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## Abstract

Agricultural output commercialization has been found to have positive impacts on the income generating activities of household in sub-Sahara Africa. This paper examines the extent of agricultural produce commercialization and its impact on the household income generation vis-à-vis household welfare in the rural areas of Osun State. Data from 200 randomly selected rural households were analyzed with descriptive statistics and Tobit regression analysis.

Results from the data analysis revealed that 74.3% of households commercialise their farm produce, though at different levels. As a measure of household welfare a food poverty line of ₦1615.92 per month/adult equivalent was obtained and 63.2 % of the rural households were below this line. Tobit regression analysis revealed that extent of agricultural output commercialization was one of the significant variables that affected the poverty status of households in the study area.

The paper concluded that there was high rate of agricultural output commercialization among households in the study area and this definitely affected their welfare statuses. It is therefore recommended that policies aimed at improving household welfare should be centered on increasing farm output and developing a competitive market for agricultural produce in the study area.

Key words: Agricultural output, commercialization, household welfare, Osun State, Nigeria.

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**Introduction**

Rapid changes in the economy of Nigeria after the structural adjustment programme (SAP) necessitated the needs for diversification of household income generating activities, most especially among the farming households whose income from farm activities could not sustain their non-food expenditures (most especially expenditure on basic needs such as education of children, health care, housing, clothing among others). Agricultural output commercialization is considered as the most readily adoptable income diversification option for the farming households who need to meet their basic needs (Adejobi, 2004).

The concept of commercialization, which has been suggested to be the single most important source of poverty reduction for small farmers in the developing world (FAO and World Bank, 2001), is achievable only with rapid technological change in agricultural production, improved rural infrastructure and diversification in food demand patterns (Pingali, 2004). However, these identified basic prerequisites for proper and sustainable commercialization (i.e. rapid technological change in agricultural production, improved rural infrastructure and diversification in food demand patterns) are not well established in the study area (Adejobi, 2004). Therefore, if there is any form of commercialization of agricultural products in the study area, it might be with some defects and may not achieve the desired goal of improving household welfare.

In the light of this, the paper examined the extent of agricultural outputs commercialization in the study area with a view to determining its impact together with those of some other economic/production variables on the household welfare (poverty) in Osun State in the northern guinea savannah zone of Nigeria.

**Methodology**

**Study area**

Osun State is situated in the Western part of Nigeria and lies within Latitude $7^0$ and $8^0$ North of the equator and Longitude $4^0$ and $5^0$ East of the Greenwich Meridian. Osun State, occupies a land mass of approximately 8,882.55 square kilometres carved out of the old Oyo State. The State is bounded in the West by Oyo State, Ondo and Ekiti States in the East, Kwara State in the north and Ogun State in the South. There are 30 local government areas that make up Osun State.

Osun State is located in the moderately hot, humid tropical climatic zone of south-western Nigeria. There are two distinct seasons in the State, namely, the rainy season which lasts from March/April to 0ctober/ November and the dry season which lasts for the rest of the year, October/November till February/March. Annual rainfall is within the range of 1,000mm in the derived savannah agro-ecology to 1,200mm in the rainforest belt (OSSADEP, 2008). Osun State has two main types of vegetation, namely, tropical rain forest and guinea savannah. Rain forests are found in the south, while guinea savannah predominates in the western and northern Local Government Areas (LGAs) of the State.

The forest region with a much higher relative humidity and rainfall favours the cultivation of tree crops while the derived savannah favours arable crops with patches of tree crops (OSSADEP, 2008). Agriculture is the traditional occupation of the people of the state, the availability of the fine climate has broadly enhanced the cultivation of arable and cash crops. One of the prominent arable crops in Osun State is maize; others include yam, cassava, millet, plantain and rice.

The study area is significant for study on output commercialization because of the amibitious agricultural development programme initiated in 2011 by the goverment tagged "Osun Rural Enterprise and Agriculture Programme (O-REAP) which has its primary focus on Value addition and commercialization through massive infrastructure development and farm service support.

**Sampling design and data collection**

The sampling technique adopted in the study was multi-stage sampling technique. All the three Agricultural Development Project zones in the state were covered in the survey. The first stage was the random selection of 9 Local Government Areas (LGAs) from all the three ADP zones. The number of LGAs selected from each of the zones was proportional to the number of LGAs in the zone. The proportionality factor used is stated as follows:

$S= n/N*9$. Where, S= the number of LGA sampled from a zone; n= the number of Local Government Areas in a zone; N= the number of Local Government Areas in all the zones in the state and 9 = the desired number of LGA for the survey.

In each LGA, a comprehensive list of the names of villages compiled by the Osun State Agricultural Development Programme (OSSADEP) was obtained. The second stage involved the random selection of 2 villages from each of the 9 selected LGAs to make a total of 18 villages sampled in the study area. However, villages or settlements that were non-rural in nature were excluded from the survey using the population criteria which stipulates that any settlement with a population less than twenty thousand (20,000) should be classified as rural (see Adejobi, 2004).

In the third stage, 200 households were randomly selected from the 18 villages earlier selected. A proportionality factor was also introduced to determine the number of respondents coming from each of the LGAs selected. The proportionality factor

used is stated thus:

S=p/P*200. Where, S= sample size from a LGA; p= the population of a LGA selected[1]; P= the total population of all the selected LGAs, and 200 = the desired number of respondents for the study area.

**Empirical models**

The main analytical tools in this study are the descriptive statistics and Tobit regression. Literature is replete on several methods of determining poverty lines (Sen, 1981; FOS, 1999; Omonona, 2001). However, the cost-of-calories (COC) method proposed by Greer and Thorbecke (1984) is used in this study for ease of computation. Besides, it gives a value that is usually close to the minimum requirements for human survival unlike the alternative methods (particularly the two-third mean per capita expenditure). The COC function estimated is of the form

$$LnX = a + bC \qquad (1)$$

Where X is the adult equivalent food expenditure (in Naira) and C is the calorie consumption per adult equivalent of a household (in kilocal). The calorie contents of the recommended (FAO, 1982; Food Basket, 1995)[2] daily nutrients level (L) were used to determine the poverty line Z using the equation:

$$Z = e^{(a+bL)} \qquad (2)$$

Where,

Z= the cost of buying the minimum calorie intake (poverty line).

a and b= parameter estimates from equation 1.

L= recommended daily nutrients level.

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[1] The population of the LGAs was obtained from the National Population Commission office in Osun State.
[2] The recommended energy requirement is 2250 kcal per adult equivalent per day

Having established the poverty line for the study area, the household extent of agricultural output commercialization and its effect on household welfare (poverty) were also described and examined with the use of descriptive statistics, such as the mean and percentages and Tobit regression analysis.

To determine and quantify the relationship between poverty levels and the extent of agricultural output commercialization[3] and other production/consumption variables, the Tobit regression analysis was carried out. The model, which was developed by Tobin (1958), is expressed in equation 3, following McDonald and Moffit (1980) and as adapted by Omonona (2001) and Adejobi (2004)

$$V_i^* = \beta T X_i + ei$$

$$V_i = 0 \text{ if } V_i^* \leq 0$$

$$V_i = V_i^* \text{ if } V_i^* > 0 \qquad (3)$$

$$i = 1, 2, \text{-----------} n$$

Where,

$V_i^*$ = Limited dependent variable, it is the depth of household poverty defined as

$$(Z - Y_i)/Z \qquad (4)$$

And $Z$ = Food poverty line

$Y_i$ = Mean household food expenditure per adult equivalent

$X_i$ = Vector of explanatory variables

$\beta T$ = Vector of unknown parameters

$e_i$ = Independently distributed error term.

The independent variables, which describe rural livelihood status, were identified as:

HHSZ = Household size

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[3] Extent of agricultural output commercialization is defined in this study as the proportion of household farm produce (mainly crops) that is offered to the market for sale.

RFETE=      Ratio of food expenditure to total household expenditure

DIVER=      Diversification index (Using Herfindhal index)

FARMSZ=    Farm size (Ha)

FARMEN=    Household production enterprise (D = 1 if farm enterprises alone, otherwise D = 0)

CREDIT=     Household head's access to credit facilities (D = 1 if yes, otherwise D = 0)

EXCOM=     Extent of produce commercialization (proportion of farm produce sold)

The diversification extent (DIVER) was measured using Herfindal index defined as:

$$DIVER \quad = \quad \sum_{i=1}^{n} R_i^2 \tag{5}$$

Where,

$$R_i \quad = \quad A_i \Big/ \sum_{i=1}^{n} A_i \tag{6}$$

$A_i$     =     share of farm revenue from crop enterprise i cultivated by the household.

n     =     number of crop enterprises owned by household.

Another way of computing the Herfindhal index for the households is to use the share of farmland used allocated to each crop. But because of the difficulty in determining the actual portion of land allocated to the production of individual crops due to the system of mixed cropping being practised in the study area, the share of the total farm revenue from each enterprise was used in this study.

The empirical model in equation 3 was used to draw inferences on the causal factors for household poverty. The probabilities of being poor and the depth or

intensity of poverty (as a measure of household welfare) in the context of rural farming household's extent of agricultural products commercialization and othe household production/consumption variables (as captured by $X_i$s) were obtained from these Tobit regression estimates.

Following the Tobit decomposition framework suggested by McDonald and Moffit (1980) as adopted by (Omonona, 2001; Adejobi, 2004), Tobit model can further be disaggregated to determine the effect of a change in the $i^{th}$ variable on changes in the probability of household being in poverty and the expected depth of poverty. It can be shown that:

$$E(V_i) = F(Z) \, E(V_i^*) \tag{7}$$

Where $E(V_i^*)$ is the expected value of $V_i$ for those households that are already poor, and F is the cumulative normal distribution function at Z, where Z is $X\beta/\delta$.

For a change in any aspects of rural farming household characteristics (independent variables $X_i$), the effect on the poverty levels of the rural farming households can be decomposed into two by differentiating equation (7) with respect to the specific household characteristics ($X_i$s).

$$\partial E(V_i)/\partial X_i. = F(Z) \{\partial E(V_i^*)/\partial X_i + E(V_i^*)\{\partial F(Z)/\partial X_i\} \tag{8}$$

Multiplying by $X/E(V_i)$, the relationship in (8) above can be converted into elasticity forms:

$$\partial E(V_i)/\partial X_i.X_i/E(V_i) = F(Z)\{\partial E(V_i^*)/\partial X_i\} \, X_i/E(V_i)+E(V_i^*)\{\partial F(Z)/\partial X_i\} \tag{9}$$

Rearranging equation (9) using equation (7), we have:

$$\{\partial E(V_i)/\partial X_i\}.X_i/E(V_i) = \{\partial E(V_i^*)/\partial X_i\}X_i/E(V_i^*)+\{\partial F(Z)/\partial X_i\}X_i/F(Z) \tag{10}$$

Therefore, the total elasticity of a change in the level of any variable of rural farming household variables ($X_i$) consists of two effects:

(1)    the change in the elasticity of poverty intensity for the poor rural farming household and

(2)    the change in the elasticity of the probability of being poor.
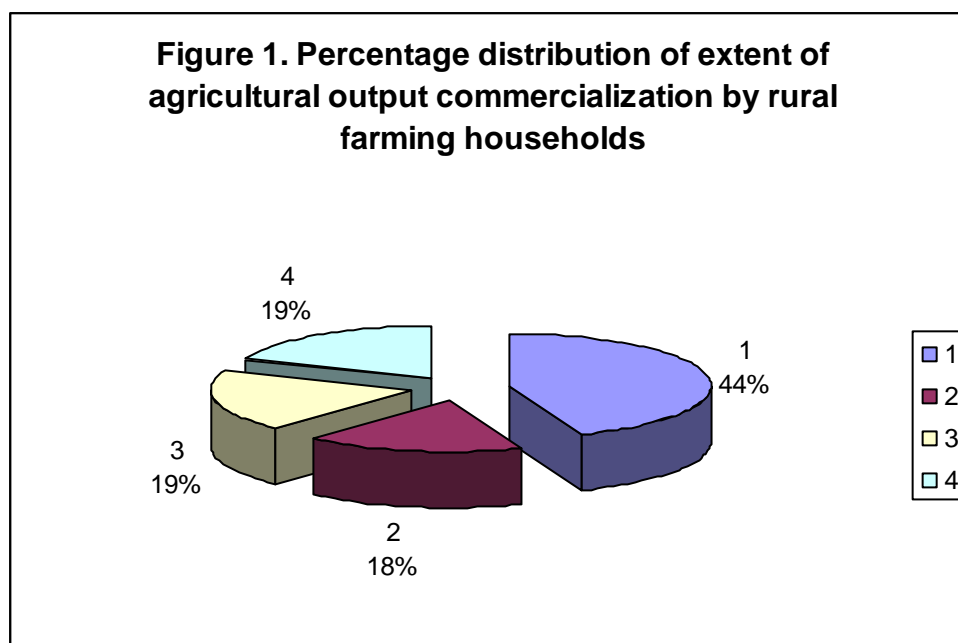
**Results**

The descriptive statistics of the socio-economic profile of rural farming households are presented in Table 1. From the table, it could be observed that 63.2 percent of the rural farming households are poor, with an average poverty depth of 0.33. About 74.3 percent of the households commercialise their agricultural products, with an average index of 0.24, which implies that an average of 24 percent of their agricultural produce is commercialised (See Figure 1).

Table 1: Summary description of rural farming household characteristics

| Characteristics | Dominant Indicator | Mean Value |
|---|---|---|
| Food poverty depth | 63.2% of household are poor | 0.33 |
| Extent of commercialization | 74.3% commercialise their agricultural products | 0.24 |
| Household size | 57% between 5-7 | About 6 adult equivalent |
| Farm size | 80% less 3 Hectares | 1.75 |
| Ratio of food to total household expenditure | 90% spend more than half of their monthly expenditure on food | 0.72 |
| Extent of agricultural production diversification | 45% diversified their farm production | 0.57 |
| Household production enterprise | 79% are into crop production alone. | - |
| Household access to credit | 76% did not have access to credit | - |

Source: Field survey, 2012

Furthermore, 90 percent of households spent more than half their monthly expenditure on food. An average of 72 percent of household expenditure was allocated to food. Though there was low level of diversification, but 45 percent of households produce more than just one type of crop in their farms. While many of the households do not have access to credit, few of them are into crop production alone.



Figure 1. Percentage distribution of extent of agricultural output commercialization by rural farming households

1= commercialise less than 5%; 2= commercialise between 5 and 20%; 3= commercialise between 21 and 50% and 4= commercialise above 50%

In order to determine the effect of household agricultural output commercialization on household poverty (welfare), a Tobit regression analysis was fitted. The result of the Tobit regression analysis is presented in Table 2.

**Table 2. Maximum Likelihood Estimates (MLE) of Tobit Regression Analysis**

| Variable | Estimate | t-value |
|---|---|---|
| Constant | 0.324*** | 3.568 |
| HHSZ | 0.008** | 2.302 |
| RFETE | 0.010 | 0.919 |
| FARMSZ | -0.001 | -0.638 |
| CREDIT | -0.146*** | -3.509 |
| HHENT | 0.014 | 0.637 |
| DIVER | 0.009 | 0.826 |
| EXCOM | 0.106** | 2.012 |

Source: Computer Printout of Tobit Analysis
***= Significant at $p<0.001$; **= Significant at $p<0.005$; *= Significant at $p<0.01$
$\sigma = 0.18$; Log Likelihood function = 46.17

The table reveals that 3 out of the 7 production/consumption variables included in the model had their coefficients significant at between 1% (p<0.01) and 10% (p<0.1), representing about 43.00 percent of the variables; Also, the sigma (σ) was 0.18, with a t-value of 18.27, and it was statistically significant at p<0.01, thus indicating that the model had a good fit to the data. Furthermore, the value of the intercept was 0.324, which means that the autonomous poverty depth was 0.325 in the study area.

Households with large sizes had higher intensity of poverty than those with smaller sizes; the household size (HHSZ) had a regression coefficient of 0.008; means that for a unit increase in the household size, there will be an increase of 0.008 in the probability of household poverty, and vice versa. Furthermore, access to credit (CREDIT) was significant. Households that had access to credit had a reduced poverty intensity than those that did not have access to credit in the study area. The intercept dummy of this variable was -0.146; this means that the autonomous poverty intensity for households that had access to credit would decrease from 0.324 to 0.178 in the study area.

More importantly, the coefficient of the extent of agricultural outputs commercialization (EXCOM) was significant at 5% (p<0.05) and exhibits a positive correlation with poverty intensity. This suggests that commercialization is detrimental to household welfare in the study area. The reason for this is traceable to the fact that households produce mainly for home consumption but may be forced to sell these products when there are pressures to spend on other household non-food needs most especially on medical care, education and so on.

Elasticities could be computed for only two of the explanatory variables included in the model because the other variable with significant coefficient was a dummy.

Elasticities computed included those of household size and extent of household agricultural production commercialization. As shown in Table 3, none of the coefficients was elastic (i.e. <1) out of the variables whose elasticities were computed.

**Table 3      Elasticity Estimates of Household Food Poverty Depth**

| Variable | Elasticity of Probability of Poverty (a) | Elasticity of Intensity of Poverty (b) | Total Elasticity (a+b) |
|---|---|---|---|
| Extent of agricultural output commercialization | 0.193 | 0.185 | 0.378 |
| Household size | 0.080 | 0.073 | 0.153 |

Source: Computed from Tobit regression results

The most important factors that significantly increased household poverty intensity, depending on the value of elasticity was the extent of agricultural output commercialization. Table 3 reveals that for a percentage change in the extent of agricultural output commercialization, there would be about 0.40 percent increase in household poverty intensity, and vice versa.

**Conclusion and Recommendation**

It is evident from the foregoing that an average rural farming household commercialised its agricultural output. Furthermore, the extent of agricultural output commercialization increased the poverty (welfare) status of rural farming households in the study area. For this negative trend to be corrected and make commercialization to be desirable, there is need for policy reforms that would enable farming household to produce in commercial quantities that would ensure enough for the farm family and the surplus for the market. There is also need for improvement in social infrastructures such as education and healthcare, which constitute bulk of households' non-food expenditure.

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