Assessment of the Risk Management Strategies Among Arable Crop Farmers in Owerri West Local Government Area of Imo State, Nigeria.

Abstract

The assessment of the risk management strategies among arable crop farmers in Owerri West Local Government Area of Imo State, Nigeria was the main focus of this study. The risk in arable crop production and the factors that influence risk in arable crop production in the study area were specifically estimated. Primary data used for the study were collected with the aid of well-structured questionnaire from eighty four farmers in the study area who were selected using random sampling technique. Data were analyzed using tables, percentages, mean, frequency distribution, Spiegel and Meddis model and the ordinary least squares multiple regressions technique. The result revealed that majority of the arable crop farmers (52.4%) were females. The average age and household size was 54 years and 5 persons respectively. Majority of the farmers (63.1%) attained at least secondary school education and had an average farming experience of 14 years. Majority of the farmers (52.4%) did not belong to any farmers' cooperative, about 69.05% of the households had diversified source of income, and the mean farm size was 0.44 hectares. the mean farm income of the respondents was ₦36,964 while the mean non-farm income of the respondents was ₦35,166. Educational level, age, farming experience, farm size, household size and farm income were the factors influencing the estimated output of the farmers due to the prevalence of risk in arable crop production in the study recommended that; the farmers should be encouraged to continuously adopt the various mitigating factors and adaptations in order to ensure optimum crops yield and to reduce the effect of risk. The study also advocated the continuous education of arable crop farmers in the area so as to increase their capacity to deal with risk on their farms.

Keywords: Assessment, Risk, Management strategies, Arable crops, Cassava, Farmers

INTRODUCTION

Arable crops are staple agricultural food crops which provide the required nutrients for man and livestock. Within the agricultural sector itself, the crops sub-sector is the largest, with arable crop production dominating about 30 percent of overall GDP. The arable crop sub-sector is particularly important not only because of the size and employment generation potentials, but also because it supplies food and therefore has the potential for dampening the rate of inflation since the price of food accounts for about 60 percent of the overall rate of inflation (Central Bank, 2006).

Arable crops are important food items to the livelihood of millions of people providing nourishment and generating income. However, Nigeria produces a wide variety of arable crops most of which are consumed as food, the major food crops include rice, maize, cassava, yam, sorghum, millet and cowpea and the minor ones are cocoyam, melon, sweet potato and plantain. Other arable crops which double as industrial and food crops to some extent also include groundnut, cotton and beni-seed (Akinyosoye, 2005).

Cassava (*Manihotesculenta*) is not only a very important staple food for urban and rural populace in Nigeria, but is also part and parcel of the rural livelihoods of the people. With an estimated annual production of 43.4 million metric tonnes in 2007 which increased by 2.8% to 44.6 million metric tonnes in 2008 (FAO, 2009) Nigeria leads the rest of the world in the production of this staple. Whereas it is usual to associate the reported increasing trends to introduction of improved farm management practices, use of high-yield and disease resistant varieties and various development initiative efforts of the Nigerian government (Nyerhovwo, 2004), the trends show that the increase had been accompanied by similar substantial increasing trends in land area cultivated, but marginal growth in yield estimates.

According to Nyerhovwo (2004), among the starch staples, cassava gives a carbohydrate production which is about 40% higher than rice and 25% more than maize with the result that cassava is the cheapest source of calories for both human nutrition and animal feeding. It is processed into various products such as lafu, garri, etc but garri is the most commonly consumed in Nigeria.

There are a number of risks and uncertainties that are associated with food production, which greatly impede the effort of farmers in terms of their agricultural production and productivity.

Risk in agricultural food production is defined as an uncertainty (i.e. imperfect knowledge or predictability) because of randomness. It is regarded as the probability of losses resulting from incomplete control over the processes with which farmers are concerned (OECD, 2000).Risk is an important aspect of the farming business. This is as a result of weather, yields, prices, government policies, global markets, and other factors that can cause wide swings in farm income (Dismukes, 2005). It also refers to variabilities or outcomes, which are measurable in an empirical or quantitative manner (Isik, 2002). These uncertainties are brought about as a result of three main causes: (i) environmental variations causing production and yield uncertainty (ii) price variation causing market uncertainty and (iii) lack of information (Upton, 1996). All these are significant in African agriculture, where unreliable rains and pest and disease outbreaks cause wide variations in resource availability and in crop and livestock yields. Human diseases are frequent, unpredictable and costly to treat. Ill health or injury of a family member at a critical period may cause serious loss of production and income.

Generally there are wide seasonal and unpredictable fluctuations in market prices, while information on alternative technologies or the market situation outside the immediate locality is often lacking. Hence the farmer cannot plan with certainty; his/her decisions are subject to risk. Much of the income of African smallholder farmers is highly vulnerable to drought. Lack of alternatives to rain-fed agriculture, technical non-viability of irrigation in many areas, widespread environmental degradation and poor access to commodity markets have together led to huge losses in income when droughts have struck (World Bank, 2000).

The main objectives of this study were: describe the socio-economic characteristics of arable crop farmers in the study area,

i. estimate the quantity of output gotten due to risk in arable crop production in the study area,
ii. estimate factors that influence risk in arable crop production in the study area.

METHODOLODY

The study was carried out in Owerri-West local government area in Imo State with headquarters at Umuguma. It is located in Owerri Agricultural Zone, in the rain forest zone about 120km North of the Atlantic coast and lies on latitude 4^0 14 North and 6^0 15 North, longitude 6^0 51 East and 8^0 09 East (National geographical journal 2004). Owerri West L.G.A has a population of

250,000 people and an estimated area of 295 square kilometers (NPC, 2006). Owerri-West local government area shares boundaries with Ngor-Okpala local government area in the South, Owerri Municipal council in the East, Mbaitolu local government area in the North and Ohaji/Egbema local government area in the West. Owerri West local government have some significant features like Federal polytechnic which is located at Nekede and Federal University of Technology (FUTO) which is located at Ihiagwa. The local government area has two dominant seasons: rainy and dry season. Rainfall starts between April and October while the dry season starts from November to early March. The average annual rainfall measures up to 2550 mm, the relative mean temperature ranges annually between 24.50 and 25.50 and the humidity varies according to the time of the year (ISADAP, 2000). Food crops grown in the area include cassava, maize, oil palm, yam, plantain and cocoyam. The people also keep animals like goats, pigs, fish, birds, poultry and recently rabbits (NARP, 1998). The Study area was chosen because of its location in the rainforest region and the availability of arable crop farmers.

Data used for the study were primary data which were collected through the use of structured questionnaire. Multi-stage and random sampling techniques were adopted in selecting the respondents for the study. In the first stage, Owerri-West local government area was purposively selected because of the high output of cassava production within the area. In the second stage, six (6) autonomous communities were randomly selected out of the eighteen (18) communities in Owerri-West Local Government Area. In the third stage, two (2) villages were selected randomly from each of the six (6) autonomous communities earlier selected to give a total of 12 villages used for this study. The sampling frame for this study was all the cassava farmers in the 12 selected villages. Random sampling technique was thus used to select 7 farmers from each village which gave a total of 84 farmers used for the study. Data were analyzed using descriptive statistics such as mean, percentage and frequency distribution tables; multiple regression analysis which was implicitly stated as:

The Spiegel and Meddis (1975) model as modified by Ehirim et al., (2006) was used to estimates the estimated quantity of output gotten as a result of risk prevalence. The model is stated as follows:

$$Q_F = \frac{(T - X)Q_T}{T}$$

Where

Q_F = Estimated quantity of cassava output not obtained as a decline due to risk prevalence and non adoption of cassava indigenous farming risk control measures (in Kg).

T = Total number of indigenous agronomic management practices required for a desired output.

X = Number of indigenous agronomic management practices adopted by an i^{th} farmer in cassava production.

Q_T = Estimated quantity of cassava produced by a farmer who is at a free risk status, or the total desired output when all the management practices are adopted (in Kg)

Q_T-Q_F = Quantity loss due to risk prevalence

This implies that the quantity of cassava output not obtained as a decline due to risk prevalence and non adoption of cassava indigenous farming risk control measures that the probability of success of an i^{th} farmer with an X number of agronomic management practices out of a total of T management practices is expressed by:

$$P_{(S)} = \frac{X}{T} \quad \ldots\ldots (2)$$

Where $P_{(S)}$ = probability of success

X = Number of indigenous agronomic management practices adopted by an i^{th} farmer in cassava production.

T = Total number of indigenous agronomic management practices required for a desired output.

The Spiegel and Meddis model applied for an i^{th} farmer's actual output is expressed by:

$$Q_S = P_{(S)}Q_T \quad \ldots\ldots (3)$$

$$Q_F = Q_T - Q_S \quad \ldots\ldots (4)$$

Putting equation 3 in 4, the expected decline in cassava output can be obtained as expressed below:

$$Q_F = (1 - P_{(S)})Q_T \quad \ldots\ldots (5)$$

Again substituting for $P_{(S)}$in equation 5, a modified model for expected decline in output of cassava according to (Ehirim et al., 2006) can be expressed by;

$$Q_F = \frac{(T - X)Q_T}{T} \quad \ldots\ldots (5)$$

Where

Q_S = Actual farmer's output realized by the use of X indigenous agronomic management practices (in Kg)

Q_T = Estimated quantity of cassava produced by a farmer who is at a free risk status, or the total desired output when all the management practices are adopted (in Kg)

Q_F = Estimated quantity of cassava output not obtained as a decline due to risk prevalence and non adoption of cassava indigenous farming risk control measures (in Kg).

$Q_F = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, e)$ ……eqn 1

Where

Q_F = Quantity gotten due to risk prevalence (Kg)

X_1 = Sex (dummy: male = 1, otherwise = 0)

X_2 = Age of farmers (years)

X_3 = Educational level (years)

X_4 = Farming experience (years)

X_5 = Farm size (hectares)

X_6 = Household size (number)

X_7 = Marital status (dummy: married =1; otherwise = 0)

X_8 = Monthly income (₦)

e = Error term

RESULTS AND DISCUSSION

The socio-economic characteristics of the farmers, such as, age, gender, marital status, educational level, major occupation, farming experience, household size etc. were investigated and discussed in this chapter.

Table.1

Variables	Frequency	Percentage
Gender		
Male	40	47.6
Female	44	52.4
Age		
36-45	14	16.7
46-55	38	45.24
56-65	23	27.38
66-75	9	10.7
Mean	54	
Marital Status		
Single	3	3.57
Married	61	72.62
Widowed	20	23.81
Household Size (number)		
1-4	43	51.19
5-8	36	42.86
9-12	5	5.95

Mean	5	
Educational Qualification (Years)		
No formal education (0)	1	1.2
Primary education (1-6)	16	19.05
Secondary education (7-12)	53	63.1
Tertiary education (>12)	14	16.7
Mean	11 years	
Farming experience		
1-10	37	44.05
11-20	37	44.05
21-30	9	10.7
31-40	1	1.2
Mean	14	
Cooperative Membership		
Yes	40	47.6
No	44	52.4
Occupation		
Farming	25	30.95
Trading	29	34.53
Civil Service	24	28.57
Artisan	5	5.95
Farm Size(Ha)		
0.01-0.50	60	71.43
0.51-1.0	18	21.43
1.01-1.5	2	2.38
1.51-2.0	3	3.57
2.01-2.5	1	1.19
Mean	0.44	
Farm Income		
1000-100000	80	95.24
101000-200000	3	3.57
201000-300000	-	-
301000-400000	-	-
401000-500000	1	1.2
Mean	₦39,964	
Non-Farm Income		
0	1	1.2
1000-50000	71	84.5
51000-100000	11	13.1
101000-150000	1	1.2
Mean	₦35,166	

Source: Field survey data, 2015

Result in Table 1 shows that majority of the arable crop farmers, (about 52 percent) were females. This implies that women dominate in the production of arable crops, especially cassava in the study area. This finding is supported by the report of CTA (2007) that women undertake almost ninety percent of agricultural production. This result is s pointer to the necessity to avail women access to resource that could help the women in mitigating risk on their farms. About 73

243 percent of the farmers were between the ages of 4 to 55 years. The mean age was 54 years. The
244 implication is that farmers were in their active stage of life and still capable of producing the
245 needed quantities of output. This agrees with the findings of Okunade *et al*. (2005) that Cassava
246 farmers are mostly between 36 and 56 years of age. The farmers at this age should have the basic
247 skills and experience to implement measures that will reduce the risk their farms are exposed.

248 An over whelming majority of the respondents (about 73 percent) of the respondents were
249 married. The high percentage of married farmers conforms to Jibowo (1992) who reported that
250 majority of the adult population of a society consists of married people. The married farmers
251 may be better endowed with resources which they may employ on their farms to assist in
252 mitigating the effects of risk. About 52 percent of the farmers in the study area had household
253 sizes of between 1-4 persons. The mean household size was 5 persons. The fairly large family
254 size may be advantageous as it may be a source of labour supply for agricultural production.
255 Furthermore, household members may also be knowledgeable in various risk prevention and
256 mitigation practices which may be useful on the farm. All the farmers in the study area attained
257 one level of educational qualification or the other, with majority (63.1 percent) of them attaining
258 secondary school education. This implies that the respondents are at least aware of the
259 implications of not adopting the various risk mitigation practices on their farms. They should
260 also be in better position to take management decisions that will positively influence output. The
261 mean for years of farming experience was 14 years, and about 55 percent of the respondents
262 farming experience of between 11-30 years. The experience of the farmers is important in
263 tackling risk and reducing loss due to elements of risk on the farm. This is especially so for these
264 farmers who practice rain-fed agriculture and whose farms are exposed to the vagaries of the
265 weather. Nwaru (2004) in Ibeagwa (2011) noted that the number of years of experience of the
266 farmer may give an indication of practical knowledge he has acquired on how he could
267 overcome certain inherent farm production challenges. Majority of the farmers (about 52
268 percent) did not belong to any farmers' cooperative. Just about 48 percent were members of
269 cooperatives. Farmers membership of cooperatives gives them the advantage of enjoying
270 economies of scale which is as a result of the collective bargaining power which members of
271 enjoy. Zeuli (2002) in Awotide et al (2015) also noted that cooperative membership also helps
272 farmers mitigate risks and uncertainties, and this helps in improving their efficiencies. The
273 analysis of the major occupation of the respondents showed that 34.53 percent of them were

majorly traders, 28.57 percent were civil servants, 5.95 percent were artisan, while only 30.95 percent were full time farmers. This implies that 69.05 percent of the respondents have been able to diversified their source of income to enable them meet up with their financial responsibilities. The income from nonfarm sources may be a source of household sustenance for these farmers in the situation of crop failure. The nonfarm income may also enable the farmers in their adoption of costly risk mitigation measures. Majority of the farmers, (about 71 percent) cultivated between O.01-0.5 hectares of farm land. The mean farm size was 0.44 hectares. The small farm sizes of these respondents may it make easier for them to manage and execute risk reduction techniques that could help them realize optimum yield. An over whelming majority of the farmers (about 95 percent) earned monthly farm income of between ₦1,000-100,000. 3.57 percent earned between ₦101,000 to 200,000 while the remaining 1.2 percent earned between ₦401,000 to 500,000. The mean farm income of the respondents was ₦36,964. The result indicates that the farmers earn very low income from their farming activities. This low farm income may also make it difficult for these farmers to carry out any effective risk mitigation action which may reduce losses and bolster output and income. 84.5 percent of the respondents had monthly non-farm income between ₦1,000-50,000, 13.1 percent earned between ₦51,000-100,000, 1.2 percent had non-farm income of between ₦101,000-150,000 while just 1.2 percent did not earn any non-farm income. The mean non-farm income of the respondents was ₦35,166.

Risks in Arable Crop Production

The value of estimated output due to the prevalence of risk is presented in Table 2

Table 2: Estimated crop out due to the prevalence of risk

Quantity due to risk prevalence (kg)	Frequency	Percentage
0-3499	64	75.29
3500-6999	13	15.29
7000-10999	4	4.71
11000-14499	1	1.18
14500-17999	2	2.36
18000-21499	1	1.18
Total	85	100.01
Mean	3155.506	

Source: Field survey, 2015.

The result shows that the estimated output due to prevalence of risk was quite low for majority of the farmers. About 75 percent of the farmers had estimated output of between 0 -3499kg. The mean estimated output due to risk was 3155kg. The exposure of arable crops on the farm to various forms of risks and the inability of farmers to adopt risks mitigating measures is responsible for the very low output recorded by farmers in developing countries, especially those which still practice rain-fed agriculture. The vagaries of the weather are becoming much more pronounced with the phenomenon of climate change and this has further aggravated an already dire situation. The low income realized from the meager output does not do much in sustaining the household or leaving the extra for saving and investment in risks mitigating activities on the farm. As a result of this, the farmers find themselves in a cycle of high risks farming leading to low output which then leads to low income.

Factors that Influence estimated crop output due to the prevalence of risk

The factors influencing estimated crop output due to the prevalence of risk were estimated using the ordinary least squares multiple regression technique. The result presented in Table 3.

The Double-log functional form provided the best fit and was chosen as the lead equation. The The R^2 value of 0.6148 indicates that about 61.48 percent of the variations in estimated crop output of arable crop farmers were accounted for by the independent variables fitted in the model. F-Value tests was significant at 1% level of significance, the t-ratios/statistics tests the statistical significance of the independent variables.

Table 3: Factors that Influence estimated quantity due to risk in arable crop production

Variables	Linear	Exponential	Semilog	Double log+
Sex	442.9034	.244397	531.6361	.2207126
	(0.72)	(1.67)	(0.78)	(1.56)
Education	-13.87537	.0023216	4371.549	-.1425023
	(-0.12)	(2.08)**	(1.60)	(-2.25)**
Age	93.17606	.0036258	-161.977	-.0722908
	(2.09)**	(0.34)	(-1.99)*	(-2.27)**
Experience	-20.25686	.0120311	-621.0936	.1026045
	(-2.36)**	(0.90)	(-0.65)	(2.53)**
Farmsize	-3908.786	1.21085	005.225	.6537068
	(-4.97)***	(6.15)***	(4.69)****	(7.19)****
Hhs	-34.22801	-.0231352	-108.6714	-.0605761
	(-0.19)	(-2.54)**	(-2.13)**	(-2.34)**
Matstatus	1109.547	-.1105012	1735.03	.0208678
	(0.70)	(-0.30)	(0.94)	(0.05)
Farm income	-.0208002	2.78e-06	2002.387	.3141112
	(-4.49)***	(2.53)**	(3.19)***	(2.37)**
Cooperative	-316.0596	.0580997	-461.4952	.0185049
	(-0.51)	(0.39)	(-0.66)	(0.13)
Occupation	-244.6936	.0269968	-249.32	.0244564
	(-0.44)	(0.20)	(-0.40)	(0.19)
Constant	-4462.758	6.565193	-31629.01	5.499925
	(-1.74)*	(10.81)***	(-2.53)**	(2.10)**
R^2	0.6107	0.6115	0.4963	0.6148
Adj R^2	0.5566	0.5552	0.4273	0.5597
F-Statistics	11.29***	10.86***	7.19***	11.17***

*, ** and *** indicate 10%, 5% and 1% level of significance.

Source: Field survey data, 2015

Educational level(X_2), Age(X_3) and Household size(X_6) were found to be negatively or inversely related to risk in arable crop production in the study area and were statistically significant at 5% level of significance. This implies that an increase in the level of education, age and household size will lead to a corresponding decrease in the risk of the farmers. The implications of this finding is that the more educated the farmer, the higher his capacity to adopt technologies and measure that will mitigate risks on his farm. The educated farmer is also better positioned to seize the opportunity offered by extension services and other stakeholders in agriculture who provide information and introduce new and better farming practices. Information on issues of the weather in the print or electronic media could be easily accessed by the educated. It is also

possible for the educated farmer to be more aware of the predisposing factors that enhance the level of risk on the farm and thereby eradicate or mitigate their effects.

The relationship between age and risk shows that the older the farmer the lower his output due to prevalence of risk. This may be attributed to seriousness and attention which older and more matured farmers give to their farming business. It is highly likely that older farmers pay keen attention and have a very sharp ability of observing their environment. These aid them to detect on time issues that may introduce the elements of risk and uncertainty in their farms.

The coefficient of household size was negatively related to the quantity of output realized as a result of the prevalence of risk. This implies that larger household sizes tend to have less effect of risk on their output. This may be attributed to the fact that every member of the farm household is usually involved in the activities of the farm from the oldest to the youngest. Useful information and skills acquired as it regards risk management on the farm are usually shared with other household members and this helps to improve the management of the farm firm and improve output.

Farm size(X_5), Farming experience(X_4) and Farm income(X_8) were found to be positively or directly related to risk in arable crop production in the study area and was statistically significant at 1%, 5% and 5% level of significance respectively. This implies that an increase in the farm size, farming experience and farm income will lead to a corresponding increase in the risk of the farmers.

The positive relationship between farm size and output due to risk may be attributed to the inability of the farmers to adopt measure that would be effective enough to mitigate risk on their farms. These low resource endowed smallholder farmer in most cases may not afford the technologies that may be required to reduce risk. This situation becomes more serious as the farm size increases. Farmers with larger farm size may therefore suffer losses more due to their inability to adequately protect their farms from the factors that introduce risk.

The positive relationship between farming experience and output due to risk does not agree with a proiri expectations. The relationship may however be explained by alluding to the over dependence of the more experienced farmers on their wealth of experience which may not be in tandem with present day realities as it pertains to risk and its predisposing factors. The

experienced farmers may also be reluctant to adopt newer technologies which could prove more effective in mitigating risks on their farms.

The positive relationship between farm income and output due to the prevalence of risk also does not agree with a proiri expectations. However, it may be that the low farm incomes of the farmers does not prove an incentive enough to encourage them embark on risk mitigating activities on their farms. Furthermore, the large number of individuals who consider farming as a minor occupation may be responsible for this relationship. Such individuals may tend to pay more attention to their major occupation to the detriment of their farms.

Sex(X_1), marital status(X_7), cooperative membership(X_9) and occupation(X_{10}) were found to be positively or directly related to risk in arable crop production in the study area but was not statistically significant. This implies that an increase or decrease in Sex(X_1), marital status(X_7), cooperative membership(X_9) and occupation(X_{10}) will have no significant influence on the risk of the farmers in the study area.

Conclusion and Recommendation

Based on the findings of the study it is concluded that; the output of arable crop farmers in the study area is highly susceptible to various types of risk. This adversely affects the output of these arable crop farmers, thereby reducing their income and hence their ability to engage risk mitigating measures on their farms. Also, higher educational level and larger household size are valuable in helping the farmers combat the incidences of risk on their farms. Large farm size and farm income are factors that could predispose the farms to the incidences of risk.

In the light of these findings, several recommendations will be made which may be useful for farmers and other related authorities.

1. The farmers should continuously adopt effect and affordable risk mitigating techniques in order to ensure optimum crops yield and to reduce the effect of risk.
2. Government should intensify effort to provide adequate and accessible inputs such as improve seeds, herbicide, farm implements and fertilizers to arable crop farming household heads (active farmers).
3. Government should ensure that research and extension services, input supply and credit arrangements, marketing structures and price system as well as communication and transport

networks are properly put in place. In other words, policy guidelines on infrastructure development and operation should be given much attention by government. This will greatly facilitate food production by reducing risks and uncertainties.

4. Formulating policies that will help to identify, conserve and utilize local food production systems that benefit farmers in rural societies will go a long way in ameliorating the problems due to risks and uncertainties confronting them. Farmers' reaction in managing their farms and in deciding between production alternatives depends on the infrastructure and the economic incentives of the agricultural sector.
5. The continuous education of the farmers especially through adult education programmes will help in equipping them with the right attitude and capacity to eliminate risk disposing factors on their farms.

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