Risk and Risk Management Practices of Rice Millers in Selected Local Government Areas in Cross River State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author OSB designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author TSE managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The study is on risk and risk management practices of rice millers in selected Local Government Areas in Cross River State, Nigeria. Specifically, the study analyzed the perception of rice millers on sources of risk in rice milling in the study area, identified the various risk management practices used by the rice millers, determined the relationship between risk management practices and rice milling output and examined the factors affecting the utilization of risk management practices by rice millers. Two Local Government Areas were purposively selected from each of the three agricultural zones in Cross River based on their level of rice production in the State. Proportionate random sampling was used to select 105 rice millers from the list of rice millers in the study area. Data were collected using structured questionnaire and analyzed using mean, frequency table, percentages and standard deviation, Kendall W-statistics, correlation analysis and binary logistic regression. The study showed that respondents perceived lack of capital, output price variability, input price

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variability, changes in technology, high cost of labour, high rate of interest and access to input as sources of high risk while the theft, ill-health, war and government regulations were considered as low risk in the study area. Also, diversification of enterprise was the most favoured risk management practice in the study area followed by diversification of source of income for the enterprise, cooperative marketing and insurance. There was a weak but positive correlation between risks management practices and rice milling output with risk management practices explaining only 5 percent of the variation in rice milling output. The weak relationship is an indication that risk management practices is not the only determinant of increase in milling output but other factors like direct production inputs and capacity of the mill may also influence output. The binary logistic regression explained 62.3 percent (Nagelkerke R^2) of the variance in utilization of risk management practices and correctly classified 81.0 percent of cases. It showed that variables such as education, household size, mill capacity, farmer of rice, and perceived risk sources were also positively affected the utilization of risk management practices. The implication of the findings is that rice millers require a level of education and orientation in enterprise management to enable them overcome the negative effect of risk in business.

1. INTRODUCTION

Rice (*Oryza sativa*) is considered as one of the important food grains for most of the world's population [1]. Rice is valued as the most important staple food for major population of the world and is deeply embedded in the cultural heritage of many societies. It is a staple food for more than half of the world's population and has become increasingly important in Africa, both as a food source and as an economic commodity [2]. Rice is seen as an important staple food for majority of the Nigerian populace. In the quest to attain food security and rapid urbanization, rice is one of the high emergent crops in Nigeria which has led to its importance in most eateries and in policy formulations.

Rice is not only a key source of food, but also a major employer of labour and source of income for the poor. Rice based production activities provide employment for several hundred million people among the poor resource based nations and developing countries in tropical Africa including Nigeria [3]. The rice value chain is made up of several actors from producers, processors (millers), marketers to consumer. The milling processes include parboiling, drying, milling and packaging for final consumption. Rice milling operations in Nigeria is still exist at small-scale industry level though there are substantial differences can be observed even within the relatively small-scale operations. The diversity of these mills is based on the output capacity, manner of running the mill, (that is if it is operated only as a mill or combined with another business), and the number of functions it can perform [4]. Given that rice is a key agricultural product in Nigeria's food chain, rice millers in Nigeria are a significant component as they process rice from the paddy form to finished rice. Rice milling is therefore an important components of the rice value chain which is the process from production to final consumption [5]. In most parts of the World, milling of rice is carried out near the farm in small mills and stored in the form of milled rice until it is consumed. The systems of milling differ in many countries across the World. In Nigeria and particularly in Cross River State, small scale milling industries are found in clusters around rice producing areas. According to [4], these mills whose classification vary from 0.05tonnes of milled rice per hour for the small size mills to 5tonnes/hour for the large size are classified using milling capacity as the common criteria.

Furthermore, business enterprises in Nigeria and particularly rice processing mills operate under uncertain environmental conditions and face high risk of survival [4]. Risk is defined as the potential negative impact to assets, investments, or profitability of investments in the agricultural industry that may arise from some present process or future event [6]. Also, [7] defined risk as the chance of loss or an unfavorable outcome associated with an action while uncertainty is not knowing what will happen in the future. The greater the uncertainty, the greater the risk. For an enterprise manager, risk management involves optimizing expected returns subject to the risks involved and the risk tolerance [7]. Agribusinesses like any other enterprise involves decision making. The consequences of such decisions are usually unknown at the time the decisions were taken and the results could be

better or worse than what was anticipated. There is a much higher probability of adverse consequences which may significantly disrupt their businesses [7]. Also, the availability of reliable information and the speed of transmission of such information to guide management decisions impacts on the future of business enterprises. Accurate and timely information on input prices, product prices, sources of raw materials and weather conditions are important for forecasting and planning which could reduce enterprises exposure to risk [8]. More so, the source of risk and its severity varies depending on factors such as type of enterprise, prevailing government policies, geographic location and weather conditions. Issues of risk and risk management are therefore a major concern especially for developing countries like Nigeria where enterprises are faced with problems of information transmission [9].

Several studies have been carried out on rice in Cross River State, but most of these studies were on production [10,11,12]. However, considering the focus of government initiatives on value chain development, rice milling (processing) is an important part of the chain, the activities of rice millers especially as it relates to risk and risk management have to be studied to enable government and other stakeholders make policy decisions about the sector. There is no documented study known to the author on risk and risk management practices of rice millers in the study area. More so, [13] asserts that many firms are attempting to have sustainable efficiency to maintain a long-term competitive advantage. In order to be successful in having this competitive advantage, the level of risk needs to be analyzed to understand its effect on the performance of the enterprise for proper management. The general objective of the study is to evaluate risk and risk management practices of rice millers in selected Local government Areas in Cross River State, Nigeria. The study will specifically analyze the perception of rice millers on sources of risk in rice milling in the study area; identify the various risk management practices used by the rice millers; determine the relationship between risk management practices and rice milling output and examine the factors that affect the utilization of risk management practices by rice millers.

1.1 Scope and Limitation of the Study

This study will investigate the various risks management practices, and examine its relationship with rice milling enterprises. Furthermore, the study is limited to answering the research questions and the research hypotheses that have been posed here. For a study of this nature, the findings would have been more robust if more research questions and hypotheses such as banning of imports and provision of assistance for storage and marketing were evaluated. Finally, in view of the large number of rice milling enterprises and the challenges of covering the whole country, we limit our study to a sample size drawn from Cross River State.

1.2 Theoretical Framework

Risk can be defined as the chance of loss or an unfavorable outcome associated with an action. Uncertainty is not knowing what will happen in the future. The greater the uncertainty, the greater the risk. For an enterprise manager, risk management involves optimizing expected returns subject to the risks involved and risk tolerance [7].

Risk is what makes it possible to make a profit. If there was no risk, there would be no return to the ability to successfully manage it. For each decision there is a risk-return trade-off. Anytime there is a possibility of loss (risk), there should also be an opportunity for profit. Agribusinesses must decide between different alternatives with various levels of risk. Those alternatives with minimum risk may generate little profit. Those alternatives with high risk may generate the greatest possible return but may carry more risk than the enterprise will wish to bear. The preferred and optimal choice must balance potential for profit and the risk of loss. It all comes down to management, and there are no easy answers.

The first step in the process of managing risk is identifying and classifying the prospective risks. According to [7], there are five primary sources of agricultural risk namely; production, marketing, financial, legal and human risks. Any production related activity or event that has a range of possible outcomes is a production risk. The major sources of production risks are weather, climate changes, pests, diseases, technology, genetics, machinery efficiency, and the quality of inputs. Fire, wind, theft, and other casualties are also sources of production risk. Marketing risk is any market related activity or event that leads to the variability of prices farmers receive for their products or pay for production inputs while financial risk encompasses those risks that

threaten the financial health of the business. This include the cost and availability of capital, the ability to meet cash flow needs in a timely manner, the ability to maintain and grow equity, the ability to absorb short-term financial shocks [7]. Furthermore, [7] explained that many of the day-to-day activities of all producers involve commitments that have legal implications. Risk arising from these activities constitute legal risk and understanding these issues can lead to better risk management decisions. Finally, human risk arise from the point of view that people are both a source of business risk and an important part of the strategy for dealing with risk. Human risk management is the ability to keep all people who are involved in the business safe, satisfied and productive [7].

One of the theories that sets the framework for this study is the financial risk theory. This theory was developed by [14] in his work titled "Portfolio Selection". He directed the focus away from individual stock picking by calculating the variance which was used as a measure of risk of returns, and demonstrated the effect on portfolio risk of the addition and subtraction of stocks to and from a group of stocks. He showed that a portfolio of stocks could generate a higher return at a lower level of risk than individual stocks held alone. Financial economics approach to corporate risk management has so far been the most prolific in terms of both theoretical model extensions and empirical research. This approach builds upon classic Modigliani-Miller paradigm [15] which states conditions for irrelevance of financial structure for corporate value. This paradigm was later extended to the field of risk management. This approach stipulates also that hedging leads to lower volatility of cash flow and therefore lower volatility of firm value. Rationales for corporate risk management were deduced from the irrelevance conditions and included: higher debt capacity [16], progressive tax rates, lower expected costs of bankruptcy [17], securing internal financing [18], information asymmetries [19] and comparative advantage in information.

2. RESEARCH METHODOLOGY

2.1 Study Area

The area of study is Cross River State, Nigeria. The State lies within latitude $40^\circ 41^1$ South and $60^\circ 30^1$ North and between longitude 8° and $9^\circ 00^1$ East of the Equator. It has a land mass of 23,072.425 square kilometres with an estimated

3.2 million people living in it (State Bureau of Statistics [20]. Cross River State was created in 1967 though known then as South-Eastern State and renamed Cross River State in 1976. It is composed of the former Ogoja and Calabar provinces sectionalized into 18 administrative parts called Local Government Areas (LGAs). Agriculture and Tourism are the key sectors that drive the State economy. The Agricultural sector is divided into private and public sub-sectors. The major food crops cultivated in the State include plantain, maize, cassava, yam, banana, rice and groundnut while the key export crops are oil-palm and rubber.

2.2 Sampling Procedure/ Method of Data Collection

A two stage sampling approach was adopted in selecting the study sample. In the first stage, two Local Government Areas were purposively selected from each of the three delineated agricultural zones of the State. The choice of the Local Government Areas was based on the intensity of rice production and location of milling clusters in these areas. The second stage involved the use of sampling frame obtained from the Cross River State Agricultural Development Project comprising all registered rice millers in the State to select respondents. Hence, proportionate random sampling method was applied to select one hundred and five (105) rice millers from Akamkpa, Biase, Abi, Obubra, Ogoja and Yala Local Government Areas.

Questionnaire was used in collecting primary data for the study. The questionnaire contained closed and open ended questions. It was made up of two sections (A and B), section A captured information on millers socioeconomic and demographic characteristics while section B provided information on risk, risk management practices and output of the mills. Questions on sources of risk and risk management practices of millers were close ended and formulated using previous risk sources and risk management practices found in literatures. Hence eleven risk sources; output price variability, access to input, input price variability, theft, ill health, war, high cost of labour, lack of capital, high rate of interest, government regulations and changes in technology were listed as sources of risk. The respondents were asked to rate the degree of importance of these risk sources using a four point scale categorised into 4= most important, 3=important, 2=less important and 1=not important. Also, a list of five (5) risk management

practices which included insurance, diversification of enterprise, diversification of sources of income, cooperative marketing and hedging were compiled from literature. The compilation was based on literatures on similar works. Respondents were asked to indicate their risk management practices following the specified order of importance (4= most important, 3=important, 2=less important and 1=not important).

2.3 Research Hypothesis

Ho₁: There is no significant association between risk management practices and the milling output of respondents in the study area.

Ho₂: There is no significant effect if any, of selected socio-economic characteristics on utilization of risk management practices by rice millers.

2.4 Data Analysis

Data obtained from the study were analyzed using mean, frequency table, percentages and standard deviation. Kendall W-statistics was used to determine the coefficient of concordance of the rice miller's perception of risk management practices. Data were collected using a 4 point rating scale and ranking. Correlation analysis was used to determine the relationship, direction and strength of the relationship between risk management practices and milling output.

A binary logistic regression model was used to examine the factors affecting rice millers' decision to use risk management practices. This model was chosen considering the possibility that risk management practices are not mutually exclusive and that there was the possibility of simultaneous utilization of multiple practices. The variables selection was guided by previous related studies like [21,22,23].

2.5 Model Specification

$$Y_{ij} = X'_{ij}\beta_j + \varepsilon_{ij} \qquad (1)$$

Where Y = Risk management practices used by the miller (Dummy variable = 1 if there was high utilization (mean value greater than or equal to 2.5) and 0 if there was low utilization (mean value less than 2.5).

X_1 = Sex (Dummy variable 1 if male, 0 if female)
X_2 = Education (number of years in schooling)
X_3 = Age (age of miller in years)
X_4 = Household size (number of people in a household)
X_5 = Ownership of mill (1 if owner and 0 if not the owner)
X_6 = Experience (number of years engaged in rice milling)
X_7 = Rice mill size (milling capacity in kg)
X_8 = Farmer of rice (Dummy = 1 if miller farms rice, 0 if not)
X_9 = Milling output for 3 years (kg)
X_{10} = Perceived risk sources (mean score of respondents)
β_j is the unknown parameters and
ε_{ij} is the observed error term.

3. RESULTS AND DISCUSSION

3.1 Perception of Rice Millers on Sources of Risk in Rice Milling in the Study Area

The study showed that respondents agree that seven (7) out of the eleven (11) perceived risk sources were high since these seven sources had means above the group mean of 2.5. The high risk sources included lack of capital, output price risk, input price variability, changes in technology, high cost of labour, high rate of interest and access to input risk. The risk of theft, ill-health, war and government regulations were considered by respondents to have low risk with the risk of war being the lowest risk factor with a value of 1.30 (Table 1). [24] in their study on sources of risk and risk management strategies for small holder farmers in a developing economy" found out that "the variability of input prices was perceived as the most important risk source on the farm. Increased wage rate and high land rental were also found to be the main factors that push up production cost for the farmers. This study tends to agree with their findings as input price variability and high cost of labour were also found to be among the 7 high sources of risk for rice millers in the study area. This result is in line with those of [25,26,27] who opined that marketing risks associated with the variability of product and input prices were the most important sources of risk considered by farmers in their respective study areas.

Table 1. Perception of sources of risk by respondents

Risk sources	Very important	Important	Less important	Not important	Mean	Std. Dev	Level of risk
Output price variability	77	23	4	1	3.68	0.60	High
Access to input	25	62	13	5	3.02	0.75	High
Input price variability	22	58	20	5	2.92	0.77	High
Theft	1	9	40	55	1.58	0.69	Low
Ill-Health	-	19	52	34	1.86	0.70	Low
War	-	4	23	78	1.30	0.54	Low
High cost of labour	25	47	26	7	2.86	0.86	High
Lack of capital	92	11	1	1	3.85	0.46	High
High rate of interest	24	49	18	14	2.79	0.95	High
Government regulations	-	51	50	4	2.45	0.57	Low
Changes in technology	20	47	25	13	2.70	0.92	High
Mean value					2.5*		

* Decision rule: the decision rule is that any risk source with a mean value of 2.5 and above is considered to be high while those with vales below 2.5 is considered to be low

Source: Field survey 2016

3.2 Risk Management Practices Used by Rice Millers

The Kendal mean ranking was used to rank the risk management practices predominant in the study area. From Table 2, diversification of enterprise was the most favoured risk management practice in the study area with a value of 3.71 followed by diversification of source of income for the enterprise with a value of 3.65. Cooperative marketing and insurance rank 3rd and 4th respectively while hedging was the least favoured practice in the study area with a value of 1.58. The reason for the hedging being the least favoured can be attributed to the fact that the respondents do not understand the practice of hedging which is relatively new to them. Enterprise diversification being the most favoured risk management practice in this study is in line with the work of [28] who found crop enterprise diversification as the most accepted risk decreasing approach by onion farmers in Kebbi State, Nigeria. In the same study, they opined that formal insurance and cooperative marketing should be encouraged among farmers. This also supports the finding in this work which ranked the two practices 3rd and 4th respectively.

3.3 Relationship between Risk Management Practices and Milling Output

The Pearson product-moment correlation analysis was performed to appraise the association between risks management practices and rice milling output. Introductory investigation indicates that the association is linear and the two variables normally distributed, and there were no outliers. Results from Table 3 showed that there was a weak but positive correlation between risks management practices and rice milling output, r (103) = 0.227, p =.05, with risks management practices explaining only 5 percent of the variation in rice milling output. Thus, the more the millers are aware of the effects of risk on their output and work hard to improve on the utilization of the available risk management practices, the greater their output would be given the positive relation between the two variables. The weak relationship is an indication that risk management practices is not the only determinant of increase in milling output but other factors like direct production inputs and capacity of the mill may also influence output. This finding is in line with [29] who in a review of the 50 largest United States oil companies from 1981 to 2002 discovered that firms that take more risk when it comes to exploration and development earn higher returns than firms that take less. According to the finding, there is a positive payoff to risk taking but not if it is reckless. Firms that are selective about the risks they take can exploit those risks to advantage, but firms that take risks without sufficiently preparing for their consequences can be hurt badly. [30] in a study however discovered a negative relationship between risks and return in most sectors of the economy, a surprise given the conventional wisdom that higher risks and higher returns go hand-in-hand, at least in the aggregate. This result has since been titled "Bowman Paradox".

Table 2. Risk management practices

Practices	Kendal mean rank	Order of mean rank
Property insurance	2.87	4th
Diversification of enterprise	3.71	1st
Diversification of source of income	3.65	2nd
Cooperative marketing	3.20	3rd
Hedging	1.58	5th

Source: Field survey 2016

3.4 Factors Affecting Utilization of Risk Management Practices by Rice Millers

A binary logistic regression was performed to ascertain the effects if any, of selected socio-economic characteristics on utilization of risk management practices. The model explained 62.3 percent (Nagelkerke R^2) of the variance in utilization of risk management practices and correctly classified 81.0 percent of cases. The estimated values of the variables was used as test for the effect of selected socio-economic characteristics on the utilization of risk management practices.

Results from Table 4 indicates that five out of the ten independent socio-economic variables were found to have significantly contributed to utilization of risk management practices. The significant variables; education, household size, mill capacity, farmer of rice, and perceived risk sources were also positive. This result signifies that the higher the level of educational of the miller, the greater the likelihood of utilizing risk

Table 3. Correlation result

		Mean of risk management practices	Milling output 1
Mean of risk management practices	Pearson correlation	1	.227*
	Sig. (2-tailed)		.020
	N	105	105
Milling output 1	Pearson correlation	.227*	1
	Sig. (2-tailed)	.020	
	N	105	105

*Source: Field survey, 2016 *. Correlation is significant at the 0.05 level (2-tailed)*

Table 4. Binomial logistic regression

Variables	B [1]	S.E. [2]	Wald [3]	df [4]	Sig. [5]	Exp(B) [6]
Sex	.510	1.805	.283	1	.777	1.666
Educational qualification	.458	.104	19.393	1	.000***	1.581
Age	-.049	.075	.426	1	.515	.952
Household size	.438	.215	4.150	1	.041**	1.550
Ownership of business	-21.467	25684.842	.000	1	.999	.000
Year of establishment	.062	.115	.290	1	.592	1.064
Mill capacity	.032	.010	10.240	1	.001***	1.033
Off business activities	1.525	.756	4.069	1	.044**	4.594
Milling output for 3 years	.000	.002	.000	1	.772	1.000
Perceived risk sources	2.336	1.228	3.618	1	.057**	10.337
Constant	-119.911	25685.914	.000	1	.996	.000
-2 Log likelihood	79.313					
Cox & Snell R Square	.467					
Nagelkerke R Square	.623					

Notes:
[1] B is the estimated logit coefficient of the independent variables
[2] S.E. is the standard error of the coefficient
[4] df is degree of freedom
[5] "Sig" is the significance level of the coefficient
[6] Exp(B)is odds ratio

*Source: Field survey 2016   Note: *** Significant at 1%, **Significant at 5%*

management practices. According to findings by [31], the educational level of farmers affected their decision making capacity as the higher educated farmers make better decisions in terms of management skills and resource allocation for profitability. Similarly, large household size was found to be positively related to the use of precautionary saving to deal with risk [32]. The size of mill (capacity) determines the risk management practices to utilize since the increase in capacity translates to high risk as the values of the enterprise increases. Therefore, as the level of risk increases so the utilization of risk management practices will increase to save the enterprise from collapse due to business risk. Also, the engagement of the millers in other enterprises and high level perception of risk sources by the millers will lead to an increase in the utilization of risk management practices. This findings is corroborated by the finding of [32] who using the multivariate probit approach to analyze risk management strategies for cocoa farmers in Cote D'Ivoire, pointed out the importance of farm size, household size, literacy level, engagement in other farm activities and risk aversion as factors that increase the likelihood of adopting risk management strategies.

4. CONCLUSION AND POLICY IMPLICATION

The level of perceived risk sources by the millers were identified and analyzed using a 4-point rating scale. Seven out of the eleven perceived risk sources were considered by respondents to be high while four were rated as low. The high risk sources included lack of capital, output price variability, input price variability, changes in technology, high cost of labour, high rate of interest and access to input. The Kendal mean ranking was used to rank the risk management practices predominant in the study area and enterprise diversification was found to be the most favoured practice. Pearson product moment correlation analysis was carried out to appraise the connection between risk management practices and rice milling output in the study area. A weak but positive correlation was found to exist between risk management practices and rice milling output.

Also, ten socio-economic variables (sex, educational qualification, age, household size, ownership of mill, experience, size of mill, off business activities, milling output and perceived risk sources) were identified as the independent variables in the study. Risk management

practices namely, enterprise insurance, diversification of enterprise, diversification of income sources, cooperative marketing and hedging were also identified and used as dependent variables for this research. Since the data was gathered by means of an ordinal scale, a binomial logistic regression was performed to ascertain the consequences of the selected independent variables on the utilization of risk management practices. The estimated values of the variables were used as test for the effect of the independent variables on the dependent variables. Five of the ten independent variables (education, household size, milling capacity, off business activities and respondents perception of risk sources) were found to have positively contributed significantly to the utilization of risk management practices in the study area.

The implication of the findings are that rice millers require a level of education and orientation in enterprise management to enable them overcome the negative effect of risk in business Furthermore, most millers preferred diversification of enterprise to formal insurance and other risk management practices, there is need for the government and other relevant stakeholders to provide the enabling environment for the growth and development of diverse enterprises.

COMPETING INTERESTS

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