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ANALYSIS OF RISK MANAGEMENT STRATEGY BY ARABLE CROP FARMERS IN ABIA STATE, NIGERIA

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Abstract- This study examined the risk management strategy by arable crop farmers in Abia State, Nigeria. The specific objectives were to identify risk common with arable crop farmers; describe risk management practices adopted by arable crop farmers; determine factors that influence the use of risk management practices; and identify constraints militating against effective risk management by arable crop farmers in the state. Multi-stage random sampling technique was used in selecting locations and respondents through which Three hundred (300) farmers were selected and interviewed with the use of structured questionnaire. Collected Data were analyzed using descriptive statistics, and probit regression model. Result revealed that prevalent risks in the area were pest and disease attack (88.33%), drought (61.67%) and theft (43.33%). The prevalent risk management strategies adopted by farmers in the study area were use of inorganic fertilizer (41.66%), planting on ridges (32.00%) and use of improved varieties (26.00%). The coefficient of farm size, farm experience, household size and age had significant influence in the use of risk management practices by farmers. In an attempt to ameliorate the identified risks, the major constraining factor has been identified as lack of fund (70.67%). We recommend implementation of policies aimed at improving farmers' access to loans and extension training this will help equip farmers to effectively manage identified risks.

Keywords- Risk management strategy, Arable crop farmers

Introduction

Agriculture remains an important economic sector in many developing countries. It accounts for a large share of GNP and is a main source of employment. It is a source of growth and a potential source of investment opportunities for the private sector. Agriculture can contribute to sustaining the environment and its GDP growth is at least twice as effective in reducing poverty as non –agricultural GDP growth. Two third of the world's agriculture value addition is estimated to be created in developing countries [1]. In agriculture-based economies which include most of sub-saharan Africa, agriculture guarantees 29.0% of GDP on average. Also, it contributes in transforming developing countries to developed countries in which agriculture is no longer a major source of economic growth [2].

Productivity gains in agriculture are necessary for sustaining economic development in most developing countries [3]. However, agricultural investments unfortunately are among the most risky economic ventures one can embark upon. Despite the importance of agriculture in developing countries, it has always been a risky business. Risk is an event that produces an adverse variation in an outcome. In its general form, risk refers to variability around an expected value. The probabilities of occurrence of the different outcomes are known, some of which are less desirable than others and may entail a loss. Expected value is the outcome that would occur on average over time if an individual or firm were repeatedly exposed to identical conditions, decisions or scenarios. Economists make a distinction between risk in which a random set of outcomes can occur for which one knows the probabilities, and uncertainty, in which a random set of outcomes can occur for which one does not know the probabilities [4].

Because of production lags associated with crop and livestock production, Farmers are exposed to considerable risks from unexpected changes in input and output prices to weather events, which affects yield. Agriculture also tend to be fairly capital intensive with considerable investment such as machinery and land. Farmers are often confronted with risks not only in making short-term production and marketing decision, but also with long term investment decision such as purchasing land or equipment.

Agricultural business is often characterized by high variability of production outcomes or production risks [5]. Unlike most other entrepreneurs, agriculture entrepreneurs are not able to predict with certainty the amount of outputs that the production process will yield due to external factors such as weather, pest and diseases [6]. The absolute dependence on unpredictable weather conditions like flood, hailstorm, hurricane, drought and other natural hazards, make income from arable crop production to be very unstable. Other agricultural enterprises like livestock and poultry are also exposed to the risks which occur in catastrophic proportions. The recent cases of flooding, bird flu and pig swine in Nigeria comes readily to mind [7].

Risk situation in agriculture is diverse. According to [5] Risks that affect agriculture can be broadly grouped as; systemic/correlated risks and idiosyncratic/independent risks. Systemic risks include production risks (farming practice, weather, pests, etc.), price risks, and political risks (export bans, price caps, debt write offs, etc.). Non agricultural risks known as idiosyncratic risk are made up of personal risks which affect the entrepreneur, proprietor and or manager of the farm business. Risk pooling and insurance arrangements are more likely to offer protections against idiosyncratic risks rather than systematic risks.

Extensively types of agricultural risk are grouped as follows: Production risk, Market risk, Financial risk, obsolescence risk, social risk, economic risk, legal risk and currency risk. Among the manifold types of risk in agriculture, variability of output qualities, output quantities and output price changes are generally considered the most important elements. Farmer's decision under risk can cause the increase of intercropping of farm products, reduce the quantity of agricultural product, it can also hinder the adoption of new agricultural technology [8-10].Ultimately the incidence of risk reduces the revenue and profit of the farm business.

Taking more risk can increase an arable crop farmer's expected profit. However, arable crop farmers (like most people) are generally risk averse, which is why they are willing to pay a premium to reduce exposure to risk. If arable crop famers can manage the risks on their farm at an acceptable cost, they will become better off as a result [10]. The way of managing risk and the extent to which different types of risks are managed depend on such factors as farmers degree of risk aversion, the cost involved, the relative size of risk, the correlation of the risk with other risks, other sources of indemnity, a farmers perception of the nature of risk and the farmers income and wealth [9].

The process of farm business management deals with decision aimed at eliminating or avoiding the incidence of risk or minimizing the adverse effects. Farms usually adopt a number of strategies. Some of these strategies include: choosing reliable enterprise, diversification, intercropping, irrigation, pest control, sale of assets, money lending and engaging in non-farm work [11,12]. Risk management is the process of measuring or assessing risk and developing strategies to minimize the risks. A prioritization process is followed whereby the risk that could attract the greatest loss and with a high probability of occurrence are handled first and risk with lower loss handled last. Managing risks on the farm is likely to result in more stable expenditure on farm inputs and household consumption, thereby implying more stability for rural farming with flow on benefits for the society as a whole, for example through rural employment.

Although better agricultural practice lead to increase in productivity and can render an enterprise more profitable. It may also compensate for reduction in revenue due to a fall in price of products if the value of the increase in yield is greater than the fall in price [13]. There is problem of low yield despite the availability of improved technologies. According to [14] most farmers in Nigeria seem not to implement risk management practices and hence low productivity of agricultural enterprise.

Risk management is and will continue to be a key driver of success in agriculture, preserve the standard of living of those who depend on agriculture, provide an environment which supports investment in the agricultural sector and strengthen the working capability of farm businesses [15]. According to [16] improvements in risk mitigation, transfer or coping can bring about large benefits to vulnerable arable crop farmers households. Hence, managing risk effectively is expected to increase arable crop farmer's profit. They therefore adopt a range of strategies to manage the risk they face. These strategies can be subdivided into strategies which might be loosely termed on-farm risk management strategies, business diversification strategies and strategies in which risks are shared with others. The risk management strategies includes: collecting information, avoiding or reducing exposure to risk, selecting less risky technologies, diversification, informal risk pooling and insurance. The welfare of the farm family conditions and survival of farm business may depend on how well farming risks are managed [9,17].

This study tends to identify the risk common with arable crop farmers; describe the risk management practices adopted by arable crop farmers; determine the factors that influence the use of risk management practices by arable crop farmers; identify constraints militating against effective risk management by arable crop farmers in the state.

The study was anchored on the following null hypothesis:

Ho_1: There is no significant relationship between selected socio-economic variables (farm output, age, education level, household size, farming experience, farm size) of farmers and use of risk management practices by the farmers.

Materials and Methods

The study was carried out in Abia State, Nigeria. The State is one of the five states in South East Geo-political zone of Nigeria. The State lies between latitudes $4^0 47^1$N and $6^0 12^1$ North of the Greenwich meridian and longitudes $7^0 23^1$E and $8^0 02^1$ East' of the equator. It is bounded by Enugu State in the North, Rivers State in the South, Akwa Ibom and Cross River States in the East and Imo State in the west. Abia State occupies a land mass of 5833.11 square kilometers [18], with an estimated population of 2,833,999 persons and a density of 580 persons per square [19].

The State is made up of seventeen (17) Local Government Areas. Multi stage random sampling technique was used for this study; in the first stage, 5 Local Government Areas (LGA's) were randomly selected from the 17 Local Government Areas that makeup Abia State. The selected Local Government Areas were Isi-Ala Ngwa North LGA, Bende LGA, Ikwuano LGA, Ohafia LGA and Isuikwuato LGA. In the second stage four communities were randomly selected from each of the chosen LGA's. This gave a total of twenty communities. Lastly 15 arable crop farmers were randomly selected from each of the chosen 20 Communities. This brought the sample size to 300 arable crop farmers. Semi-Structured questionnaire was used to elicit and collect information. The data generated was mostly demographic and those related to farmers risk management strategy.

The data collected were analyzed using both simple descriptive statistics (frequencies tables and percentages) and inferential statistics (maximum likelihood probit analysis). Objectives i, ii, and iv were analyzed using descriptive statistics while objective iii was analyzed using maximum likelihood probit regression analysis.

The probit model is appropriate when the response (dependent variable) takes one of only two possible values representing presence or absence. The model was adopted as used by [20,21].

$$Pi\ [y=1] = [Fzi] \quad (1)$$

Where

$$Zi = \beta 0 + \beta_1 X_1$$

$$Y1 = \beta 1 + \beta_2 X_{2i} + \ldots\ldots + \beta_k X_{ki} + \mu \quad (2)$$

Yi^* is unobserved but $Yi = 0$ if $y_i^* < 0$,1 if $Y_i^* \geq 0$

$$P\ (Yi = 1) = P\ (Yi^* \geq 0)$$

$$P\ (\mu\ i \geq -\beta_1 + \beta_2 X_{2i} \ldots\ldots -B_k\ X_{kL} \quad (3)$$

where i = 1,2 ……300

where Y_i = use of risk management practice (use ≥ 50.0% of the available risk management practices in the area = 1, use < f50.0%

of the available risk management practices in the area = 0).
B_1 = A factor of unknown coefficients, X_1 = Farm output (kg),
X_2 = Age (years), X_3 = Household size (number),
X_4 = Educational level (years in school),
X_5 = Farming Experience (years), X_6 = Farm size (hectares)

Result

The result of the percentage distribution of respondents according to risks encountered is presented in [Table-1]. From the result it was observed that the predominant types of risks in the study area are natural risks and social risks. The result shows that pest and disease attack (88.33%) constituted the major natural risk which is encountered in the area followed by drought caused by late rains (61.67%). The result further shows that the prevalent social risk in the area are theft (43.33%) and fire outbreak (20.00%). Other aspects of natural risk observed are flood caused by excessive rainfall (19.67%) and soil infertility caused by erosion (7.67%).

The percentage distribution of respondents according to risk management strategies adopted as shown in [Table-2] indicated that 41.66% of the farmers adopt the use of fertilizer as a risk management strategy for soil infertility (low yield) while 32.00% plant on ridges, to reduce risk of erosion and soil infertility (low yield). These two have the highest percentage of the table. Few farmers, 8.33% seek the services of extension agents. The result of [Table-2] also shows that about 1.33% of the farmers adopt risk management strategy for drought control, while about 1.67% adopt effective risk management strategy for flood.

The maximum likelihood probit regression result of factors that influence the use of risk management strategies by arable crop farmers in the state as given in [Table-3] reveals there was high degree of confidence and goodness of fit (Chi^2) with a t-value of (79.630) that is significant at 1.0% level of probability. [Table-3] also shows that age, household size, farm experience and farm size were significant determinants at varying levels of significance. The estimated coefficients of age, household size and farm experience were positively signed but the coefficient of farm size is negatively signed. The estimated coefficient of age (1.97053) is a positive determinant of arable crop farmer's use of risk management strategy and was statistically significant at 10.0%. The estimated coefficient of farm experience (2.25912) is positive and statistically significant at 5.0%. The coefficient of household size (2.67219) is positive and statistically significant at 1.0%. The estimated coefficient of farm size (-2.06214) is negative and statistically significant at 5.0%.

The result of percentage distribution of respondents according to constraints militating against the adoption of risk management strategies as given in [Table-4] shows that about 70.67% and 37.00% of the respondents are faced with lack of fund and inadequate inputs respectively as constraints militating against their adoption of risk management strategies. Also, 29.67% of respondents are faced with problem of inadequate labour.

Discussions

The risks encountered by arable crop farmers in the area as observed in [Table-1] if not managed effectively tend to hinder optimum farm production and thus, reduce revenue accruing to arable crop farmers. The result is in line with Nnadi, et al [7] who posited that unpredictable weather conditions like flood, hailstorm, hurricane, drought and other natural hazards, make income from crop production to be very unstable. One unique characteristic about the natural risks in farming is that they cannot be controlled easily. This result also gives credence to the assertion by Adegeye [22] that only a form of insurance can save farms from the dilemma of natural hazards.

Table 1- Percentage Distribution of Respondents According to Risks Encountered

Risks	No of Respondents*	Percentage
Pest and Disease Attack	265	88.33
Fire outbreak	60	20
Theft	30	43.33
Erosion and soil infertility	135	45
Animal and bird attack	61	20.33
Drought	185	61.67
Poor varieties of planting materials	40	13.33
Financial risks	40	13.33
Flood	59	19.67

*Source: Field Survey Data, 2013. *= Multiple responses recorded.*

[Table-2] results imply that even though natural risk was the major source of risk in the study area, a low percentage of farmers were involved in its management. Farmer's means of minimizing farm risks in the study area was found to be traditional and old and this led to poor management of the farm risks.

Table 2- Percentage distribution of Respondents According to Risk Management Strategies Adopted

Management Strategies Adopted	No of Respondents*	Percentage
Spraying of Agrochemical	34	11.33
Fencing	19	6.33
Using improved varieties	78	26
Planting on Ridges	96	32
Scaring animals and bird away with scarecrow	43	14.33
fertilizer application	125	41.66
Training service of extension agents	25	8.33
Setting traps	35	11.67
Adoption of crop rotation	19	6.33
Good drainage system	5	1.67
Avoid of bush burning	25	8.33
Irrigation	4	1.33

*Source: Field Survey Data, 2013. *= Multiple responses.*

The maximum likelihood probit regression result of factors that influence the use of risk management strategies by arable crop farmers in the state as given in [Table-3] shows that the coefficient of age was significant and positively signed indicating a direct causal relationship with use of risk management practice. This agrees with *a priori* expectation that increase in age leads to increase in use of risk management practices because the ageing are more pragmatic and may manage the farm more effectively.

Table 3- Factors that Influence the use of Risk Management Practices

Variables	Estimated Coefficient	Standard Error	T-Value
Intercept	-2.2625	0.4056	-5.57321***
Farm output	-0.029	0.0001	-0.029
Age	0.01433	0.00727	1.97053*
Household size	0.03872	0.01449	2.67219***
Education level	-0.0073	0.02228	-0.3286
Farm Experience	0.0619	0.00274	2.25912**
Farm size	-0.0738	0.03578	-2.06214**
Chi^2			79.630***

*Source: Field Survey Data, 2013., *** = 1.0% level of significance, ** = 5.0% level of significance, * = 10.0% level of significance*

The significant coefficient of household size which is positively signed implies increases in household size will cause increases in

the use of risk management practices. This conforms to *a priori* expectation that increase in household size will lead to increase in the use of risk management because there will be division of labour within the household which will make the use of risk management practices easier and less time consuming for the farmers in reducing risk farm.

The significant and positively signed coefficient of farm experience implies that increasing farm experience will lead to increasing use of risk management practices. This implies that the more experienced farmers are, the more they will adopt available risk management practices because they can lean on past experience to solve present problem or know more about the advantages of adopting the risk management practices in reducing farm risk.

The significant and negatively signed coefficient of farm size implies that increases in farm size will result to decreases in the use of use of risk management practices. This result is not in line with *a priori* expectations that increase in farm size will lead to more use of management practices. However, because of poor status of rural farmers, they may not have the fund to adopt risk management practices for the whole farm due to its largeness. Also the farmers may be less anxious to manage the farm effectively since they have more farms.

The findings on percentage distribution of respondents according to constraints militating against the adoption of risk management strategies as given in [Table-4] reflects the low economic status of rural farmers which will lead to more farm risk as a result of not adopting the risk management practices. Hence, low output from the farm.

Table 4- Percentage Distribution of Respondents according to Constraints Militating against the Adoption of Risk Management Strategies

Constraints	No of Respondents*	Percentage
Lack of fund	212	70.67
Time	35	11.67
Land tenure problem	20	6.67
Inadequate inputs	111	37
High cost of agricultural inputs	44	14.67
Inadequate extension visit	40	13.33
Cost of transportation	21	7
Inadequate labour	89	29.67
High cost of labour	35	11.67

*Source: Field Survey Data, 2013. *= Multiple responses.*

Conclusion

Age, household size, farming experience and farm size were found at varied levels of significance and signs to be determinants of use of risk management strategies by farmers in the study area. Farmers in the area encountered various risks and adopted various risk management strategies. In an attempt to ameliorate the identified risks the major constraining factor has been identified as lack of fund. We recommend that policies aimed at improving farmers' access to loans should be passed, this will help farmers in effectively ameliorating some identified risks. Also increased extension service activities should be encouraged by all levels of government, this will facilitate farmers farm risk management potential.

There is the need to ensure that laws against indiscriminate bush burning are effectively carried out through community leaders in the study area. More research efforts on farm risk should be encouraged to help generate more scientific information on the issue. Development of co-operative insurance among the farmers should be encouraged. Adequate provisions of farm chemicals to farmers to enable them tackle the problem posed by pests and disease that attack farm crops and produce in order to reduce the risk of disease and pest.

Conflicts of Interest: None declared.

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