Journal of Sustainable Development in Africa (Volume 22, No.4, 2020)
ISSN: 1520-5509
Clarion University of Pennsylvania, Clarion, Pennsylvania

RISK SITUATIONS AND POVERTY MANAGEMENT STRATEGIES AMONG RICE FARMERS IN NIGER STATE, NIGERIA

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ABSTRACT

Nigeria is currently the highest rice producer in West Africa, producing an average of 3.2 million tons of paddy rice per annum; nevertheless, there is a wide gap between local supply and the ever-increasing demand for rice owing to various risk situations facing the farmers. This paper examined the poverty management strategies vis a vis the poverty status of rice farmers towards mitigating risks. Primary data along with a multistage sampling procedure was used to select respondents for this study. In all, 377 rice farmers were randomly selected for the study. Data were analysed using the Likert scale and the Tobit regression model. The agricultural risk-management strategy and poverty status of the respondents were negatively and significantly related, meaning that as agricultural risk-management strategies increases, the risk situations of rice farmers decreases which leads to decrease in the poverty status of the respondents' in the study area. The study suggests support to rice farmers in the study area with eco-friendly farm inputs and engaging them on contract farming and extension advice.

Keywords: Risk Situation, Poverty, Management Strategies, Rice Farmers, Sustainability

INTRODUCTION

Agriculture plays an important role in the development of Nigerian economy. It employs about 70 per cent of the labour force and contributes about 41 per cent to the Gross Domestic Product (GDP) (World Bank, 2015). In Nigeria, farmers are poor and live in the rural areas and are characterized by low income, large family size, and lack of formal education, low savings and investment, lack of access to credit facilities and use crude farm production technologies (Olayide *et al.,* 2014).
Rice, (*Oryza sativa, L*) plays a vital role as a staple food in the diet of about 168 million Nigerians (Daramola, 2005). Rice production in Nigeria is dominated by smallholder farmers who use traditional methods that are characterized with problems of low productivity. Although per capita poverty rates in Nigeria declined by 10 percentage points, from 46.0percent in 2004 to 35.6 percent in 2011 and 36.1 percent in 2013, The reduction in the poverty rate was not commensurate with the rapid growth in the gross domestic product (GDP) of the country (World Bank, 2016).

Poverty remains widespread within farmers in Nigeria. This is no longer a controversial issue. What is controversial is the choice of appropriate risk management strategies for poverty reduction (Oyemomi, 2003). Despite the huge investments and numerous programmes embarked upon by the Nigerian government and developmental agencies over the years to increase rice production in the country and improve the livelihood of the farmers, the average Nigerian rice farmer remains poor. The deprivations experienced by the farmers are more than just income poverty. All farmers are prone to a wide variety of risks. Some of these risks affect their well-being in the most direct manner: illness, accident, and death. Others affect their ability to support and feed themselves, either temporarily - unemployment, crop failure, loss of property - or permanently - disability, business failure, skill obsolescence (Fafchamps, 2014). According to (Oladimeji *et al*. (2019), most agricultural decisions are taken in the environment of risks and uncertainty. The decision that a farmers make now can affect their production later. Farmers are not sure of weather, government policies, and new changes in technology - factors which make it difficult for them to predict the future with certainty. Farmers are unable to take actions which will move them away from poverty because they are poor. Thus the vicious circle of poverty takes many forms. One key element in many versions of the risk management in any country or environment is risk aversion. If poor people are risk-averse to the extent that they are unwilling to invest in the acquisition of modern assets just because it involves taking risks, they will remain poor. Thus the willingness to climb the ladders out of poverty is a process of investment in physical, human and social capital-being which is confined to those who are economically secure and in possession of sufficient defences against risk (Mosley and Verschoor, 2016).

"Farming itself is a risky business". Farmers live with risks and make decisions every day that affect their farming operations. Many of the factors that affect the decisions that farmers make cannot be predicted with 100 percent accuracy such as change in weather conditions, change in prices at the time of harvest, unavailability of hired labour at peak times, unreliability of machinery and equipment when most needed, draught which can results to animals death and government policy which can change overnight (Oladimeji *et al*., 2019). All of these changes are examples of the risks that farmers face in the process of farm operation. All of these risks affect their farm profitability. While farmers have always faced risk, farming has over the years, as a result of market

income to fluctuate unpredictably and these are ultimately great sources of risk to production activities of the farmers. The crop production activities which are largely rain-fed and irrigated would be largely affected if the variation in the rainfall distributions is either too high or low. An agricultural enterprise, with particular reference to rice production is one of the riskiest businesses in Nigeria. Higher profits are usually linked with higher risks. Risky and potentially profitable situations need to be managed as carefully as possible. Farmers need to have a good understanding of the farming environment and be skilled at managing risk. Paddy rice production is also a large agricultural contributor of greenhouse gas (GHG) emissions. Rice is a major source of agricultural methane (CH4) and nitrous oxide (N2O), accounting for 19 percent of global CH4 emissions and 11 percent of global agricultural N2O emissions (United States Environmental Protection Agency, 2006; Smith *et al*., 2007).

Statement of the Problem

There is a general belief that farmers are reluctant to modifications in their production, financial and marketing practices as a result of their risk aversion behaviour. The concern of every farmer is the awareness of presence of risk in farming activities. This is apparent due to the fact that they depend upon it for their livelihoods (National Programme for Food Security (NPFS), 2006). Variation in climatic conditions, amount of rainfall, incidence of pests and diseases, crop failure, fire outbreak, price fluctuations, unstable government policies, farmer's ill-health etc., cause farm income to fluctuate unpredictably and these are ultimately great sources of risk to production activities of the farmers(Nmadu and Peter, 2010). This is because the production environments as well as marketing prospects are fraught with imperfect knowledge and the vagaries of nature. The resultant effect is farmers increase level of poverty. In sum, the issue of sustainable production and productivity becomes a matter of concern. This study attempts to describe the various risk situations faced by rice farmers and also asses the relationship between their risk management strategies and poverty status for sustainable productivity.

METHODOLOGY

The Study Area

The study area is Niger state of Nigeria, with special focus on rice farmers in the State. It lies between latitudes 8^0 to 11^0:30^0 North and longitude 03^0:30^0 to 07^0:40^0 East, with total land area of 76,363 square kilometres with a population of 3,950,249 (NPC,2006) and exhibits a tropical climate of averagely high temperature and relative humidity. The State shares boundary with six states including FCT. Namely, Zamfara to the North, Kebbi to the West, Kogi to the South, Kwara to the South West, Kaduna to the North East and FCT to the South East. It also has an International Boundary with the Republic of Benin along Agwara and Borgu LGAs to the North West.

There are two distinct seasons, namely, the rainy season, which lasts from March/April to October/November, and the dry season, which lasts from October/November till March/April. The temperature is relatively high during the dry season with mean of 32°C. The harmattan, brought in by the north-easterly winds from December - February, has ameliorating effects on the dry season. Low temperatures are experienced during the rain between July and August when the temperatures could be as low as 24°C. The distribution of rainfall varies from about 1100 mm to about 1600 mm. The type of vegetation is Guinea

savannah. The natural resource of the region includes land, water, mineral, forest and agricultural resources, through which a wide range of agricultural products, are obtained. The state is a notable producer of food crops such as yam, rice, maize and sugarcane. It is also a notable producer of melon in the country. Tree crops such as cashew, mango and coconut also grow well in the state. Other crops it produces are cassava, millet, sweet potatoes and beans. The livestock resources include goats, poultry, sheep and cows which are reared on free range by small holder farmers. The state also has the potentials for fisheries development. The state consists of 25 Local Government Area with three major ethnic groups (Nupe, Gbagyi, and Hausa) and three Agricultural zones namely I, II and III (NAMDA, 2015) with their component Local Governmesnt Areas as follows: (i) Zone I: Consist of Agaie, Bida, Edati, Gbako, Katcha, Lapai, Lavun, Mokwa. (ii) Zone II: consist of Bosso, Chanchaga, Gurara, Munya, Paikoro, Rafi, Shiroro, Suleja, Tafa. (iii) Zone III: consist of Agwara, Borgu, Kontagora, Magama, Mariga, Rijau, Wushishi Mashegu

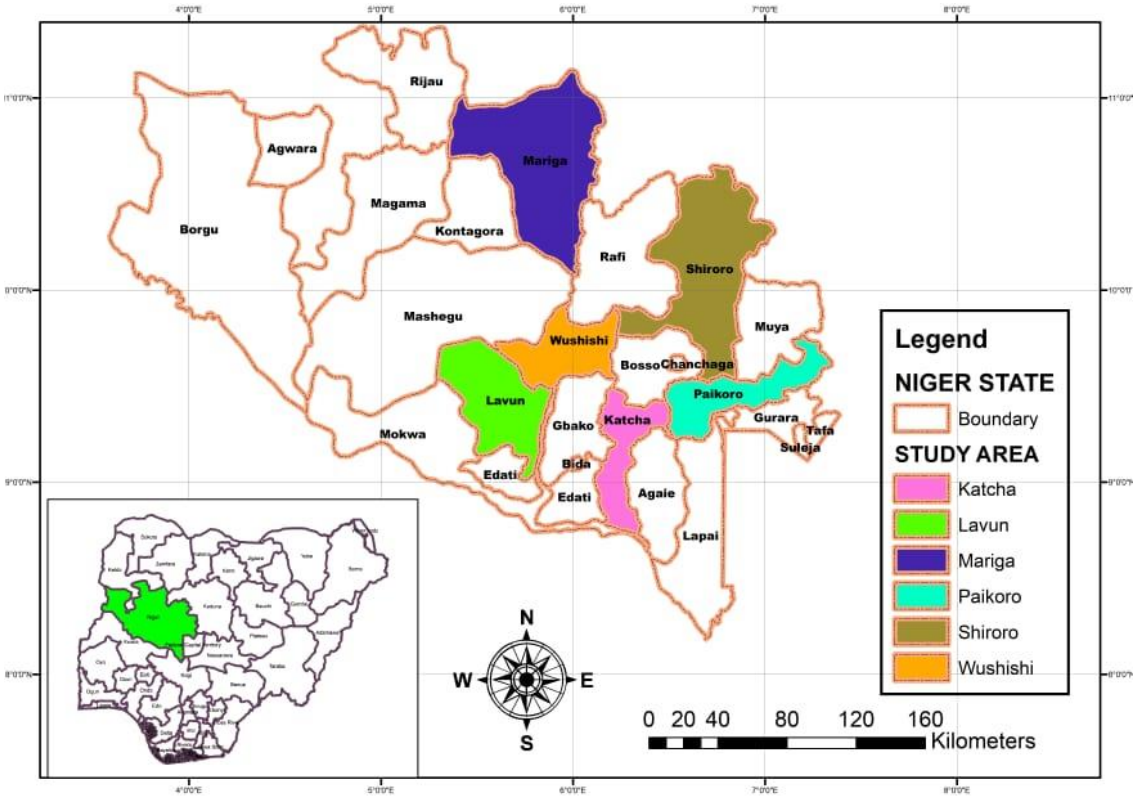

Figure: **1**: Map of Niger State showing sampling areas

Sampling Procedure and Sample Size

A multistage sampling procedure was used to select respondents for this study. The first stage involved purposive selection of zone I, II and III for the study because all the zones constitute rice farmers. Secondly, a simple random sampling was employed through the use of card method in selecting two (2) Local Government Areas from each zone. Thirdly, out of six Local Government selected in all, (5) villages were randomly selected from each Local Government Area. Areas that had no participants were not included in the sampling technique in order to have a wider coverage of the real respondents and which gave a total of thirty (30) villages. Finally, a Slovin's formula for calculating sample size based on the assumption of 5% expected margins of error, 95% confidence interval and applying the finite population correction factor. The formula is expressed as follows:

$$n_0 = \frac{N}{1+N(e^2)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 1$$

Where: n_0 is the sample size without considering the finite population correction factor; e = 0.05; N = total number of observations.

Hence;

$$n_0 = \frac{N}{1+N(e^2)} ., n_0 = \frac{1885}{1+1885(0.05^2)}, n_0 = \frac{1885}{1+1885(0.0025)}$$

$$n_0 = \frac{1885}{1+4.7125}, n_0 = \frac{1885}{5.7125}, n_0 = 330$$

Therefore: $\frac{330}{1885} * 100 = 18\%$

Eighteen percent (18%) of the sample frame (1885) was used as the sample size. In all, 377 rice farmers were randomly selected.

Table 1: Sample Frame and Sample Size of Rice farmers

Selected Zones (Purposive)	Selected LGAs (Random)	Selected Villages (Random)	Participants (sample frame)	Participants (18%) (sample size)
Zone I	Katcha	.Essa	49	9
		Edotsu Bakeko	69	12
		Sidi-saba	57	10
		Dzwafu	24	40
			83	15
	Lavun	Batati	76	14
		Doko	33	6
		Gaba	69	12
		Jima	42	8
		Kutigi	54	10
Zone II	Paikoro	Adanu	37	7
		Chimbi	61	11
		Gwam	43	8
		Ishan	88	16
		Jere	79	14
	Shiroro	Fuka	35	6
		Gini	44	8
		Daza	81	15
		Beni	71	13
		Guni	49	9
Zone III	Wushishi	Kwata	57	10
		Barwa	78	14
		Maito	64	12
		Kodo	98	18
		Akare	44	8
	Mariga	Igwam	61	11
		Bobi	65	12
		Bangi	94	17
		Inkwai	83	15
		Beri	97	17
Total 3	6	30	1885	377

Source: Survey, 2018

Method of Data Collection

Primary data was used for this study. The data was collected for the 2019 cropping season during the rice harvesting period with the use of structured questionnaire. The questionnaires were administered by trained enumerators. Information was collected on: (a) rice farmer's socio-economic characteristics such as gender, age, household size, farming experience, educational level, farm size, extension contact, membership of cooperatives, amount of credit received; (b) types of risks such as production, marketing, financial, human and institutional risks; (c) risk-management strategies adopted. Other materials were sourced from the Niger State Agricultural and Mechanisation Development Authority (NAMDA) office.

METHOD OF DATA ANALYSIS

The Tobit regression model was used to assess how the rice farmers' management strategies affect their poverty status. The Tobit regression, a hybrid of the discrete and continuous dependent variables was used to determine the effect of the explanatory variables on the probability of being poor. The empirical model is specified as follows:

$Y_i = 0$ if $Y^*_i < 0$

Yi = Y* i if Y* i>= 0

$Y^*_i = P_0X_0+P_1X_1+P_2X_2+P_3X_3+P_4X_4+P_5X_5+P_6X_6+$

$B_7X_7+P_8X_8+P_9X_9+P_{10}X_{10}+P_{11}X_{11}$ + **ei** .....(2)

Where:

Y_i = Poverty gap

*Yi**= Unobserved poverty severity ([(Z-/i)/Zj)

Z = Poverty line

Ii= Mean per capita household income

ei= Truncated error term

P*0* = Intercept term

Pi.-Pn = Slope coefficients i = *1, 2... 11*

$^{x}u^{=}$ Age of rice farmer

$^{x}2i^{=}$ Farming experience in rice production

x_{3i} = Gender of household head

x_{4i} = Household size

x_{5i} = Dependency ratio

x_{6i} = Educational level

x_{7i} = Number of contact with extension agent

x_{8i} = Membership of cooperative

^{x}ioi = Amount of credit obtained

x_{in} = Off-farm income

2. The likert scale was used to describe the various risk situations faced by rice farmers. The widely used Likert's scale was used due to its suitability in measuring an individual's attitude as established by Bhattacharya (1993). The responses were measured on a 5-point scale. Strong disagreement (score of 1) implies the utilization of the risk management tool in question (risk aversion). On the other hand, strong agreement (score of 5) indicates a risk-taking attitude. In between the two extremes, disagreement (score of 2), undecided/neutral (Score of 3) and agreement (score of 4) are inclusive as alternative responses. Thus, a lower total for the respondent is then hypothesized to correspond to higher degree of risk aversion.

RESULTS AND DISCUSSIONS

Table 2: Effects of Management Strategies on Farmer's Poverty Status

Poverty status	**Coef.**	**Std. Err.**	**Z**	**dy/dx**
Sharing in crops	0.0018	0.0108	0.17	0.0003
Contract farming	-0.6362	0.1497	-4.25***	-0.099
Spread of sales	0.0730	0.1086	0.67	0.011
Financial diversifying investment	1.16E-08	1.8E-07	0.06	1.8E-09
Non-farm employment	0.0496	0.0244	2.04**	0.008
Risk management training	0.0087	0.0138	0.63	0.001
Production diversification	-0.0971	0.0493	-1.97*	0.015
_cons	1.4390	0.6556	2.2**	
Log likelihood	-162.175			
LR chi2(7)	38.92			
Pseudo R2	0.1071			
Prob>chi2	0.000			
Marginal effects after logit				
y= effects (predict)	0.808			

***Significant at 1% level **Significant at 5% level *Significant at 10% level

The result in Table 2 revealed that engaging in contract farming is negative and significant ($p < 0.01$). This implies that, an increase in contract farming as risk management strategy reduce the probability of been poor. Engaging in contract farming improved productivity in the contracted crop and could spread to other crops, resulting in an additional increase in income, or, if the crops are for home consumption, improved household food security. The marginal effect of 0.099 shows that a unit increase in contract farming reduces the probability of been poor by 9.9%. This implies that farmers that participate in this aspect of contract farming are likely to be better off due to the additional income from their involvement in these activities. The additional income has been found to reduce poverty levels through its positive contribution to welfare indicator. This is good for sustainable development because contract farming ensures farmers education and awareness on efficient utilisation and access to good inputs not detrimental to the environment. It also encourages adoption of environmentally safe use of pesticides by farmers as they have access to extension advice. Okpiaifo *et al*. (2020) showed that food safety and health are

the most preferred sustainable rice platform sustainability attributes amongst Nigerian rice consumers and that these are robust across different dimensions such as education level, markets, and attitudes toward the environment. Since food safety generates the most concern among the respondents, agents within the rice supply chain should prioritize producing the rice in the safest way possible, for instance by educating producers about the proper use of agrochemicals, which will require renovating the efforts of agricultural extension and the use of technology to deliver information to the producers.

Similarly, the coefficient of non-farm employment was positive and significant at ($p < 0.05$) level. Which implies that, an increase in non-farm employment as risk management strategy among rice farmers will lead to increase in the probability of becoming poor by 0.8% in the study area. Although, this finding is at variance with the *a priori* expectation where increase in non-farm activities should reduce the poverty level. This finding is at variance with the findings of Oladimeji, Abdulsalam, Damisa, and Omokore, (2015) who asserted additional income as an important determinant of poverty and reported that an increase in off farm activities will lead to extra household income which could reduce the poverty level of the farmers. Furthermore, the coefficient of productions diversification was found to be negative and significant ($p< 0.10$) level. This implies that, an increase in risk management strategy among rice farmers will lead to reduce the probability of becoming poor by 1.5%. Production diversification reduces pressure on the environment and contributes positively to sustainable development.

Table 3: Risk Situation of Rice Farmers

Risk situation of Rice Farmers	SA	A	U	D	SD	WS	Mean	St.Dev	Decision
Supply of inputs not in time	550	672	39	0	86	1347	3.57	1.48	A
High Prices of inputs	450	752	45	0	84	1331	3.53	1.44	A
Fluctuation in product prices	350	708	87	14	94	1253	3.32	1.46	U
Natural disasters (flood, calamities)	545	416	174	36	88	1367	3.62	1.52	A
Rice disease (Pest etc.)	425	440	99	56	121	1456	3.86	1.59	A
Lack of information sources	410	380	150	50	125	1115	2.95	1.59	U
Drying of river and underground water	545	240	216	44	114	1159	3.07	1.61	U
Infrastructure	380	420	129	64	121	1434	3.80	1.57	A
Exploitation from middlemen	430	500	105	36	113	1571	4.16	1.57	A
Inadequate extension services	465	460	168	22	102	1471	3.90	1.54	A
Severe Weather Condition	410	424	186	34	110	1164	3.08	1.54	U
Political unrest (strike)	265	324	186	86	138	999	2.64	1.49	U
Uncertainty about foreign market prices / policy change	555	316	141	34	123	1169	3.10	1.65	U
Excessive rain fall	325	272	237	70	130	867	2.29	1.51	D
Production uncertainty	250	456	183	76	114	1079	2.86	1.46	U
Lack of contract growing	330	396	162	68	124	1080	2.86	1.54	U
Changes in agricultural local Policies	480	348	171	50	112	567	1.50	1.58	D
Lack of farmers cooperatives	320	320	180	86	130	1036	2.74	1.53	U
Lack of keeping farm record	375	348	180	52	129	1345	3.57	1.57	A
Insufficient machinery	370	308	195	38	142	1390	3.68	1.58	A
Market dishonesty	450	292	153	74	126	1095	2.90	1.61	U
Insufficient family labour	305	320	180	114	119	1038	2.75	1.48	U
No supply of private capital	290	340	207	42	114	1450	3.84	1.53	A

NOTE: SA=Strongly agree, A = Agree, U=Undecided, D = Disagree, SD = Strongly disagree =Weighted score

Production risk include rice pests and diseases, high prices of inputs, supply of inputs not in time and no supply of private capital were agreed by the farmers as the major risk affecting farmers production. In overall results, rice pest and disease (Mean =3.86, SD= 1.559) stood out as the major risk affecting the farmers followed by high prices of inputs (Mean =3.53, SD= 1.438) and supply of inputs not in time (Mean =3.73, SD= 1.484) (Table 3). The result shows that farmers rate disease incidence as an important source of risk owing to the fact that disease control through the use of agrochemicals increases the cost of crop production. Rice farmers rate rise in input prices as a source of risk. The consequent effect of inputs not supplied on time and erratic rainfall leads to delay in planting dates and death of plants when dry spells periods are prolonged.

Marketing risk includes high prices of inputs (Mean =3.53, SD=1.438), infrastructure (Mean =3.53, SD=1.568), exploitation from middleman (Mean =3.53, SD=1.438) and fluctuation in product prices (Mean =4.16, SD=1.574) were agreed by the farmers as the major marketing risk. It can be seen from the Table 3 that farmers perceive high price of inputs as an important source of risk. Agricultural commodities must move from the farms where they are grown to the retail outlets where they are

bought. Owing to the bulky nature of the commodity, bigger trucks are required, but the cost associated with such transportation has a negative bearing on the profitability of rice production and farmers cannot afford to hire trucks to transport the rice commodity to more lucrative and high value markets.

Again, the result shows that, farmer's rate output loss due to inadequate storage (infrastructure) as a source of risk. Due to lack of storage facilities, most smallholder producers are keen to sell produce almost immediately after harvest in order to ease congestion, leading them to sell their produce at lower prices (Wilson *et al.*, 1995). Financial risk includes lack of keeping farm record (Mean =3.57, SD= 1.567). No supply of private capital (Mean =3.73, SD= 1.484). A plausible explanation is that farmers ranked difficulty in securing loans due to high interest rates as a source of risk. The confidence which farmers could have gained to invest in production through insurance policy to cushion their financial position in case of "bad" happening might be lacked (Harwood *et al*., 1999). In specific terms however, excessive rainfall and changes in agricultural local policies seemed to be of least importance in the study area.

CONCLUSION

The study identified risk situations faced by rice farmers as: high input prices, inadequate supply of inputs, exploitation from middlemen, lack of extension services, pests and diseases, natural disasters, lack of farm records, and lack of capital. The study also revealed that contract farming and production diversification was negative and significant ($p < 0.01$). This implies that, an increase in contract farming and production diversification as risk management strategy reduces the probability of being poor among rice farmers in the study area. In general, the agricultural risk-management strategy and poverty status of the respondents were negatively and significantly related, meaning that as agricultural risk-management strategies increases, the risk situations of rice farmers decreases which leads to decrease in the poverty status of the respondents in the study area. For sustainable production of rice in the study area, the three tiers of government at the local, state and the federal level as well as non-governmental organizations should support farmers and farmer organizations with eco-friendly inputs, and extension advice for overall development.

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