, percentages and t-test to compare the socioeconomic characteristic and income of cassava farmers in rural and urban areas. To determine the effect of location on income the ordinary least square's regression technigue was used. The model was specified in implicit form as follows:

INC = f (FS, LAB, LED, SEX, VCI, AC)
INC = Income of cassava farmers
FS = Farm size in hectares
LAB = Labour in man-days
LED = Level of education in number of years spent in school

SEX = Sex of farmer
VCI = Value of capital inputs in Nageria
AC = Access to credit

The model was used to run two regressions; one for each location. To test for equality between the coefficients from the two regressions, data for the two locations were pooled together and used to run a third regression. The residual sums of squares from the three regressions were used to compute chow's $F^+$-statistic as follows:

$$F^+ = \frac{\sum e_3^2 - (\sum e_1^2 + \sum e_2^2)}{\frac{K_3 - (K_1 + K_2)}{\frac{\sum e_1^2 + \sum e_2}{K_1 + K_2}}}$$

Where:
$K_1$ = $n_1$ - m
$K_2$ = $n_2$ - m
$K_3$ = $n_1 + n_2$ - m
$n_1$ = Sample size for first regression
$n_2$ = Sample size for second regression
m = Number of parameter estimates including the intercept

The computed chow's $F^+$ statistic was compared to the tabulated $F^*$ ratio. Chow's test was again used to verify changes in the income function between the two locations. A dummy variable, LOC was introduced into the model. For the rural area, LOC = 0, while for the urban area LOC = 1. Using the pooled data, the new model was used to run a fourth regression. The residual sum of squares from the third and fourth regressions were used to compute chows $F^+$ statistic which was compared to the tabulated $F^*$ ratio. $F^+$ calculated is given as:

$$F^+ = \frac{\sum e_3^2 - \sum e_4^2}{\frac{K_3 - K_4}{\frac{\sum e_4^2}{K_4}}}$$

Where:
$K_3$ = $n_3$ - m
$K_4$ = $n_4$ - m
$n_3$ = Sample size for the third regression
$n_4$ = Sample size for the fourth regression

## RESULTS AND DISCUSSION

**Socioeconomic characteristics of cassava farmers:** Most (about 58%) of the farmers in the rural area were at least 51 years old, while most (about 60%) of the farmers in the urban area were at most 50 years old. The mean age of the farmers was 55 years in the rural area and 49 years in the urban area. The results indicate that the rural farmers were on the average older than the urban farmers. Old farmers are widely conservative and risk averse. This will probably constrain innovation and technology adoption. Consequently, income is expected to be higher among urban farmers who are younger.

About 65% of the rural farmers were women, while about 83% of the urban farmers were women. The indication is that women engage in cassava production more than men in the state. This is probably why cassava is considered a 'women's crop'. Nweke (2004) contends that this is an important half-truth. He argues that men are increasingly involved in cassava production, processing and marketing as the cassava transformation unfolds in Africa. About 40% of the farmers in the rural area had at least complete secondary education compared to about 48% of the urban farmers; an indication that the urban farmers were more literate and had better education than the rural farmers. Education will predispose farmers to be innovative and put them in a better position to cope with the intricacies of new factor and product markets that the adoption of new technologies introduces them to. Consequently urban farmers are expected to earn higher incomes than rural farmers.

Farming experience was higher among rural farmers. About 58% of the rural farmers had between 21 and 50 years of farming experience compared to about 33% of the urban farmers. The mean level of farming experience was 29 years for rural and 20 years for urban farmers. Onyebinama (2004) notes that previous experience in farm business would enable the farmer to set realistic cost and time targets, allocate and utilize resources efficiently and identify production risks. As a result rural farmers are likely to earn higher incomes than urban farmers.

Farm size was on the average higher (0.32 ha) for rural farmers than for urban farmers (0.25 ha). It is expected that farm size will be positively related to output. Consequently rural farmers are expected to produce more and earn higher revenue than urban farmers. Every unit of the total cultivable land is suitable for other non-agricultural uses such as recreation, transportation, housing etc. In urban areas the use capacity of land for recreation, transportation, housing and industrial services is generally higher than for agricultural uses and as a result the size of land available for agricultural production will be significantly reduced. This is probably why farm size was smaller in urban areas. Access to credit was better for rural farmers than for urban farmers. About 15% of rural farmers had access to credit compared to about 8% of urban farmers. This limited access to credit is an eloquent testimony of the comparative disadvantage of

farmers in the formal credit market. The consequence is a stifling of the productive capacity of agriculture and consequently the expansion of the overall economy.

**Farm income:** The average income of cassava farmers in the rural area was ₦62, 606.80 and 39, 886.20 for farmers in the urban area. This indicates that on the average farm income was higher for rural based farmers than for urban-based cassava farmers. The mean difference was significant (t = 1.671) at 10%. Therefore, income from cassava production accrued more to rural farm households than to urban farm households. The regression result of the determinants of the income of cassava farmers shown in Table 1 and 2 indicate that for rural based farmers, farm size was the only significant determinant of income, while for urban based farmers, labour, sex and value of inputs were significant determinants of income. In the rural area, farm size was positively related to income an indication that income increased as farm size increased. Output is likely to increase as farm size increased. As output increases, farm income is expected to increase. Farm size was on the average higher in the rural area. As a result output is expected to be higher.

Table 1: Determinants of Income of cassava farmers in the rural area

| | Model | | | |
|---|---|---|---|---|
| Variables | Double log[1] | Exponential | Semi log | Linear |
| Constant | 6.938 | 8.564 | - 384486.1 | - 90234.67 |
| | (2.157)*** | (15.683)*** | - (0.936) | (-1.401) |
| Labour | 0.259 | 8.906E.04 | 53543.640 | 148.898 |
| | (0.815) | (1.246) | (1.316) | (1.766)* |
| Farm size | 0.784 | 2.057 | 17750.660 | 61100.294 |
| | (2.524)*** | (2.289)** | (0.447) | (0.577) |
| Education | 9.351E-02 | 1.906E-02 | 11111.731 | 2011.111 |
| | (0.855) | (0.977) | (0.795) | (0.874) |
| Sex | 0.286 | 0.318 | 28117.578 | 28017.470 |
| | (1.368) | (1.376) | (1.052) | (1.028) |
| Value of | 0.264 | 1.953E-05 | 8308.478 | 4.396E-02 |
| inputs | (1.211) | (1.334) | (0.299) | (0.025) |
| Access to | -0.208 | -7.134E-02 | -20668.61 | -12331.19 |
| credit | (-0.734) | (-0.241) | (-0.572) | (-0.353) |
| $R^2$ | 0.543 | 0.489 | 0.208 | 0.245 |
| $R^2$ | 0.46 | 0.396 | 0.064 | 0.108 |
| F-ratio | 6.539*** | 5.269*** | 1.446 | 1.789 |

*** = Significant at 1%; ** = Significant at 5% * = Significant at 10%. 1 = Lead Equation; Figures in Parenthesis = t-ratios

Table 2: Determinants of income of cassava farmers in the urban area

| | Model | | | |
|---|---|---|---|---|
| Variables | Linear[1] | Exponential | Semi-log | Double-log |
| Constant | 11918.339 | 10.232 | -173616.9 | 4.194 |
| | (1.265) | (30.142)*** | (-3.374)*** | (4.431)*** |
| Labour | 90.009 | 2.954E-03 | 28095.723 | 0.933 |
| | (8.036)*** | (7.321)*** | (4.343)*** | (7.839)*** |
| Farm size | 8899.582 | -1.496 | 11885.610 | -4.669E-02 |
| | (0.666) | (-3.106)*** | (2.484)** | (-0.530) |
| Education | -87.454 | -1.103E-02 | 1628.940 | -4.663E-02 |
| | (-0.297) | (-1.041) | (0.555) | (-0.864) |
| Sex | -7255.113 | -0.313 | 378.314 | -0.151 |
| | (-1.723)* | (-2.062)** | (0.053) | (-1.155) |
| Value of | 1.034 | 2.200E-05 | 8141.651 | 0.145 |
| inputs | (4.230)*** | (2.498)** | (1.320) | (1.277) |
| Access to | -881.382 | 7.313E-02 | -2610.570 | 4.074E-02 |
| credit | (-0.147) | (0.339) | (-0.264) | (0.224) |
| $R^2$ | 0.930 | 0.836 | 0.810 | 0.884 |
| $R^2$ | 0.917 | 0.806 | 0.775 | 0.863 |
| F-ratio | 72.980*** | 27.987*** | 23.386*** | 41.775 |

*** = Significant at 1%. ** = Significant at 5% * = Significant at 10% figures in parenthesis = t-ratios. 1 = Lead equation

Consequently, income will be higher. In the urban area, labour and the value of inputs were positive determinants of income, while sex was a negative determinant of income. These results imply that the income of urban-based farmers increased as the use of labour and other capital inputs increased. Agricultural labour is probably scarce and expensive in urban areas and as a result cassava farmers in urban areas are likely to face labour constraints. Amongst smallholder farmers, cassava production is labour intensive. Consequently, a shortage of labour will adversely affect out put and vice versa.

Given that the urban-based farmers were younger and had better education than the rural based farmers coupled with their urban location, the use of purchased inputs is likely to be higher amongst urban farmers. The use of more purchased inputs such as fertilizers, improved cuttings, agrochemicals etc will lead to higher yield levels and consequently income will increase as the use of purchased inputs increase. The negative relationship between income and sex indicates that the income of urban-based cassava farmers was more influenced by the participation of women than men. As indicated earlier about 83% of the urban-based cassava farmers were women.

The regression result of the effect of location on the income of cassava farmers (Table 3) indicates that labour and value of inputs were positive and significant determinants of income of cassava farmers while location (urban or rural) was not a significant determinant of income. The result of the chow's test for the equality of the regression coefficients indicate that the coefficients from the regression results of the determinants of income of rural based and urban-based cassava were not equal (the absolute value of F-cal. (9.43) was greater than F-tab. (3.87) at 1% with $v_1 = 7$ and $v_2 = 66$ degrees of freedom). This suggests that the income function differed between locations. However, the test for the stability of the intercepts from the regression results of urban and rural cassava farmers indicates that the intercepts were homogenous (F-cal. (1.34) was >F-tab. (8.10) at 1% with $v_1 = 1$ and $v_2 = 72$ degrees of freedom) suggesting

Table 3: Regression results of the effect of location on income of cassava farmers

| | Model | | | |
|---|---|---|---|---|
| Variables | DoubleLog[1] | Semi Log | Linear | Exponential |
| Constant | 3.799 | -260144.0 | -47385.31 | 9.422 |
| | (3.007)*** | (-1.932)* | (-1.484) | (27.756)*** |
| Labour | 0.612 | 40385.638 | 136.985 | 1.878E-03 |
| | (4.471)*** | (2.770)*** | (3.581)*** | (4.616)*** |
| Farm size | 0.192 | 14812.812 | 18871.927 | 3.365E-04 |
| | (1.473) | (1.068) | (0.380) | (0.001) |
| Education | 3.986E-02 | 9198.230 | 1316.445 | 2.155E-03 |
| | (0.621) | (1.344) | (1.208) | (0.186) |
| Input | 0.339 | 5460.471 | 0.377 | 2.219E-05 |
| | (2.639)* | (0.399) | (0.437) | (2.420)** |
| Sex | 8.023E-02 | 16899.535 | 13165.573 | -1.145E-02 |
| | (0.600) | (1.186) | (0.956) | (-0.078) |
| Credit | -8.046E-03 | -9565.196 | -3937.743 | 0.106 |
| | (-0.044) | (-0.489) | (-0.209) | (0.529) |
| Location | 5.565E-02 | 3378.497 | 1340.923 | 4.576E-03 |
| | (1.157) | (0.659) | (0.280) | (0.090) |
| $R^2$ | 0.635 | 0.295 | 0.331 | 0.555 |
| $R^2$ | 0.599 | 0.227 | 0.266 | 0.511 |
| F-ratio | 17.876*** | 4.310*** | 5.096*** | 12.816*** |

*** = Significant at 1%. ** = Significant at 5%. * = Significant at 10%
Figures in parenthesis are t-ratios. 1 = Lead Equation

that there is no tendency for significant differences in income between locations. This result suggests that location did not directly influence the income of cassava farmers. The difference in the income function between locations is probably due to the influence of location on farm size the availability and cost of labour, the level of use of purchased inputs and on the age and level of education of the farmers. These factors in turn influence income by directly influencing the level of output.

**Constraints to cassava production:** In the rural area the major constraints to cassava production were in order of importance, lack of capital, poor road networks, lack of storage and processing facilities and the incidence of pests and diseases. In the urban area, cassava farmers are confronted by the following major constraints; lack of capital, theft of produce, incidence of pests and diseases and high cost of inputs.

## CONCLUSION

On the average, cassava farmers in rural areas earned higher income than those in urban areas. Cassava is still produced mostly by women. Rural cassava farmers had more farming experience, while urban cassava farmers were younger and had better education. Farm size was on the average higher in the rural areas. Access to credit was poor in both rural and urban areas. Farm size was the significant determinant of income of rural cassava farmers, while labour, value of inputs and sex were significant determinants of income of urban based cassava farmers. Even though income was on the average higher for rural based cassava farmers, the indication is that the influence of location on income is probably indirect.

## RECOMMENDATIONS

In the light of the foregoing conclusions, it is recommended that given the dominance of women in cassava production and related activities, cassava production and processing innovations should be women friendly. In Abia state as in other parts of the Southeast, women have limited access to land. It is estimated that to meet the cassava initiative target of an annual U$ 5 billion revenue from cassava by 2007 and beyond, an expansion of 2 million ha of land and an average yield of 30 tones $ha^{-1}$ are required (Phillps *et al*., 2004). This underscores the need to improve women's access to land and to credit with which to purchase more and better inputs that increase yield per hectare. There is an urgent need for concerted action by the various levels of government to provide adequate and functional agricultural and rural infrastructure such as roads and storage and preservation facilities. To this end the provision of rural and agricultural infrastructure should become the exclusive preserve of the local governments. Consequently, the allocation of funds to Local Governments from the federation account should be tied to specific rural and agricultural infrastructure.

The incidence of theft of produce and pests and diseases calls to question the effectiveness of the National Agricultural Insurance Scheme (NAIS) in providing compensation to farmers for such losses. The scheme needs to be re-engineered to provide comprehensive crop insurance for farmers in place of the current practice of credit insurance that primarily addresses the risk of default faced by lending agencies. High cost of cassava production inputs is inimical to the attainment of the targets of the cassava initiative. Farmers need to be financially empowered to enable them acquire and use more and better inputs through improved access to credit predicated on production friendly loan terms and conditions.

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