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Original Article

Effect of Poverty on Risk attitude of Smallholder Maize Farmers in Oyo State, Nigeria

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Abstract *- The study examined the effect of poverty on the risk attitude of smallholder maize farmers in Oyo State. A multistage sampling technique was adopted to sample 207 smallholder maize farmers in the study area. The study employed descriptive statistics, Foster, Greer, and Thorbecke's (FGT) poverty index and instrumental variable (IV) regression model to analyze the data collected. The findings revealed that the majority of the respondents were male, married with an average household size of 7 and a farm size of 3.36 hectares. The result of FGT poverty analysis showed that Poverty incidence (P0) was 0.406, which indicated that 40.6% of the respondents were poor in the study area, the poverty gap/depth (P1) was 0.106, and poverty severity (P2) was 0.036. The study further revealed that the majority of the maize farmers in the study area were high risk-averse (55.07%) while 22.71% of the farmers prefer taking the risk. In profiling the risk attitude by their poverty status, the result showed that 23.81% of the poor respondents were risk preferers, 9.52% were low-risk averter, 13.10% were intermediate risk averters while 53.57% of the respondents were high-risk averter. Also, about 22% of the non-poor respondents were risk preferers, 4.07% were low-risk averter, 17.89% were intermediate risk averters and 56.10% of the respondents were high-risk averters. The result further showed that gender, household size, labor, farm size, and farm experience were the main factors influencing the risk attitude of maize farmers in the study area. The study, therefore, concluded that farm income and asset maize farmers need to be improved through the provision of effective social safety nets projects.*

Keywords *- Poverty, Risk, Smallholder, Maize, Management.*

I. INTRODUCTION

Nigeria is gifted with abundant human, capital, and natural resources but the country is still one of the poorest countries in the world. One of the main challenges facing Nigeria today is how to reduce the high level of poverty prevailing among her population (Olofin, 2008). The statistics based on the survey of the National Household Survey (NHS) in 2005, put the Nigerian population living in poverty to 51.6% (NBS, 2005). Poverty hampers the adoption of innovations and ideas, the ability to accept and practice new research results, ability to respond and adapt to new technologies which can improve the economic, social, and political situation of the farmers.

Since most rural farmers are poor, they found it difficult to take actions that will extricate them from poverty. According to the assertion of Mosley and Verschoor (2003) that farmers will remain poor if they are not willing to invest in possession of the newest assets for production due to the fact of the risks involved in it. Poverty has been on the rise and the severity of this menace has kept worsening all this while with the decline in the performance of the economy in Nigeria (CBN 2004). Ever since poverty remains a key element posing threat to the farmer's production and socioeconomic environment, there is a need for a detailed study on the effects of poverty on the risk attitude of maize farmers.

The agricultural sector is exposed to an array of risks that occur with high frequency especially when farmers' crop output and income are reliant on a range of exogenous factors such as price fluctuations and weather conditions (Menapace*et al.,* 2012). Risk is ever-present in farming decisions; these include risks associated with climate and weather, natural disasters, pests, and diseases, which greatly influence variable production outcomes. Production risks worsen by risks associated with credit, price, technology, and institution.

In Nigeria today, agriculture is characterized by the lower rate of adoption of agricultural technologies, inefficiency in production techniques which all resulted in low agricultural productivity. The present poor state of Nigerian agriculture is connected to the attitude of farmers towards risks, as well as risks in the production and socioeconomic environments.

Picazo-Tadeo and Wall (2011) posited that risk is attached to agricultural production and the stance of farmers towards risk always powered input choices. The attribute time-lag in agricultural production practices holds back correct forecast of expected output and their prices, hence raising the fear of risks and uncertainty. The rural poor are risk-averse, they are always keen not to lose the little resources they are using, and this made them go for low-risk returns activities (Collier and Gunning, 1999). They are more risk minimizers opposing the neo-classical belief of profit maximization. Quintessentially, the households are liable to follow a safety-first rule that assumes the individual's objective is to reduce the odds of experiencing a shortfall in income below a certain level (Sekar and Ramasamy, 2001).

Smallholder farmers are unsurprisingly enthusiastic in avoidance of risks taken which might terrorize their livelihoods; this attitude sways the echelon and types of inputs they use and the cumulative levels of output produced. In countless environments, risk aversion is one key component in many versions of the spiral of the vicious circle of poverty. It is considered dangerous and harmful if poor people are risk-averse to the point that they are always disinclined to invest in the acquisition of modern inputs just as a result of the risks involved, they will remain poor (Mosley and Verschoor, 2003).

II. METHODOLOGY

This study was carried out in Oyo State Nigeria. A Multi-stage sampling procedure was used for the selection of 207 respondents from Oyo and Ogbomoso Agricultural Development zones (ADPs)out of the four ADP zones in Oyo State, the respondents were randomly sampled from the registered smallholder farmers in the study area. The data was collected with the aid of a well-structured questionnaire and interview schedule. Descriptive statistics, Foster, Greer, and Thorbecke's (FGT) poverty index and instrumental variable were used to analyze the data collected.

III. ANALYTICAL TECHNIQUES

A. Foster, Greer, and Thorbecke (FGT) poverty index

The following model specified as a general formulation for computing poverty incidence, depth, and severity Foster *et al.,* (1984) was adopted to measure the index of poverty among the farm-households in this study.

$$Pi = \frac{1}{n}\sum_{i=1}^{q}(1 - yi/z)^{\alpha} \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where:

"P" is the poverty index; "α" is a non-negative parameter that can take on different values (0, 1, and 2), thus indicating the headcount ratio, the poverty gap, and the poverty severity respectively; symbol "n" is the total number of farmers; "t" is the number of poor farm households;

"Z" is the poverty line relevant to a given expenditure unit, and "y" is the farm household per capita expenditure. Additionally, its unique property which allows for the disaggregation of the population into specific subgroups, thus allowing for the analysis of a particular group's contribution out of the total population will be an added advantage for its adoption in this case. The poverty situation of farmers and the economic environment in which they operate is important for policy-relevant. Poverty depth is the extent to which the income of the poor lies below the poverty line. Poverty severity, however, describes the distribution of those below the poverty line.

B. Safety-First Model

The risk attitude coefficient was calculated using a safety-first model derived as follows: First, a Cobb-Douglas production function was estimated as:

$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}e^{u}$……..(2)

Where

Y - yield (grain equivalent/ha) (maize}

a= intercept of the equation

FERT = fertilizer (kg/ha), PLM = planting material (grain equivalent/ha), LAB = labour cost (N), CoC = cost of chemicals (N), CoE = cost of equipment (N), b's = partial regression coefficient, e = error term

The double log form of the Cobb-Douglas function was used in the estimation based on evidence from the literature (Moscardi and de Janvry, 1997).

$K(s) = \frac{1}{\theta}\left(1 - \frac{PiXi}{Pf\mu y}\right)$…….(3)

Where:

K(s) = risk parameter, θ= coefficient of variation of yield, Pi = factor price (fertilizer price/kg), Xi = Input level (fertilizer kg/ha), μy = mean yield, fi = elasticity of fertilizer input, P = price of output /kg

The coefficient of variation of yield was calculated from summary statistics of yield from the study area.

$\theta = \sigma y / \mu y$ ……(4)

Where;

σy = standard deviation, μy = mean yield

The input and product price used was the prevailing market price during the time of the survey. The farmers were classified into four (4) groups on the basis of the risk parameter "k" following the work of Moscardi and de Janvry (1977). A farmer is risk preferring if k<0, low risk-averse if 0<k<0.4, intermediate risk-averse if 0.4 < k < 1.2 and high risk-averse if 1.2 <k <2.0

C. Two-stage least square regression (2SLS) model

The IV regression analysis was used to determine the effects of poverty on the risk attitude of maize productivity. Farm income and assets were used in the study as a proxy to poverty and the function is written as;

$Y_1 = \alpha_0 + \beta_1 X_1 + \beta_2 X_1 + \beta_3 X_3 + \beta_4 X_1 + \beta_5 X_5 + U$ … (5)

$Y_2 = \delta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_1 + \beta_5 X_5 + U$.. (6)

Where;

Y= maize output (tons), α_0 = shows the intercept or the constant terms, U = error term and βs = parameter estimate

IV. RESULTS AND DISCUSSION

The result presented in Table 1showed that 51.21% of the farmers were between 41-50 years, 20.29% were between 51-60 years and 6.28% were more than 60 years. The mean age was 47 years. This implies that most of the farmers were still active and should be able to adapt and take risks towards improving their farm production. Also, about 78% of the farmers were male, while 21.74% were female. This implied that the proportion of males in maize production was larger than females; this might be as a result of women being into the processing and marketing of agricultural produce.

The table also revealed that 24.15% of the farmers had household sizes of 1-5 members, 74.40% had between 6-10 members while 1.45% of the farmers had household sizes of 10 and above. About 44% of the farmers had secondary school education, 42.03% of the farmers had primary school education, 6.76% had tertiary education and 6.76% had no formal education. The result indicated that a significant number of the respondents had formal education. This result is in line with the findings of Awotide (2012) in her study on Poverty and income inequality among fish farming households in Oyo State, Nigeria where most of the respondents had secondary school education.

Furthermore, 95.65% of the farmers were married, 2.42% were widow/ widower, 0.97% of the farmers were single and the same proportions of the respondents were divorced. This indicated that most of the farmers were married and had more hands to help in their farming activities. The result tallied with the findings of Yusuf *et al.*, (2015) in their study on poverty and risk attitude of farmers in North Central of Nigeria, where most of their respondents were married. Also, 99.03% of the farmers cultivate not more than 5 hectares of farmland while only 0.97% had between 6-10 hectares of farmland. The average farmland size was 3.37 hectares. This implied that most of the respondents were smallholder farmers.

Table 1. Socioeconomic Characteristics of the respondents

Socioeconomic Variables	Frequency	Percentage
Age group(Years)		
≤ 30	3	1.45
31-40	43	20.77
41-50	106	51.21
51-60	42	20.29
Above 60	13	6.28
Mean = 47		
Total	207	100.00
Gender		
Male	162	78.26
Female	45	21.74
Total	207	100.00
Household size		
≤ 5	50	24.15
6-10	154	74.40
Above 10	3	1.45
Total	207	100.00
Education		
No formal education	14	6.76
Primary education	87	42.03
Secondary education	92	44.44
Tertiary education	14	6.76
Total	207	100.00
Marital Status		
Married	198	95.65
Single	2	0.97
Divorce	2	0.97
Widow/widower	5	2.42
Total	207	100.00
Farm size		
≤ 5	205	99.03
6-10	2	0.97
Mean = 3.37		
Total	207	100.00

Source: Field Survey, 2017.

A. Analysis of Poverty Profile of the Respondents

The per capita household expenditure approach was used in analyzing the poverty profile of the respondents. The poverty line which is equivalent to two-thirds of the mean per capita household expenditure was calculated. The average total expenditure for the respondents was estimated to be ₦56,054.41 and the mean per capita expenditure for all the respondents was ₦9,211.12 while the poverty line calculated was ₦6,140.74

The FGT poverty index was used to calculate the poverty incidence (P_o), depth or gap (P_1), and severity (P_2). Table 14 shows the result of poverty indices among the respondents in the study area. The result revealed that poverty incidence among the respondents was 40.6% which showed the percentage

of maize farmers that fell below the poverty line. This implied that the occurrence of poverty is relatively high among the respondents.

The poverty gap/depth (P_1) was 10.6%, this implied that an average maize farmer would require 10.6% of the poverty line to get out of poverty; indicating how far an individual farmer is from the poverty line. Poverty severity was 3.6%, which implied that the extent of the effect of poverty among the poor maize farmers was 3.6% based on the poverty line. This finding compared fairly with available national statistics that put the poverty incidence in South-west Nigeria in 2004 at 43% (National Bureau of Statistics, 2008).

Table 2. Poverty indices among the respondents

FGT indices	Estimated
Poverty incidence	0.405
Poverty gap	0.105
Poverty severity	0.036

Source: Field Survey, 2017.

B. Estimates of Production Function

The Safety – First Principle was used in the determination of the risk attitude parameter of maize farmers in the study area. This principle assumes that the individual's objective is to minimize the probability of experiencing variability (a shortfall) in output or income below a certain initial level, (specified levels of disaster). Assuming that the first principle holds, the degree of risk aversion manifested by an individual farmer is derived from an observed behavior because given a production technology and the risk associated with production and market condition. The observed level of factor use reveals the underlying degree of risk aversion. This method involves first, the estimation of the production function in which the direct relationship between input vector (X) and output (Y) is established. Then the most significant input variable from the estimated function is determined by considering the R^2-values, signs, and magnitudes of significant variables, coefficients of significant variables, including conformation of variables to *a priori* expectations. From our results, the cost of labor with a coefficient of 0.690 appeared as the most significant input of the production process in the study area. (Table 3)

Table 3. Analysis of Production Function

Variables	Coefficients	Standard error	t-value
Seed	0.274	0.044	6.26*
Fertilizer	0.092	0.032	2.89*
Chemical	0.090	0.033	2.73*
Labour	0.690	0.079	8.79*
Equipment	-0.012	0.031	-0.38
R^2	0.763		
F			

*Source: Field Survey, 2017. Note: * Significant at 1%*

In testing the homogeneity of explanatory variables, the Hausman test was employed to detect whether there is a problem of endogeneity. The Hausman test is only valid under homoscedasticity and often involves the cumbersome generalized inversion of a non-singular matrix (Wooldridge, 2010). Durbin (score) and Hausman test with the P-value statistically significant at $P \leq 0.05$) was obtained; this leads to rejection of the null hypothesis that poverty is exogenous to risk attitude. We then conclude that poverty is endogenous.

Risk attitude may be correlated with wealth level and also asset level (Haneishi*et al.,* 2014). Therefore, the study developed two models which served as proxies for poverty by employing the methodology of Mawejje and Holden, (2014). The results of the 2SLS instrumental variables regression shown in Table 4 below showed that the variables instrumented (farm income and asset) for poverty have expected signs and were consistent with theoretical expectations. The

As shown in Table 4, the result for model A revealed that farm income, household size, association, farm size, and labor were significant exogenous variables that influenced the risk attitude of maize farmers. This finding indicated that the income of the maize farmers was significant at 1% and has a positive indication of the risk attitude. It agrees with the findings of Aye and Oji (2007) which states that the lower a household's per capita income, (a measure of poverty) the more risk-averse they will be. In other words, a household whose income fall above the poverty line is more willing to take risk than a non-poor household.

Household size was negatively related to risk attitude, it was statistically significant at 5%. There are two opposing interpretations as to the nature of the relationship between household size and risk attitude. The larger the household size, the greater the total consumption needs of the farm family and thus, the less willing to take risks. However, larger household size also augments the total labor supply of the farm thereby enhancing its income-generating potentials and thus reducing farmers' risk aversion. This finding is consistent with that of Aye and Oji (2007)

Membership of association was statistically significant at 10 % and positively related to risk attitude. This implies that farmers that are members of groups such as cooperative societies will prefer taking the risk. This is similar to findings by Aye and Oji (2007), cooperative strength system and farmers' group absorbed more members in risk-taking.

Table 4. Parameter estimate of the effects of poverty on risk attitude of the respondents

Variables	Coeff.	Std error		Coefficients	Std. error	T
Farm income	0.6241	0.2109	2.96***			
Asset				0.2334	0.1041	2.24**
Explanatory variables						
Age	-0.0002	0.0007	-0.36	-0.0008	0.0014	-0.52
Sex	0.1458	0.1371	1.06	0.1505	0.0756	1.99**
Years in school	-0.0196	0.0192	-1.02	-0.0214	0.0183	-1.17
Household size	-0.0335	0.0149	-2.24**	-0.0198	0.0080	-2.48***
Association	0.2050	0.1101	1.86*	-0.1366	0.0680	-2.01**
Off farm work	0.0421	0.1163	0.36	0.1822	0.1129	1.61
Farm experience	0.0150	0.0080	1.87*	0.2016	0.0979	2.06**
Extension visit	0.0141	0.1381	1.61	0.0460	0.1691	0.27
Farm size	0.2259	0.1021	2.48***	-0.2362	0.0928	2.54***
Labour	-0.0951	0.0111	1.95**	-0.1025	0.0138	-7.40***
First Stage R^2	0.635					
Hausman (p-value)	0.0251		0.0266			
Sargan (p-value)	0.6521					
Basmann (p-value)	0.6354					

Source: Field Survey, 2017.
,,*** represent significant at 10%, 5% and 1% respectively*

C. Method of Risk Management adopted by the smallholder maize farmers

Table 5 revealed that 93.24% of the respondents managed risk through Training, 85.99% managed risk through extension services, 4.35% managed risk through the application of irrigation, 38.16% managed risk through fertilizer application, 0.48% managed risk through crop insurance, 96.62% managed risk through mixed farming, 41.06% managed risk through storage program, 3.38% managed risk through price support, 10.63% of the respondents managed risk through cooperative society,43.00% managed risk through reduced consumption, 9.18% managed risk through Children out of school, 94.20%

managed risk through Borrowing of money, 43.48% managed risk through Selling of assets while 43.48% of the respondents managed risk through off-farm work

Table 5. Distribution of Risk Management adopted by the respondents

Management	Frequency	Percentage
Training	193	93.24
Extension service	178	85.99
Irrigation	9	4.35
Fertilizer Provision	79	38.16
Crop insurance	1	0.48
Mixed farming	200	96.62
Storage Programme	85	41.06
Price support	7	3.38
Cooperative society	22	10.63
Reduced consumption	89	43.00
Children out of school	19	9.18
Borrowing of money	195	94.20
Selling of assets	90	43.48
Off farm work	90	43.48

Source: Field Survey, 2017

V. CONCLUSION

Based on the findings of this study, it is evident that poverty incidence was high among the smallholder maize farmers indicating that quite a number of the maize farmers in the study area live below the poverty line. Also, most of the maize farmers were high risk-averse, and lastly, farm income and assets were found endogenous to the attitude of farmers towards risk. However, the study suggests effective social safety net projects that will improve the farm income and the asset of the smallholder farmers.

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