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Risk Aversion among Farmers of the National Program for Food Security in Imo State Southeast Nigeria

Onyemauwa, C.S; Orebiyi, J.S; Onyeagocha, S.U.O; Ehirim, N.C; Nwosu, F.O. and N.G. Ben-Chendo
Department of Agricultural Economics; Federal University of Technology, Owerri, Imo State, P.M.B.1526 Owerri, Nigeria.

Abstract
The study examined the relationship between the socioeconomic variables and risk aversion coefficients of farmers of the national program for food security in Imo State. Purposive and simple random sampling techniques were used to select 76 respondents. Questionnaire and interview schedule were the instruments used to collect data. Descriptive statistics, risk aversion index and econometric tool were used to analyze data. The result which shows that the respondents have a mean age of 56 years, mean formal education of 10 years, mean household size of 9 persons, mean farm experience of 29 years and a male dominated farming enterprise is an indication of favourable socioeconomic features of the farmers. Majority of the farmers were risk averters as they had negative risk coefficients. Farm size, number of contact with extension agents, amount of available capital, and amount of farm income were found to influence the risk coefficient of the farmers in the state. Since farmers attitude to risk have been identified as major determinants of the rate of participation in new technologies among the farmers and of the outcome of agricultural development programs, risk attitude of rural farmers should be considered in intervention policies aimed at ensuring the success of rural development programs.
Keywords: farmers, risk, aversion, attitude, coefficients, food security, program.

Introduction

One of the development challenges facing Nigeria today is how to reduce the high level of poverty prevailing among her population (Abiola and Olofin, 2008). High levels of poverty in rural households in Nigeria are due to food insecurity in the country (Akinyele, 2009). It goes to show, therefore, that food security is synonymous with poverty reduction. Food insecurity remains a fundamental challenge of governments in all parts of the world (Tangerman, 2000). Evidence in Nigeria shows that poverty has been on the increase and severity of poverty in the country has been worsened with the deteriorating performance of the economy (CBN, 2002). Nigeria's food supply has for many years fallen short of demand. Between 1994 and 2001 for which fairly consistent data are available, Nigeria's domestic food output moved from 86.70 million metric tonnes (mmt) in 1994 to 98.74mmt in 1998 and later moved to 103.86mmt in 2001 (NBS, Abstract of Statistics, Various Issues). Food demand which was consistently above the domestic production level moved from 87.23mmt in 1994 to 101.87mmt in 1998. It later moved to 110.37mmt in 2001 (Okolo, 2004). The report noted further that although the annual domestic food productions constituted a large share of the food supplies, they were consistently inadequate to fully meet national food demand. During this period, the gap has consistently been met with food import.

Food security is said to exist when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and the food preferences for an active and healthy life (Benson,2004; Nyam, 2005). Based on the above definition, food security can-not be said to be attained by Nigeria where food shortages have prevailed over the years. Okolo (2004) asserts that food shortages rose significantly in Nigeria from 0.30 million metric tonnes to 6.51 million metric tonnes between 1994 and 2001 representing over 2000 percent increase; while in 2003 the estimated shortfall is 9.01 million metric tonnes. The implication of this is that Nigeria has a growing reliance on import as a means of solving her food shortage problem. The nation's food import bill has, accordingly, assumed an upward trend. According to Okolo (2004), it rose from 3.47 billion naira in 1990 to 195.81 billion naira in 2001.

Given the high rise in prices, food importing nations like Nigeria face increased costs in meeting domestic food demands. The implication is that the already existing hunger, malnutrition and food insecurity will re-double. This emerging scenario in Nigeria has engendered a bloat in the percentage of food insecure households, especially those residents in the rural areas where the effect of government policies are rarely felt. Expectedly, the percentage of food insecure households in Nigeria has been on the increase. According to Sanusi et al. (2006), the percentage of food insecure households rose from 18 percent in 1986 and over 40 percent in 2005. The food insecurity situation above may have necessitated the establishment of the national program for food security (NPFS) in 2001 with a broad objective of improving national food security and reducing poverty on an economically and sustainable basis.

Small farmers are the focus of agricultural development programs in developing countries including Nigeria. Unfortunately, these categories of farmers, due to their socio-economic and demographic features, are

inadequately equipped against risks and uncertainties associated with these agricultural programs (Adubi, 2000). Despite the persistent food challenges in Imo state and the importance of the food security program in addressing such challenges, no previous study have been carried out to assess the risk behavior of the farmer's vis-à-vis the program. The responsiveness of farmers to these economic incentives/policies determines agriculture's contribution to the economy. Farm households are the likely key players in most agricultural projects in Nigeria and they will form the basis for this study. Given that the purpose of most government programs on agriculture is to transform small-scale farmers' production, it is necessary to understand the attitude of these small farmers' towards these programs especially their risk behaviour with respect to the programs. This is pertinent as studies have shown that the risk behavior of small-scale farmers' determines the outcome of rural development programs as farmers' react to policy incentives when allocating resources (Ayinde, 2008). A study such as this undertaken in line with farmers' attitudinal variables is appropriate.

Materials and Methods

The study was conducted in Imo State. The choice of Imo state for the study is because it is among the beneficiaries of the Unilateral Trust Fund tripartite agreement for food security program between the Federal Government of Nigeria (FGN) and the Food and Agricultural Organization (FAO) of the United Nations. The state is located in the south eastern part of Nigeria. It is bounded to the North by Anambra State, to the East by Abia State, to the South by Rivers State and to the West by Delta state. Geographically, Imo state is located between latitudes 5°2' and 5°9' North and longitudes 6^{o}5' and 7^{o}7' East (Onuekwusi and Gideon, 2007). The state has an area of 5 430 square kilometers representing about 1.02 percent of Nigeria's land mass. The state has an estimated population of about 2.9 million people (FRN Gazette, 2007). Administratively, the state is divided into 27 Local Government Areas and has 3 agricultural zones of Agricultural Development Program (ADP) namely: Owerri, Orlu and Okigwe.

Purposive and simple random sampling techniques were used for the study. Three Local Government Areas (LGAs) were purposively selected from each of the three agricultural zones of Imo State which are Owerri, Orlu and Okigwe zones. The LGAs are Owerri North, Mbaitoli, and Ezinihitte Mbaise from Owerri zone; Oru West, Ideato North, and Isu LGAs from Orlu zone; Ihitte Uboma, Isiala Mbano, and Obowo LGAs from Okigwe zone. This is because it is in these nine LGAs that the program is executed in the state. Achara Ubo, Obinnoha, and Owutu communities were purposively selected from Owerri North, Mbaitoli, and Ezinihitte Mbaise LGAs respectively in Owerri Zone; Amorie Ubulu, Arondizuogu, and Isuobishi communities were purposively selected from Oru West, Ideato North, and Isu LGAs respectively in Orlu zone; while Onicha Uboma, Okohia, and Amuzi communities were purposively selected from Ihitte Uboma, Isiala Mbano, and Obowo LGAs respectively in Okigwe zone. These are the nine communities (sites) where the program is domiciled in the state. Since membership of a registered and viable co-operative society is a necessary condition for farmers in the state to benefit from the program, a list of registered co-operative societies in each of the sites in the chosen LGAs was obtained from the National Program for Food Security (NPFS) office in the Imo ADP. This list serves as a sample frame from which samples were drawn from each of the communities. The investigator compiled a list of non-participating food crop farmers in each of the nine sites in the three agricultural zones in the state. This serves as a sample frame from which sample were drawn for the non-participating farmers of the program in the state. Three co-operative societies were randomly selected from each of the sites/communities in the state. Three crop farmers were randomly selected from each of the three co-operative societies in each community. This makes a total of nine (9) respondents for each of the sampled communities and LGAs, twenty seven (27) respondents for each of the three zones, and eighty one (81) respondents as the total sample size of the participating farmers.

Data for this study were obtained mainly from a field survey. Questionnaire was used as the primary data collection instrument. Personal interview was also scheduled to suit the convenience of the respondents who are not literate. Data were collected from farmers who are members of registered and viable co-operative societies and who are engaged by the National Program for Food Security in the state. Primary data collected include the respondent's age, sex, educational qualification, mode of land acquisition, farming experience, number of extension contact and their size of farming household. Others include number of plots of farm cultivated, size of each plot as well as the total area, in hectares, where the food crops were cultivated. Information were collected also on items that make up their cost of production such as rent on land, cost of seeds, seedlings and fertilizers, the wage rate and number of man-days of labour used. Data were collected also on the depreciated value of capital implements used in production; as well as the amount and terms of loan facility, nature and amount of farm input and technical support services provided by the Imo ADP under the national food security program. Data on actual output and returns, food crop choices, yield, and the prices of output of each of the food crops cultivated by the farmers in each of the sites/communities and level of risk involved in the program.

The major objective which is to compare and correlate the socioeconomic characteristics and risk coefficients of

the participating farmers was achieved using descriptive statistics, risk aversion index or coefficient and econometric tool like ordinary least squares multiple regression analysis. The risk aversion coefficient model is based on safety-first principle. The model which was developed by Roy (1952) is expressed below following Sekar and Ramasamy (2001) and Salimonu (2007).

$$\Psi_i = \frac{\partial_{i*} - \mu_i}{\sigma_r}$$

Where,

Ψ_i = risk aversion coefficient

∂_{i*} = disaster level of income

μ_i = expected income from the farm

σ_r = standard deviation of household income

i = 1 to n

n = sample size

Disaster level of income is given by

$$\partial_{i*} = (A_{\min} + C_{ot}) - (L_{as} + N_{ai})$$

Where,

A_{min}= minimum consumption needs

$$A_{\min} = X[F - \frac{C_n}{2}]$$

Where,

X = minimum number of calories per person

F = household size

C_n = number of children

C_{ot} = credit outstanding, which include both institutional and non-institutional credit

L_{as} = Liquid asset, which include farm and non-farm assets

N_{ai} = Non-farm income

Expected farm income is given by

$$\mu_i = Q(1 + DMG) - C_i$$

Where,

Q = value of farm output (Naira)

DMG = weighted crop damage variable

C_i = Total Cost of farm inputs (Naira)

Weighted crop damage variable can be obtained following Salimonu (2007) as

$$DMG = \frac{ExpectedYield - ActualYield}{ExpectedYield}$$

The risk aversion coefficient expressed above was regressed on the determinants of the risk aversion levels of the farmers. The regression model used follow after Adubi (1994), Allub (2000), Sekar and Ramasamy (2001), and Salimonu (2007). The function in its implicit form is shown below:

$$\Psi_i = f(X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 + X_{10} + X_{11} + X_{12} + e)$$

Where,

Ψ_i = Risk aversion coefficient of the farmers

FSZ = Available farm size in hectares

HHSZ = Household size in persons

FEXP = Number of years of food crop production

AGE = Age of farmers in years

SEX = Sex (Dummy, D = 1 if male, otherwise D = 0)

FEDU = Number of years of formal education of the farmers

MRST = Marital status (Dummy, D = 1 if married, otherwise D = 0)

EXT = Frequency of extension agents' visit in a year

CAPT = Amount of capital available in Naira

LNDO = Ownership of cultivated land (Dummy, D = 1 if owned by farmer, otherwise D = 0)
FMINCM = Farm income in Naira
e = well behaved error term

Results and Discussion

The socio-economic characteristics of the farmers of the national program for food security in Imo state as presented Table 1 shows that the food crop farmer categories had varying features in terms of sex, age, years spent to acquire formal education, size of household and number of years of experience in food crop production. Table 1 show that greater percentage (59.11%) of the participants in the program in the state is men relative to women (40.79%). The socioeconomic and cultural environment of the study area gives men major responsibilities in households than women including that of decision making. The greater involvement of men in the program relative to women is consistent with the findings of IFPRI (2010) that the percentage of male farmer-participants in agricultural programs is higher than female participants. Table 1 show that the modal class of the age of the participants is 41-60 years and about 78% of the respondents are in that category. With a mean age of about 56 years majority of the farmers are in their economically active stage of life. Several studies have shown that variables other than inputs affect the productivity of farmers (Chidebelu, 1983). Education is an important variable in this regard. Jaja et al (1998) and Nwaru (2001) view education and training as being of utmost importance in an attempt to enhance farmers' capabilities to understand and accept technological innovations in agricultural activities. Result of field survey presented in Table 1 show that an average farmer has spent about 10 years to acquire formal education. When translated in Nigerian education system, an average farmer attained secondary education and, all things being equal, should not only be able to read and write but also able to understand and key into government agricultural policies and programs. The modal class of the household size of the farmers is 7-11 persons. With a mean household size of 9 persons for the participant farmers as shown in Table 1, paucity of required man-days of labour at different stages of agricultural production was not a constraint to the respondents. The result of Table 1 show further that an average participant farmer sampled in the state has had about 29 years experience in food crop production. Considering the mean age of the respondents, which is 56 years, an average farmer started farming at the age of 27 years. The result shows that the respondents took up farming at a later phase of their life which is an indication that they, probably, regard farming as a secondary occupation.

Farmers attitude to risk are major determinants of the rate of participation in new technologies among the farmers and of the outcome of agricultural development programs (Adejoro, 2000). Following the procedure outlined in the methodology, the attitude of the farmers to risk indices was generated and the distribution is given in Tables 2. From the indices in Tables 2, negative risk coefficients indicate risk aversion while positive risk coefficients imply risk takers.The farmers were thereafter categorized into risk averters and risk preferers (takers) and the result as presented in Table 3 shows that 74 participant farmers in the study area have negative risk coefficients and were therefore categorized as risk averters. This represents 97.37% of the farmers. 2 participant farmers on the other hand have positive risk coefficients and were categorized as risk seekers. This represents 2.63% of the farmers.

Analysis of decision making under risk commonly distinguishes many factors that determine the risk preferences. In this sense, personal attributes have been found to play an important role, like age, gender, education level, experience or decision-maker environment (Barsky et al., 1997; Cooper et al., 1999). Haven compared the socioeconomic characteristics and risk coefficients of the farmers, further analysis was conducted to correlate their socioeconomic variables with their risk coefficients and the result is as presented in Tables 4. The linear form of the specified equations best fits the regression line haven satisfied the necessary criteria and was selected as the lead equation and used for analysis. For the lead equation, R^2 is 0.630 denoting that about 63.00% of the variation in risk aversion coefficient of the participant farmers is explained by the specified independent variables. The F-statistic of 9.90 is significant at 1% level, implying that the R^2 is significant. Durbin-Watson statistic of 2.11 is an indication that auto-correlation is not a serious problem. The intercept is 1.00 and this represents the autonomous risk aversion coefficient of the sampled farmers. The empirical results show that the coefficients of farm size (FSZ) and farm income (FMINCM) are statistically significant at 1% level while that of available capital (CAPT) is significant at 5%. They are positively related to risk aversion coefficient of the participant farmers in the state. However, their sign does not conform to the a-priori, that is, it is contrary to the expectation. This explains that risk aversion status among the respondents increases with farm size, farm income and available capital. What could be attributed to this is that it is likely that as the farm size increases the scale of operation increases also and the farmers would not wish to commit their huge investment to chance. Similarly, as their farm income and capital increases they tend to channel their resources to other sources of income considered to be relatively stable. The coefficient of number of visits by extension agents in a farming season

(EXT) is statistically significant at 5% level and negatively related to risk aversion status of the farmers. This conforms to a-priori and it implies that as the number of
times extension agents visit the farmers in a planting season increases their risk aversion level reduces or their tendency to take risk in their farming activities increases. This is because extension education enhances farmers' access to technological learning and improved production inputs that will lead to increased productivity, farmer's management ability and efficiency (Chikaire et al., 2011). Thus farmers deprived of access to extension services are prone to being more risk averse.

Conclusion and Recommendations

Survey result has shown that socioeconomic variables of farmers actually have significant effect on their risk behaviour. . The result of the study agrees with the general assumption in the world of agriculture that farmers are risk averse and is consistent with the empirical results of previous research efforts on the same subject matter. Since farmers attitude to risk have been identified as major determinants of the rate of participation in new technologies among the farmers and of the outcome of agricultural development programs, risk attitude of rural farmers should be considered in intervention policies aimed at ensuring the success of rural development programs.

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Table 1: Distribution of the Respondents based on Socioeconomic Characteristics

Variables		NPFS Participants	
		Frequency	Percentage
(i) Sex			
Male		45	59.11
Female		31	40.79
Total		76	100.00
(ii) Age			
Mean	55.55		
21 – 40		01	1.32
41 – 60		59	77.63
61 – 80		17	22.37
Total		76	100.00
(iii) Years of Formal Education			
Mean	9.93		
1 – 6		25	32.89
7 – 12		31	40.79
13 – 18		20	26.32
Total		76	100.00
(iv) Household Size			
Mean	8.88		
1 – 6		7	9.21
7 – 11		62	81.58
17 – 22		0	0.00
Total		76	100.00
(v) Farming Experience			
Mean	28.87		
5 – 24		29	38.16
25 – 44		29	38.16
45 – 64		18	23.68
Total		76	100.00

Source: Field Survey, 2012

Table 2: Distribution of Risk Aversion Indices among the *NPFS farmer-respondents

Risk aversion indices	Frequency	Percentage
≤ -8.00	0	0.00
-7.99 to -6.00	1	1.32
-5.99 to -4.00	9	11.84
-3.99 to -2.00	38	50.00
-1.99 to 0.00	26	34.21
0.10 to 1.00	2	2.63
Total	76	100.00

Source: Field Survey, 2012
*NPFS = national program for food security

Table 3: Distribution of Farmer-respondents by Attitudes to Risk

Category	Participants	
	Frequency	Percentage
Risk aversion	74	97.37
Risk indifference	0	0.00
Risk preferences (Seekers)	2	2.63
Total	76	100.00

Source: Field Survey, 2012

Table 4: Risk Coefficient equations of NPFS Farmer-respondents

Variables	Linear(L)	Exponential	Double-log	Semi-log
Constant	1.00(0.63)	0.04(0.04)	1.32(0.38)	-0.20(-0.04)
FSZ	1.17(2.96)**	0.64(2.44)**	0.64(2.22)*	1.29(2.82)**
HHSZ	-0.04(-0.56)	0.08(1.50)	0.64(1.69)*	-0.42(-0.69)
FEXP	-0.00(-0.12)	-0.01(-1.34)	-0.05(-0.32)	0.19(0.81)
AGE	-0.03(-1.14)	-0.02(-1.02)	-1.13(-1.33)	-1.50(-1.11)
SEX	-0.30(-0.88)	0.17(0.72)	0.20(0.94)	-0.28(-0.80)
FEDU	0.05(1.24)	0.00(0.10)	0.06(0.32)	0.31(1.08)
MRST	-0.10(-0.54)	0.08(0.63)	0.08(0.64)	-0.07(-0.36)
EXT	-0.05(-2.30)*	-0.04(-2.34)*	-0.38(-3.24)**	-0.60(-3.20)**
CAPT	0.03(1.85)*	0.01(0.66)	0.13(0.76)	0.70(2.55)**
LNDO	0.61(1.26)	0.20(0.62)	0.09(0.29)	0.18(0.35)
FMINCM	2.72(5.61)**	8.23(2.53)**	0.24(2.10)*	0.71(3.79)**
R^2	0.630	0.469	0.457	0.565
F-Stat	9.90**	5.15**	4.90**	7.54**
DW-test	2.11	2.14	2.18	2.03
Std-Error	1.13	0.76	0.77	1.23

Source: Field Survey, 2012
Note: Asterisk * and ** represent 5% and 1% significance levels respectively. Figures in parentheses are the t-values and variables are as defined in equation (3.1). L means lead equation.