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## 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

**Comment [WU1]:** Abstract is very long and need to be shortened but with description clear.

Abstract 100-150 words to be better

28 **INTRODUCTION**

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

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Needed up to date source

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

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

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

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

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

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

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

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

84

## 85 **METHODOLOGY**

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

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90 250,000 people and an estimated area of 295 square kilometers (NPC, 2006). Owerri-West local  
91 government area shares boundaries with Ngor-Okpala local government area in the South,  
92 Owerri Municipal council in the East, Mbaitolu local government area in the North and  
93 Ohaji/Egbema local government area in the West. Owerri West local government have some  
94 significant features like Federal polytechnic which is located at Nekede and Federal University  
95 of Technology (FUTO) which is located at Ihiagwa. The local government area has two  
96 dominant seasons: rainy and dry season. Rainfall starts between April and October while the dry  
97 season starts from November to early March. The average annual rainfall measures up to 2550  
98 mm, the relative mean temperature ranges annually between 24.50 and 25.50 and the humidity  
99 varies according to the time of the year (ISADAP, 2000). Food crops grown in the area include  
100 cassava, maize, oil palm, yam, plantain and cocoyam. The people also keep animals like goats,  
101 pigs, fish, birds, poultry and recently rabbits (NARP, 1998). The Study area was chosen because  
102 of its location in the rainforest region and the availability of arable crop farmers.

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

115  
116 The Spiegel and Meddis (1975) model as modified by Ehirim et al., (2006) was used to estimates  
117 the estimated quantity of output gotten as a result of risk prevalence. The model is stated  
118 as follows:

$$119 Q_F = \frac{(T - X)Q_T}{T}$$

120

121 Where

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

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

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

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

129  $Q_T - Q_F$  = Quantity loss due to risk prevalence

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

135  $P_{(S)} = \frac{X}{T}$  ..... (2)

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

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

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

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

141  $Q_S = P_{(S)}Q_T$  ..... (3)

142  $Q_F = Q_T - Q_S$  ..... (4)

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

145  $Q_F = (1 - P_{(S)})Q_T$  ..... (5)

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

148  $Q_F = \frac{(T - X)Q_T}{T}$  ..... (5)

149

150 Where

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

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

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

157

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

159 Where

160  $Q_F$  = Quantity gotten due to risk prevalence (Kg)

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

162  $X_2$  = Age of farmers (years)

163  $X_3$  = Educational level (years)

164  $X_4$  = Farming experience (years)

165  $X_5$  = Farm size (hectares)

166  $X_6$  = Household size (number)

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

168  $X_8$  = Monthly income (₦)

169  $e$  = Error term

170

171 **RESULTS AND DISCUSSION**

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

175

176 **Table.1**

177 Variables	Frequency	Percentage
178 <b>Gender</b>		
179 Male	40	47.6
180 Female	44	52.4
181 <b>Age</b>		
182 36-45	14	16.7
183 46-55	38	45.24
184 56-65	23	27.38
185 66-75	9	10.7
186 Mean	54	
187 <b>Marital Status</b>		
188 Single	3	3.57
189 Married	61	72.62
190 Widowed	20	23.81
191 <b>Household Size (number)</b>		
192 1-4	43	51.19
193 5-8	36	42.86
194 9-12	5	5.95

**Comment [WU14]:** Discussion can be make POINT DISCUSSION.

RESULT,,,,,

DISCUSSION.....

195	Mean	5	
196	<b>Educational Qualification (Years)</b>		
197	No formal education (0)	1	1.2
198	Primary education (1-6)	16	19.05
199	Secondary education (7-12)	53	63.1
200	Tertiary education (>12)	14	16.7
201	Mean	11 years	
202	<b>Farming experience</b>		
203	1-10	37	44.05
204	11-20	37	44.05
205	21-30	9	10.7
206	31-40	1	1.2
207	Mean	14	
208	<b>Cooperative Membership</b>		
209	Yes	40	47.6
210	No	44	52.4
211	<b>Occupation</b>		
212	Farming	25	30.95
213	Trading	29	34.53
214	Civil Service	24	28.57
215	Artisan	5	5.95
216	<b>Farm Size(Ha)</b>		
217	0.01-0.50	60	71.43
218	0.51-1.0	18	21.43
219	1.01-1.5	2	2.38
220	1.51-2.0	3	3.57
221	2.01-2.5	1	1.19
222	Mean	0.44	
223	<b>Farm Income</b>		
224	1000-100000	80	95.24
225	101000-200000	3	3.57
226	201000-300000	-	-
227	301000-400000	-	-
228	401000-500000	1	1.2
229	Mean	₦39,964	
230	<b>Non-Farm Income</b>		
231	0	1	1.2
232	1000-50000	71	84.5
233	51000-100000	11	13.1
234	101000-150000	1	1.2
235	Mean	₦35,166	

236 Source: Field survey data, 2015

237  
 238 Result in Table 1 shows that majority of the arable crop farmers, (about 52 percent) were  
 239 females. This implies that women dominate in the production of arable crops, especially cassava  
 240 in the study area. This finding is supported by the report of CTA (2007) that women undertake  
 241 almost ninety percent of agricultural production. This result is a pointer to the necessity to avail  
 242 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

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274 majorly traders, 28.57 percent were civil servants, 5.95 percent were artisan, while only 30.95  
275 percent were full time farmers. This implies that 69.05 percent of the respondents have been able  
276 to diversified their source of income to enable them meet up with their financial responsibilities.  
277 The income from nonfarm sources may be a source of household sustenance for these farmers in  
278 the situation of crop failure. The nonfarm income may also enable the farmers in their adoption  
279 of costly risk mitigation measures. Majority of the farmers, (about 71 percent) cultivated  
280 between 0.01-0.5 hectares of farm land. The mean farm size was 0.44 hectares. The small farm  
281 sizes of these respondents may it make easier for them to manage and execute risk reduction  
282 techniques that could help them realize optimum yield. An over whelming majority of the  
283 farmers (about 95 percent) earned monthly farm income of between ₦1,000-100,000. 3.57  
284 percent earned between ₦101,000 to 200,000 while the remaining 1.2 percent earned between  
285 ₦401,000 to 500,000. The mean farm income of the respondents was ₦36,964. The result  
286 indicates that the farmers earn very low income from their farming activities. This low farm  
287 income may also make it difficult for these farmers to carry out any effective risk mitigation  
288 action which may reduce losses and bolster output and income. 84.5 percent of the respondents  
289 had monthly non-farm income between ₦1,000-50,000, 13.1 percent earned between ₦51,000-  
290 100,000, 1.2 percent had non-farm income of between ₦101,000-150,000 while just 1.2 percent  
291 did not earn any non-farm income. The mean non-farm income of the respondents was ₦35,166.

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306 **Risks in Arable Crop Production**

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

308

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	

309 Source: Field survey, 2015.

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

321

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

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

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

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

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

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

333 Source: Field survey data, 2015

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

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

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

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

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

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

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

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

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

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

### 385 **Conclusion and Recommendation**

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

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

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

**Comment [WU16]:** Recommendation is very long, and many more. So can be cut or shorted

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

404 4. Formulating policies that will help to identify, conserve and utilize local food production  
405 systems that benefit farmers in rural societies will go a long way in ameliorating the  
406 problems due to risks and uncertainties confronting them. Farmers' reaction in managing  
407 their farms and in deciding between production alternatives depends on the infrastructure and  
408 the economic incentives of the agricultural sector.

409 5. The continuous education of the farmers especially through adult education programmes will  
410 help in equipping them with the right attitude and capacity to eliminate risk disposing factors  
411 on their farms.

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