

## Analysing the Determinants of Poverty Severity among Rural Farmers in Nigeria: A Censored Regression Model Approach

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### **Abstract**

*This study applied censored regression model approach to analyse the determinants of poverty severity among rural farmers in Nigeria using data from randomly sampled 233 rural farmers in Benue State. The study showed that 87.63% variation in poverty severity was explained by variations in the specified explanatory variables. Furthermore, at 5% level of significance, the critical determinants of poverty severity among the respondents were economic efficiency, household income, dependency ratio, ratio of food expenditure to total household expenditure, farm size, access to credit, household production enterprise structure, extent of household production diversification, extent of production commercialization, expenditure on education, access to agricultural extension services, membership of cooperative societies or other farmers' associations, market access, total value of household assets, household size and formal education. Measures that promote both household enterprise diversification and agricultural production commercialization are highly desirable. Measures should be put in place to encourage the formation of effective farmers' cooperatives and other farmers' organizations for the purpose of knowledge transfer, input and output marketing and distribution, savings mobilization, and farm credit sourcing and supply.*

**Key words:** censored regression model, poverty severity, determinants, rural area, farmers

### **1. Introduction**

Poverty reduction has received increased focus in development debate in the past two decades. Progress on poverty reduction has become a major measure of success of development policy. In the 1970s and 1980s, the pre-occupation was with growth, the need to grow the economies and incomes. Thus, growth was seen as a prerequisite for improved welfare. Many developing countries in the 1980s implemented structural adjustment programmes (SAP) aimed at enhancing growth. Following these programmes, many countries recorded positive real growth rates. The development literature in the 1990s was dominated by the view that growth is central to any strategy aimed at poverty reduction. Studies suggest that countries that made noticeable progress on poverty reduction were those which recorded fast and high growth rates (World Bank 2000, Dollar and Kraay 2000). This view was somewhat modified to suggest that it is not growth per se, but the structure of growth that matters (Ravallion and Datt, 1996, Mellor 1999). It has further been recognized that income inequality matters when it comes to making progress on poverty reduction.

It is noted that little progress can be made in poverty reduction when inequality is high and rising (Addison and Cornia, 2001). This contradicts earlier theories of development which suggest that inequality is good for growth and, therefore, for poverty reduction through growth. This has, therefore, called attention to the role of inequality in the growth and poverty reduction process.

Studies have reported rising inequality in many countries over the last two decades and half, even as the period has witnessed increased focus on poverty reduction. Cornia and Kiiski (2001) listed 15 developing countries in which inequality was rising (South Africa is in this group), 12 in which inequality was constant (including Cote d'Ivoire, Senegal, and Tanzania) and 7 in which it was declining (Tunisia is the only African country in this group). Nigeria was not included in any of the groups. The apparent under-representation of sub-Saharan Africa (SSA) countries, and in particular the non-inclusion of Nigeria points to a gap in knowledge on what has been happening to inequality in relation to growth and poverty reduction in these countries.

Nigeria, like many developing countries, implemented SAP policies in the 1980s, which continued in varying degrees till the late 1990s. The new democratic government in 1999 introduced further series of reforms, culminating in the National Economic Empowerment and Development Strategy (NEEDS) launched in mid-2004.

Following the reforms, the real growth rate became positive from 1988, turning from an average of minus 1.7 per cent in 1980/86 to 4.7 percent in 1986/92. The strong growth performance continued in the 1990s and into the 2000s, rising to 6.6 percent in 2002/2004 and 6.24 percent in 2004/2006.

However, despite this strong growth performance, poverty incidence has remained high, rising from 42.7 percent in 1992 to 65.6 percent in 1996. Although estimated to have declined to 54.4 percent in 2004, poverty incidence could still be considered high. The decline gives an annual average of 1.6 percentage points since 1997. Considering the arguments in the theoretical literature and evidence from the empirical literature that faster economic growth is associated with faster poverty reduction, why has the rate of poverty been so high in Nigeria?

Poor households are more in agricultural occupation and participation in agriculture is found to be more predominant in rural areas where majority are small-holder farmers. For many households in Nigeria, especially in the rural areas, agriculture is the main activity, and previous and current analysis of poverty has shown that poverty is disproportionately concentrated among households whose primary livelihood lie in agricultural activities (Federal Republic of Nigeria, 2007). Understanding the factors underlying the persistent deprivation of rural farming households is important, when designing policies to meet their needs and improve their welfare. The focus of this study is therefore to identify the factors that influence poverty among the rural farmers.

## **2. Methodology**

### **2.1 The Study Area**

For this study, farm level data were collected on 233 rural farmers in Benue State, Nigeria. Benue State is one of the 36 states of Nigeria located in the North-Central part of Nigeria. The State has 23 Local Government Areas, and its Headquarters is Makurdi. Located between Longitudes  $6^{\circ} 35'E$  and  $10^{\circ}E$  and between Latitudes  $6^{\circ} 30'N$  and  $8^{\circ} 10'N$ . The State has abundant land estimated to be 5.09 million hectares. This represents 5.4 percent of the national land mass. Arable land in the State is estimated to be 3.8 million hectares (BENKAD, 1998). This State is predominantly rural with an estimated 75 percent of the population engaged in rain-fed subsistence agriculture. The state is made up of 413,159 farm families (BNARDA, 1998) and a population of 4,219,244 people (NPC, 2007). These farm families are mainly rural. Farming is the major occupation of Benue State indigenes. Popularly known as the "Food Basket" of the Nation, the State has a lot of land resources. For example cereal crops like rice, sorghum and millet are produced in abundance. Roots and tubers produced include yams, cassava, cocoyam and sweet potato. Oil seed crops include pigeon pea, soybeans and groundnuts, while tree crops include citrus, mango, oil palm, guava, cashew, cocoa and *Avengia spp.*

### **2.2 Sampling Technique**

In this study, the multi-stage random sampling technique was used for sample selection. Benue State is divided into three (3) agricultural zones viz: Zone A, Zone B and Zone C. Zone A and Zone B are made up of seven Local Government Areas each while Zone C is made up of nine Local Government Areas.

Using a constant sampling fraction of 45%, three Local Government Areas were randomly selected from Zone A and Zone B while four Local Government Areas were randomly selected from zone C under the guide of Benue ADP workers in BNARDA. From each of the selected Local Government Areas, one rural community was randomly selected. Finally, from each community, households were randomly selected on the basis of the community's population size using an appropriate sampling fraction in order to make the sampling design to be self-weighting thereby avoiding sampling bias (Eboh, 2009). Based on the foregoing, 233 farm households were randomly selected from rural communities for the study.

### **2.3 Data Collection**

Data were collected mainly from primary sources. The primary data were obtained through the use of a structured questionnaire, copies of which were administered to the selected 233 rural farm households in Benue State of Nigeria.

### **2.4 Analytical Technique**

P-alpha poverty measures (Foster-Greer-Thorbecke Index) and the Food Energy Intake (FEI) method were used for the measurement of poverty among the respondents while the Tobit regression model, a hybrid of the discrete and continuous dependent variable was used to estimate the determinants of poverty among the rural farmers in Nigeria.

### **2.5 Model Specification**

#### **2.5.1 Estimation of poverty line**

The measurement of household welfare or standard of living is a question which has not been resolved completely (Sen, 1976). There are many ways one could go about addressing this issue depending on the context, need and availability of information. Since quality of life has to take into consideration all direct and indirect consumption, both tangible and intangible items, measuring welfare has become a daunting task. The most common a single indicator of welfare in the literature is to generate value of consumption basket both market purchases and consumption of own production, using appropriate price measures. In the present case, since expenditure is expressed only in terms of value there is no need to construct a vector of prices which then can be used to convert the quantity information into a value (Canagarajan et al., 1997).

To determine the poverty status of households in the study area, a poverty line was constructed, using two-thirds of the mean per adult equivalent expenditure, below which a household was classified as being poor and above which a household was classified as being non-poor. The use of monetary income or consumption to identify and measure poverty has a long tradition, right from the study of Rowntree (1901) up to the recent World Bank's (1996) study on global income poverty. One interesting thing, however, is that most of these studies shared common approaches and methods. These studies were based on household income and expenditure surveys and this has made the approach to become the standard for quantitative poverty analysis (World Bank, 2001). In his early study, Rowntree (1901) defined poverty as a level of total earnings that is insufficient to obtain the minimum necessities of life (including food, house rent, and other basic needs) and for the maintenance of physical efficiency.

He generated different poverty lines for different families, depending on their sizes, and compared these with their earnings to arrive at their poverty status. The World Bank, on the other hand, has been assessing global income poverty by using expenditure data collected through household surveys. This is because consumption level, which is reflected in consumption expenditure, has been conventionally viewed as a preferred welfare indicator. Also, for practical reasons of reliability, consumption expenditure levels are thought to better capture long-run welfare levels than current income levels (World Bank, 2001). However, the literature (World Bank, 2001) is explicit on the fact that consumption expenditure may not fully capture a household's or an individual's command over goods and services. However, in the absence of more practical approaches, consumption expenditure has become the most widely used variable for determining the poverty line (World Bank, 2001).

Foster *et al.* (1984) proposed a family of poverty indices based on a single formula capable of incorporating any degree of concern about poverty through the poverty aversion parameter  $\alpha$ . This is the so called P-alpha measure of poverty or the poverty gap index. The index is defined as:

$$P_a = \frac{1}{N} \sum_{i=1}^q \frac{(z-y_i)^a}{z} \quad \dots \dots \dots \quad (1)$$

where  $z$  is the poverty line,  $q$  is the number of households below the poverty line,  $N$  is the total sample population,  $y_i$  is the mean adult equivalent expenditure of the  $i$ th household, and  $\alpha$  is the Foster *et al.* (1984) parameter, which takes the value 0 (which measures head-count ratio), 1 (which measures poverty depth) and 2 (which measures poverty severity), depending on the degree of concern about poverty. The quantity in parentheses is the proportionate shortfall of expenditure below the poverty line. By increasing the value  $\alpha$ , the aversion to poverty as measured by the index is increased. For example, where there is no aversion to poverty  $\alpha = 0$ , the index is simply:

which is equal to the head count ratio. This index measures the incidence of poverty. If the degree of aversion to poverty is increased, so that  $\alpha = 1$ , the index becomes:

Here the head-count ratio is multiplied by the expenditure gap between the average poor person and the line. This index measures the depth of poverty; it is also referred to as “expenditure gap” or “poverty gap” measure.

Although superior to  $P_0$ ,  $P_1$  still implies uniform concern about the depth of poverty, in that it weights the various expenditure gaps of the poor equally.  $P_2$  or expenditure gap squared index allows for concern about the poorest of the poor by attaching greater weight to the poverty of the poorest than that of those just below the line. This is done by squaring the expenditure gap to capture the severity of poverty:

$$P_2 = \frac{1}{N} \sum_{i=1}^N \frac{(z - y_i)^2}{z} = \dots \quad (4)$$

This index satisfies the Sen-Transfer axiom, which requires that when income is transferred from a poor to a poorer person, measured poverty decreases.

### 2.5.2 Empirical model for determinants of household poverty status

According to Joreskog (2002), a censored variable has a large fraction of observations at the minimum or maximum. Because the censored variable is not observed over its entire range ordinary estimates of the mean and variance of a censored variable will be biased. Ordinary least square (OLS) estimates of its regression on a set of explanatory variables will also be biased. These estimates are not consistent, i.e., the bias does not become smaller when the sample size increases. The maximum likelihood estimates are consistent, i.e., the bias is small in large samples.

Censored regression models commonly arise in econometrics in cases where the variable of interest is only observable under certain conditions. Censored regression models refer to model in which one observes the dependent variable only if it is above or below some cut off level. The first example of censored regression appears to be that of Tobin (1958).

According to Wooldridge (2002), in censored regression applications, there is a variable with quantitative meaning,  $y^*$  and one is interested in the population regression  $E(y^*)$ . If  $y^*$  were observed for everyone in the population, one could use OLS etc. However, a data problem arises in that  $y^*$  is censored from above and/or below i.e. it is not observed for some part of the population. The Tobit model is a special case of a censored regression model, because the latent variable  $y_i^*$  cannot always be observed while the independent variable  $x_i$  is observable.

In order to estimate the determinants of household poverty in this study, a Tobit regression model was conceptualized.

The full model, which was developed by Tobin (1958), is expressed in equation 5, following McDonald and Moffit (1980). The Tobit model originates from the work of Tobin (1958) and has been extensively used by economist to measure the effect of changes in the explanatory variables ( $x_i$ ) on the probability of being poor and the depth or intensity of poverty (McDonald & Moffit, 1980). The Tobit model can be used to determine the impact of the explanatory variables on the probability of being poor. The model assumes that many variables have a lower (or upper) limit and take on this limiting value for a substantial number of respondents. For the remaining respondent, the variables take on a wide range of values above (or below) the limit. The model measures not only probability that a farmer is poor but also the intensity of poverty (Tobin, 1958).

The model is expressed based on Tobin (1958).

$$y_i = 0 \text{ if } Y_i^* \leq 0 \text{ (i.e. } Z < I)$$

$$y_i = Y_i^* \text{ if } Y_i^* > 0 \text{ (i.e. } Z > I)$$

i = 1, 2 ..... n

Where,

$y_i$  is the limited dependent variable. It is discrete, when the households are not poor and continuous, when they are poor.

$Y_i^*$  is the poverty severity (poverty gap squared index) defined as  $[(Z - I_i)/Z]^2$  and

Z is the poverty line,

$I_i$  is the mean household food expenditure per adult equivalent.

$X_i$  is a vector of explanatory variables,

$\beta$  is a vector of unknown coefficients and

$e_i$  is an independently distributed error term.

Following the Tobit decomposition framework suggested by McDonald and Moffit (1980), the Tobit model can be further disaggregated to determine the effect of a change in the value of the  $i$ th variable on change in the probability of a household being in poverty and the expected depth of the poverty. For it can be shown that:

$$E(V_i) = F(Z) E(V_i^*), \dots \quad (6)$$

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  $X\beta/\delta$ . The effect of a change in the level of any of the household characteristics (represented by the independent variable  $X_i$ ), on the poverty level of a household can be decomposed into two, by differentiating equation (6) with respect to the specific household characteristic ( $X_i$ ). That is:

Multiplying by  $X/E(V_i)$ , the relationship in (7) above can be converted into elasticity forms:

$$\frac{\partial E(V_i)}{\partial X_i} \cdot X_i / E(V_i) = F(Z) \left\{ \frac{\partial E(V_i^*)}{\partial X_i} \cdot X_i / E(V_i) + E(V_i^*) \left\{ \frac{\partial F(Z)}{\partial X_i} \right\} \right\} \quad \dots \dots \dots \quad (8)$$

Rearranging equation (8) using equation (7), we have:

$$\{\partial E(V_i)/\partial X_i\} \cdot X_i/E(V_i) = \{\partial E(V_i^*)/\partial X_i\} \cdot X_i/E(V_i^*) + \{\partial F(Z)/\partial X_i\} \cdot X_i/F(Z) \quad \dots \dots \dots \quad (9)$$

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

- i. change in the elasticity of household poverty intensity, and
  - ii. change in the elasticity of the probability of being poor.

The  $\beta$  coefficient is interpreted as the combination of (1) the change in  $y_i$  of those above the limit, weighted by the probability of being above the limit; and (2) the change in the probability of being above the limit, weighted by the expected value of  $y_i$  if above. Wooldridge (2002) recommended reporting both the marginal effects on the latent dependent variable ( $y_*$ ) and the expected value for  $y$  for uncensored observations. In the first case, the reported Tobit coefficients indicate how a one unit change in an independent variable alters the latent dependent variable. In the second case, the reported Tobit coefficients indicate how a one unit change in an independent variable affects uncensored observation.

In the Tobit regression analysis used, only poor households were considered. In other words, the limited dependent variable  $y_i$  was censored at zero from below. The variable was observed for values greater than zero and censored otherwise. Hence, the dependent variable measured the intensity of poverty among households in the study area. The values of this dependent variable ranged between 0 and 1 and the farther away the value is from 0, the worse the poverty situation.

### **3. Results and Discussion**

#### **3.1 Tobit regression results**

From the maximum likelihood estimates of the Tobit regression (Table 1), the results show that the model (regression line) fits the data reasonably. For example, the (maximum likelihood) estimates maximize the log likelihood functions. This implies that among all the possible regression lines, the coefficients ( $b$ 's) of this regression line maximizes the joint (total) probability (likelihood) of observing the  $n$  sample values of the poverty severity. This indicates that variation in poverty severity is explained by the (maximum likelihood) estimates of the explanatory variables, suggesting that the model as specified explained significant non-zero variations in factors influencing poverty severity among the respondents. Furthermore, the Pseudo R-square (coefficient of determination) is 0.8763, suggesting that the model has a good fit to the data. This indicates that 87.63% variation in poverty severity is explained by variations in the specified explanatory variables, suggesting that the model has good explanatory power on the changes in poverty severity among the respondents with 95% level of confidence.

The result in Table 1 further shows that at 5% level of significance, the coefficient of economic efficiency of the household had negative and significant influence on poverty severity among the respondents. This implies that poverty severity will be reduced as economic efficiency increase indicating that as profit increases the probability and intensity of poverty decreases. This is attributable to fall in costs per unit of output for a farm, suggesting that as the cost of maximizing output decreases poverty decreases, implying that profit is being maximized. This finding however contrasts with Asogwa et al. (2012).

Table 1 also shows that at 5% level of significance, the coefficient of income of the household had negative and significant influence on poverty severity among the respondents. This implies that poverty severity will be reduced as income increase indicating that as income generation of farmers increases the probability and intensity of poverty decreases.

The coefficient of dependency ratio was significant at 5% level and had a positive relationship with the poverty severity among the respondents. This implies that a unit increase in the dependency ratio would increase the probability of poverty intensity in an average household in the study area, and vice versa. This is because the larger the number of less active adults (e.g., the old or the unemployed) and children in a household, the heavier the burden of the active members in meeting the cost of minimum household nutrition and, hence, the higher the level of the probability or intensity of poverty, and vice versa (Hassan and Babu, 1991; World Bank, 1996; FOS, 1999; Omonona, 2001).

The coefficient of ratio of food expenditure to total household expenditure was significant at 5% level and had a positive relationship with the poverty severity among the respondents. This is because (based on Engel's law) the higher the income, the lower the proportion of such income that is spent on food, and vice versa. Studies have shown that the higher the ratio of food expenditure is to total household expenditure (or income), the higher is the probability and intensity of poverty (Hasan and Babu, 1991).

The coefficient of household farm size had significant and negative relationship with poverty severity among the respondents. This means that a unit increase in the size of farm holding would lead to a reduction in the probability of household poverty severity intensity and vice versa. Households with larger farm sizes were, on average, less poor than those that cultivated smaller farm sizes. This was because households with larger farm holdings were expected to generate more income, which would enhance their consumption level and subsequently improve their household poverty status. This finding is in agreement with FOS (1999) and Omonona (2001).

The coefficient of household head's access to credit had significant and negative relationship with poverty severity among the respondents. This means that the autonomous poverty intensity of households whose heads had access to credit facilities was, on average, lower than that of households without access.

Households whose heads had access to credit facilities had a lower level of poverty severity intensity than those whose heads did not have such access. This might be due to the fact that those households with access to credit were able to acquire more productive resources for their household enterprises. This would subsequently enhance the household's income-generating ability and household welfare. This is similar with the result of FOS (1999) and Omonona (2001).

The coefficient of household production enterprise structure had significant and negative relationship with poverty severity among the respondents. This suggests that the probability of poverty intensity was autonomously reduced among households whose enterprise structure was not restricted to farm production alone in the study area, compared with households having only farm production enterprises. Households whose enterprise structure was not restricted to farm production alone had a lower intensity of poverty than those that depended solely on farm production. The implication is that among the rural people, those who engage in agriculture as a single and sole source of income tend to be poorer than those who combine agricultural and nonagricultural activities. That is, rural households, who are engaged in other occupations, in addition to farming, are often less poor than households that are engaged in farming alone (Omonona 2001). Hence the literature has reported an increased engagement of rural households in nonagricultural income-earning activities in recent years in Nigeria (Meludu 1993; Jambiya 1998; Yunusa 1999).

The coefficient of the extent of household production diversification is statistically significant at the 5% level and carries a negative sign. This shows that households with relatively more diverse farm enterprises and, hence, more diverse sources of farm income tended to have lower probabilities of poverty severity intensity than households with relatively less diverse enterprises and income sources, given other factors. Production diversification is a well-known strategy to minimize risk. In this case, it could serve as a strategy for minimizing the risk of losses in farm income and, hence, the risk of a more intense household poverty level. Agricultural enterprise diversification ensures that the farmer derives income from a wide range of sources, thereby reducing income instability.

The coefficient of extent of agricultural production commercialization had a significant and negative relationship with household poverty severity implying that the higher the extent of commercialization, the lower the intensity of poverty, and vice versa. This is plausible, because the sale of output is expected to generate income for households to meet their needs, such as expenses for healthcare and the education of their children and this tends to reduce the household's poverty level, given other factors.

The coefficient of household expenditure on education had significant and positive relationship with poverty severity intensity among the respondents. This implies that a unit increase in the expenditure of a household on education would increase the probability of household poverty intensity and vice versa, suggesting that households with higher expenditure on education were on the average poorer. This may be due to the fact that expenditure on education as an item of priority expenditure would deprive a household of some other basic needs. This could have a negative impact on household welfare and increase the intensity of household poverty.

The coefficient of household's access to agricultural extension services is statistically significant at the 5% level and shows a negative relationship with poverty severity among the households. This implies that households that had access to extension services had lower probabilities of being poor than those that did not have such access, and vice versa. This might be because contact with extension services provided more access to improved crop production techniques, improved inputs, and other production incentives. These would positively affect farmers' outputs and their income-generating ability, thereby reducing their poverty level.

The coefficient of membership of cooperative societies or other farmers' associations was significant at 5% level and exhibited a negative relationship with household poverty severity intensity. This implies that the intensity of poverty was lower in a household whose head was a member of a cooperative society or any other farmers' association than in one whose head did not belong to such an organization. This might be as a result of various benefits accruable to members of cooperative societies, such as credit facilities, access to improved production inputs, and access to information that could enhance their productive capacity.

The coefficient of market access was significant at 5% level and had negative relationship with the intensity of household poverty. This implies that households that had access to markets had lower probabilities of being poor than those that did not have such access, and vice versa. This might be because access to markets improves farmers' liquidity and the affordability of the inputs required for production (Tchale, 2009).

Consequently, they might be able to adequately educate their children or start and expand a business (Todaro and Smith, 2009). The coefficient of total value of household assets was significant at 5% level and had negative relationship with the intensity of household poverty. This implies that the higher the value of household assets, the lower the household poverty intensity, and vice versa. The value of household assets measures the ability of the household to withstand economic shocks and income shortfalls to finance the purchase of household needs. Furthermore, ownership of assets serves as a surety and a fallback strategy for the household against transitory poverty because some of these assets could be sold to procure basic household needs in periods of temporary financial distress.

The coefficient of household size was significant at 5% level and had positive correlation with probability and intensity of poverty. This is because the larger the number of less active adults (for example, the old or the unemployed) and children in a household, the heavier the burden of the active members in meeting the cost of minimum household nutrition and, hence, the higher the probability or intensity of poverty, and vice versa (Hassan and Babu, 1991; World Bank, 1996; FOS, 1999; Omonona, 2001).

The coefficient of formal education was significant at 5% level and had negative relationship with poverty severity among the respondents. This is because the level of formal education of a household head would tend to be a positive factor in the adoption of improved farm production and management techniques. Hence, the educational status of the head of household is positively correlated with household income-earning capacity and, therefore, negatively correlated with the poverty status of the household. Several studies have revealed that the incidence of poverty is higher among people with little or no education (World Bank, 1996; FOS, 1999; Omonona, 2001).

### **3.2 Elasticities of household poverty intensity**

Table 2 presents the result of the elasticity coefficients that were computed for only ten of the variables included in the model because other variables with statistically significant coefficients were dummies. Elasticity coefficients computed were those of household size, total household expenditure on education, food expenditure to total expenditure ratio, total value of household assets, dependency ratio, extent of household agricultural production commercialization, economic efficiency, farm size, household income and formal education. The result in Table 2 shows that out of the ten computed elasticity coefficients, only the coefficients of economic efficiency, farm size, household income and formal education (with values greater than one) were elastic. This implies that a proportionate change in these variables would lead to a more than proportionate change in the intensity of household poverty.

The important factors that reduced household poverty intensity, in order of importance were household income, farm size, economic efficiency, formal education, the total value of household assets and the extent of household agricultural production commercialization. A 1% increase in household income, farm size, economic efficiency and formal education would reduce the intensity of household poverty by 2.69%, 2.28%, 2.21% and 1.02% respectively, and vice versa. On the other hand, a 1% increase in the total value of household assets and the extent of agricultural product commercialization would reduce the intensity of household poverty by 0.15% and 0.06% respectively, and vice versa.

Some variables were, however, found to increase household poverty intensity. In order of importance these variables were the household size, dependency ratio, ratio of food expenditure to total expenditure and household expenditure on education. Table 2 shows that a 1% increase in household size, dependency ratio, ratio of food expenditure to total expenditure and household expenditure on education would increase household poverty intensity by about 0.703%, 0.418%, 0.121% and 0.099% respectively, and vice versa.

### **4. Conclusion**

The study showed that the critical determinants of poverty severity among the respondents were economic efficiency, household income, dependency ratio, ratio of food expenditure to total household expenditure, farm size, access to credit, household production enterprise structure, extent of household production diversification, extent of production commercialization, expenditure on education, access to agricultural extension services, membership of cooperative societies or other farmers' associations, market access, total value of household assets, household size and formal education.

The result showed that household poverty intensity was elastic with respect to household income, household's farm size, economic efficiency and formal education. All these elasticity coefficients were negative but greater than unity in absolute values. This implies that a 1% increase in the value or level of each of these variables, given the values of all others, would decrease the intensity of household poverty by more than 1% and vice versa. Other variables with significantly negative elasticity coefficients but which were less than unity in absolute values were value of household assets and extent of agricultural production commercialization. This implies that an increase of 1% in the value of each of these variables, given the values of all other variables, would decrease poverty intensity, but by less than 1%, and vice versa. Four variables had statistically significant but positive elasticity coefficients that were also less than unity in value. These were household size, dependency ratio, ratio of food expenditure to total expenditure and household expenditure on education. This implies that a 1% increase in the values of each of these variables, given the values of all other variables, would also increase the level of poverty intensity, but by less than 1% and vice versa.

There is a need for a sustained improvement in farm total economic efficiency among the rural farmers. This would go a long way to improve the farmers' productivity and income and hence poverty reduction.

Farm enterprise diversification, involving mixed farming and also promoting crop and livestock interaction, as well as farm/non-farming enterprise diversification can, therefore, serve as an effective strategy for promoting household food security and for reducing household poverty in the study area.

Measures that promote both household enterprise diversification and agricultural production commercialization are highly desirable. Such measures would include the adequate supply of improved farm inputs, the provision of technical services, including technical training and agricultural extension services, and the supply of adequate credit to farmers.

Measures to address inadequate market access for farm produce should include the provision of improved market infrastructures, such as market stalls, community storage facilities, rural access roads, rural transportation facilities, and agricultural price information systems. Furthermore, the private sector should be encouraged to invest in agricultural input and output market infrastructure and facilities.

Measures should be put in place to encourage the formation of effective farmers' cooperatives and other farmers' organizations for the purpose of knowledge transfer, input and output marketing and distribution, savings mobilization, and farm credit sourcing and supply.

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**Table 1: Tobit Regression Results of Poverty Severity Determinants among Rural Farmers in Nigeria**

<b>Variable</b>	<b>ML Estimate</b>	<b>t-ratio</b>
Constant		
Economic efficiency	-0.2433078	-1.9606*
Income	-0.0009300	-1.5103*
extent of production commercialization	-0.0014420	-2.5106**
Household production enterprise structure	-0.0041611	-3.3305**
Farm size	-0.3265939	-2.6914**
Household size	0.4570631	6.7593**
Household expenditure on education	0.0274096	1.6559*
Credit access	-0.0890609	-7.3895**
Formal education	-0.0709665	-2.5233**
Dependency ratio	0.7499481	3.4706**
Food expenditure to total expenditure ratio	0.6968871	2.0681**
Level of food self-sufficiency	-0.2064865	-0.7443
Extension access	-0.0361194	-1.7835*
Farming experience	-0.0171008	-1.0985
Household members in school	0.6888156	0.2189
extent of household production diversification	-0.5380534	-2.9762**
Cooperative society/farmer association	-0.1197320	-1.5090*
Market access	-0.0699551	-2.1392**
Total value of asset	-0.0031886	-5.6420**
Log likelihood	-1473.02567902	
Pseudo R-square	0.87633	

**Source:** Field Survey, 2012.

\*\*t-ratio is significant at 1% level of significance.

\*t-ratio is significant at 5% level of significance.

**Table 2: Elasticity estimates of household poverty intensity**

<b>Variable</b>	<b>Elasticity of probability of poverty (a)</b>	<b>Elasticity intensity of poverty (b)</b>	<b>Total elasticity (a + b)</b>
Household size	0.359	0.344	0.703
Expenditure on education	0.053	0.046	0.099
Food expenditure to total expenditure ratio	0.056	0.065	0.121
Household assets	-0.073	-0.081	-0.154
Economic efficiency	-1.15	-1.06	-2.21
Farm size	-1.24	-1.04	-2.28
Dependency ratio	0.263	0.155	0.418
Extent of product commercialization	-0.039	-0.022	-0.061
Household income	-2.685	-0.0003	-2.685
Formal education	-0.494	-0.523	-1.017

Source: Computed from Tobit regression results.