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Attitudes Toward Risk and Coping Responses: The Case of Food Crop Farmers at Agona Duakwa in Agona East District of Ghana

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Abstract Ascertaining the attitude of farmers toward risk is an important first step in understanding their behaviour and coping strategies they normally adopt to mitigate the effects of risk they constantly face within the environment they operate. This study aims at examining risk attitudes of farmers using the Equally Likely Certainty Equivalent with a Purely Hypothetical Risky prospect (ELCEPH), and analyzing coping strategies use by food crop farmers to deal with risk situations at Agona Duakwa in East District in the Central Region of Ghana. Simple random sampling technique was used to select 40 farmers from a sample frame of 100 farmers which was obtained through snow balling. Data was obtained through structured interview schedule with the selected farmers. Descriptive statistics (frequencies and percentages, means and standard deviations) were further used to analyse the data with the help of Statistical Product and Service Solution (SPSS) computer software. The study revealed that majority of food crop farmers are risk-averse. The regression result shows that access to microcredit, income status, age, education and household size are significant determinants of farmer risk attitude. Most food crop farmers use enterprise diversification, geographical diversification, and labour supply for non-farm wage to manage risk of loss in yield; however, the food crop farmers understudied neglect the use of crop insurance and some human and marketing risks coping strategies to deal with risk in their farming business.

Keywords Farmers, Risk Attitudes, Coping Strategies

1. Introduction

The Food and Agricultural Sector Development Policy (FASDEP) provides a framework for improving agribusinesses in order to make them catalysts for rural transformation. The strategy on production and gainful employment to which farming and fishing are the key, seeks among other things to improve public sector delivery programmes, especially intensifying agricultural extension delivery services for the dissemination of innovations and improved technologies of various kinds, and also provide incentives to stimulate the private sector. According to FASDEP, the activities are aimed at increasing and sustaining production for local consumption and export, and expanding employment especially in geographical areas that have high poverty profiles (MOFA, 2003). One would then wonder why Ghana is trapped in the threat of food insecurity. The Food Security Strategy is derived from the country's FASDEP. It aims at increasing domestic food production; ensuring access to food for food deficit households and strengthening

emergency response capabilities. Nevertheless, farmers' attitudes to risk are major determinants of the rate of diffusion of new technologies among the farmers and of the outcome of rural development programmes (Shahabuddin, Mestelman and Feeny, 1986; MANR, 1997; Adejoro 2000). This assertion calls for critical emphasis on the decision making environment within which farmers operate.

The decision environment for most businesses to operate is characterized by uncertainty or the absence of perfect and complete information. Actions are taken in anticipation of future benefits that may not be realized. Thus all decisions contain some element of risk because of the unpredictability of outcomes, which imposes an opportunity cost on the decision-maker (Hill, 1989). According to Adegeye and Dittoh (1985), most agricultural decisions are taken in the environment of risks and uncertainty. Farmers will have to make decisions now, which will affect their production later. The farmers are not sure of changes in range of factors including weather, government policies, and new changes in technology which may make things difficult for them to predict the future with certainty.

Risk and uncertainty impact households' production and consumption decisions. There is strong evidence that poor farm households are risk-averse (Moscardi and de Janvry, 1977; Dillion and Scandizzo, 1978; Binswanger, 1980,

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1981, 1982; Antle, 1983, 1987). These general conclusions and observations have stimulated considerable research into the effects of risk on farmers' economic decisions. Some studies have focused on production decisions and choice of technology (Feinerman and Finkelshtain, 1996). Other studies have analyzed risk coping and risk management strategies (Hersch, 1997; Vanderveer and Loehman, 1994), or use of assets or savings to cope with risk (Udry, 1995; Dercon 1996). However, to add to the current literature, more need to be done considering the fact that economics of risk in farming businesses at some places has not been researched and documented. In Ghana, particularly in the study area, empirical evidence from the studies involving risk in food crop farming business is hard to come by. Moreover, knowledge of how subsistence farm households make economic decisions under risk is important in determining strategies and formulating policies for agricultural development. It is in this light this study proposed to analyse farmers' attitudes towards risk in food crop farming and seek answers to the following questions:

1. Are food crop farmers in the study area risk neutral, risk preferring/loving, or risk averse?
2. What are the risk coping strategies use by food crop farmers to deal with risk situations in the study area?

2. Objectives of the Study

2.1. General Objective

The general objective of the study is to examine decision behaviour of food crop farmers in risky environment and to determine their risk management strategies.

2.2. Specific Objectives

To help achieve the broad objective of this study, the study seeks to address the following specific objectives:

1. to examine socioeconomic characteristics of farmers
2. to assess the risk attitudes of farmers
3. to ascertain how farmers risk attitudes are influenced by socio-economic characteristics and income status
4. to determine and describe risk coping strategies use by food crop farmers

3. Theoretical Framework

There are different approaches for measuring attitudes toward risk (Antle, 1987; Just, and Pope, 1979). For example Moscardi and de Janvry (1977) classified these approaches into direct and indirect approaches. They believed that the direct method, developed by von Neumann and Morgenstern, has serious difficulties resulting from the fact that the subjects have different levels of tolerance or intolerance for gambling (the method used to reveal their preferences) and that the concepts of probability are by no means intuitively obvious. Also, it is a time consuming method. For these reasons, they proposed and used an indirect ap-

proach in their study. In their model, risk was introduced into a model of economic decision making as a safety-first rule.

Dillon and Scandizzo (1978) classified the methods of measuring risk behaviours under the headings of: (i) economic anthropology (ii) econometrics (iii) farm risk programming (iv) sectoral risk programming (v) expected utility and safety-first theory. They used the expected utility and safety-first theory methods to measure the risk attitudes of subsistence farmers in northeast Brazil.

Binswanger (1980) measured attitudes toward risk using two methods, an interview method eliciting certainty equivalents and an experimental gambling approach with real payoffs. He believed the interview method is subject to interviewer bias, and his study showed that the interview results were totally inconsistent with the experimental measures of risk aversion. Anderson, Dillon, and Hardaker (1977) introduced several techniques for designing interviews to elicit the preference functions of farmers. These were: the von Neumann-Morgenstern (N-M) model, a modified version of the N-M model or the Equally Likely Certainty Equivalent (ELCE) method, and the Ramsey or the Equally Likely but Risky Outcome (ELRO) method.

In the light of above discussion, there are two main approaches for measuring attitudes toward risk which are direct approaches based on von Neumann-Morgenstern method, and indirect approaches. Attitudes toward risk based on direct approaches can be measured by means of both interview and experimental methods. In this paper, after critical review of the interview method of the direct approach with various techniques that are usually used, the Equally Likely Certainty Equivalent with a Purely Hypothetical Risky prospect (ELCEPH) model was adopted but modified to study food crop farmers' attitudes toward risk. The two other techniques that can be used in direct approach interview method are the Equally Likely Certainty Equivalent with a Hypothetical but Realistic Risky prospect (ECLER), and Probability of Winning Demanded (PWD).

Ellis (2000) used income variance approach to analyze farmers' production decision behaviour under risk and categorized them as follows:

- **Risk-preferring/loving/taking:** a person is willing to take the risk of doing better than expected while being aware of the possibility of doing less-well than expected
- **Risk-neutral:** a risk neutral person is indifferent between certain and uncertain outcomes with the same expected value of income
- **Risk-averse:** a person is described as being risk averse if he prefers a situation in which a given income is certain to a situation yielding the same expected value for income but which involves uncertainty

4. Materials and Methods

Central to the research methodology used for eliciting the risk attitudes is the Equally Likely Certainty Equivalent with a Purely Hypothetical Risky prospect (ELCEPH) tech-

nique which is explained as follows.

4.1. ELCE -PH Technique

The ELCE-PH model was designed to avoid bias caused by probability preferences through the use of ethically neutral probabilities (i.e., $P = (1-P) = 0.5$). The subject was confronted with two-state risky prospects having an equal probability of 0.5 for each state. This method overcomes the criticism of bias owing to probability preference. However, it still has the difficulty that the subject is forced to select between a certainty and a lottery. Nevertheless, this problem may be minimized by presenting the questions as practical decision making problems (Anderson, Dillon, and Hardaker, 1977).

In the study, each farmer was asked to indicate the certain income that he or she would need to be indifferent between receiving certain amount and a lottery with the highest possible win of GH¢1000.00 and the lowest of GH¢100.00, each with a probability of 0.5. The expected value of the lottery was GH¢550.00. So depending on whether the certain amount was greater than, equal to, or less than the expected value of the risky prospect, each farmer in the sample could be classified as risk preferring, risk neutral or risk averse. The farmers were classified according to their choice into three groups as below:

- **Risk-preferring:** GH¢55 0.00 < certain amount
- **Risk-neutral:** GH¢55 0.00 = certain amount
- **Risk-averse:** GH¢55 0.00 > certain amount

The study was a descriptive survey of food crop farmers at Agona Duakwa in the Agona East District of Ghana. Snow ball sampling technique was used to identify a sample frame of 100 food crop farmers who had being in farming business for not less than ten (10) continuous cropping seasons. Then after, the lottery approach random sampling was done to select a sample size of 40 food crop farmers who were interviewed. Structured interview schedule was used to collect data from the farmers which were analyzed with the help of Statistical Product and Service Solution (SPSS) soft ware. Data analysis was mainly by descriptive statistics and running of logit regression.

4.2. Regression Analysis

Logitregression model was estimated to establish the effect of income as a proxy measure of poverty situations, access to credit, and other socioeconomic variables on farmer's attitude towards risk. The implicit form of the equation is given as:

$$\text{LOGIT: } \log [P_i / (1 - P_i)] = Z\beta + E$$

Where:

Z – represents the matrix of observations of the explanatory variables

β – represents the column vector of the coefficients; and

E – represents a vector of disturbances.

P_i – the probability that a particular condition occurs

Hence the test of the estimated beta (β) coefficients in the model equations were used to draw conclusions on how

socio-economic variables influence farmer-risk behaviour.

This equation is further expanded in the estimation as:

$$K = f(\text{Ag, Se, Hhs, Edn, La, Acc, Fip, U})$$

$$K = \beta_0 + \beta_1 \text{Ag} + \beta_2 \text{Se} + \beta_3 \text{Hhs} + \beta_4 \text{Edn} + \beta_5 \text{Fs} + \beta_6 \text{Acc} + \beta_7 \text{Fip} + e$$

Where:

$K = \text{Log}[P_{KA} / (1 - P_{KA})]$ = risk attitude parameter

P_{KA} = probability that a farmer is risk-averse

Ag = Farmer's age (in years)

Se = Sex

Hhs = Household size

Edn = Educational level of the farmer (in years)

Fs = Farm size (in ha)

Acc = Access to microcredit (dummy)

Fip = Farm household income below poverty line

U/e = random term

5. Results and Discussion

5.1. Socio - Economic Characteristics of the Food Crop Farmers

The socioeconomic characteristics of the respondents are shown in Table 1. As portrayed in the table, more than half (52.5%) of the food crop farmers were within the ages of 41 and 50 years; and also about 28% were in the age range of 31 and 40 years. These people belong to the active labour force and are expected to manage their farms effectively. This suggests that all other things being equal, there is the potential for improved production of food in the study area beyond subsistence level. The Table 1 also shows that about 63% of the respondents were married while about 30% were single.

In terms of gender distribution, females constituted about 58% of the respondents. This implies that more female than males in the study area are involve in food crop farming business. About 70% of farm households' family size range from 1-5 members. This suggests an average family size of about 3 members. Family size might affect the labour capacity of the farm household in which case a larger family size implies greater capacity to assume risks.

Whiles more than half (57.5%) of the farmers had formal education only up to primary level, further 30% have had no formal education. This stands to reason that there is high illiteracy rate amongst farmers. Inadequate training has implication for farmers' ability to work efficiently in the decision-making environment within which they operate, which is characterized by high incidence of risks and uncertainties. It is evident that education plays a vital role in the entrepreneurial performance of Small and Medium Scale Enterprise (SMSE) managers (Delcon *et al*, 1989). This entrepreneurial performance is dependent on proper and efficient management of human, physical and financial resources available to the manager to work with.

Table 1. Socio-Economic Characteristics of the Food Crop Farmers

Age	0-30	31-40	41-50	51-60	Total
Frequency	2	11	21	6	40
Percent	5.0	27.5	52.5	15.0	100.0
Sex	Male	Female			Total
Frequency	17	23			40
Percent	42.5	57.5			100.0
Marital status	Married	Single	Divorced	Widow/widower	Total
Frequency	25	12	3	-	40
Percent	62.5	30.0	7.5	-	100.0
Family size	1-5	6-10	>10		Total
Frequency	28	10	2		40
Percent	70.0	25.0	5.0		100.0
Farm size(acre)	< 1	1- 5	6-10	>10	Total
Frequency	19	7	5	9	40
Percent	47.5	17.5	12.5	22.5	100.0
Educational level	No-formal education	Primary	Secondary MSL/JSS/SSS	Post Secondary	Total
Frequency	12	23	5	-	40
Percent	30	57.5	12.5	-	100.0
Type of food crop	Maize	Cassava	Vegetables		
Frequency	29	32	25		
Percent	72.5	80.0	62.5		
Source of financing	Credit(banks/NGOs)	Credit(relatives/friends)	Own savings		
Frequency	17	28	26		
Percent	42.5%	70.0%	65.0%		

Source: survey data, 2009

The study identifies three food crops produce by the farmers interviewed in the study area. These are maize, cassava and vegetables (such as garden eggs, tomatoes, pepper, and okra). The result shows that majority (i.e. about 98% and 83% respectively) of the food crop farmers interviewed engaged in the production of maize and cassava; and about 58% of them produce vegetables. Maize and cassava are staple foods in the study area so to most of the farmers, producing them guaranteed a ready market. The relatively low number of farmers into production of vegetables might due to high cost of production. Vegetables are special crops and though may offer the possibility of high gross return, their production involve high cost and difficulties in marketing (McCarthy, 1992). Most of the farmers interviewed were found to be engaged in garden eggs production than other vegetable crops (tomatoes, pepper, and okra) and this production preference was attributed to manageable cultural practices involve in garden eggs production compared to production of other identified vegetables.

The means by which farmers raised funds to finance their business depicts that only 42.5% of the food crop farmers could successfully sourced credit from banks and financial NGOs while most of them either resorted to credit assistance from relatives and/ or friends (70.0%), or relied on their own savings (65.0%) to finance their business. This implies that access to formal credit by farmers continue to be a limiting factor to rapid agricultural development. Explanations gathered from the survey suggest that most of the farmers who required credit facility from various financial institutions had their applications rejected. Especially, the banks have become severely selective, rejecting or discouraging credit applications from farmers on grounds of high

agricultural credit default rate.

Food Crop Farmers' Household Income

Effective risk management requires protection against unconventional shocks. According to Ellis (2000), in the absence of insurance markets, reducing exposure to external shocks usually takes the form of livelihood diversification among farmers in developing countries. The uncertainty in income streams associated with one type of productive activity (as income source) is offset by income from other sources within the household economic portfolio such that risks between livelihood components are reduced.

Most of the farm households do not restrict themselves to a single activity but receive income from various sources. The survey result indicated farmers multiple sources of income as cropping activities (GH¢302.40; 100%), animal rearing activities (GH¢113.72; 72.5%), wage employment (GH¢76.50; 77.5%), self-employment and non-labour income (GH¢58.25; 47.5%). As shown in Table 2, the income values are average annual income per farm household while the figures in percentages indicate the percentage of farm household that receive income from a particular source. Crop income is income received from farming activities (production of crops). Crop income is usually received one or two times during the year. Wage employment and self-employment income are incomes earned from off-farm activities. Wage employment income comprises income received from working for paid development work (such as food for work), regular jobs (such as masonry, and carpentry), and casual daily work. Self-employment income comprises income earned from selling fire wood and homemade charcoal, stone mining, and petty trading. Wage and self-employment incomes can be spread over the year to reduce

overall income variability. Finally, non-labour income includes income received from relatives, gifts, and inheritances.

The result also shows that the total annual income per farm household interviewed on average, was GH¢426.32. This income adjusted for household composition and size was GH¢118.42 income per adult equivalent. According to GLSS (1999), poverty line for Ghana in 1999 prices is GH¢90.00 per adult equivalent household member per annum. Adjusting this line for inflation using the composite national Consumer Price Index (CPI) sets it at about GH¢131.4 during our survey period. A household with an annual income per adult equivalent below this line was said to be income-poor. Thus the average household of the respondents interviewed was found to be income-poor.

Table 2. Food Crop Farmers' Annual Household Income by Source

Income sources	Mean (GH¢)	Standard Deviation (GH¢)	Percent of households
Food crop	302.40	234.44	100.0
Livestock	113.72	217.10	72.5
Waged labour	76.50	47.30	77.5
Other income sources	58.25	29.65	45.0
Total imputed income	426.32	286.93	
Income per adult equivalent	118.42	79.70	

Source: survey data, 2009

5.2. Distribution of Food Crop Farmers by their Attitudes towards Risk

Farm households in Ghana face numerous natural, market and institutional risks in generating means of survival. Yield risk, crop price risk and risk of unready market, risk of illness and injuries are common risks prevalent in food crop farming business. As a result, farm households' economic decisions are overshadowed by risk. Their attitude towards risk, therefore, tends to display an explanation for the many observed economic decisions. Knowledge of farmers' attitude toward risk has important implications for the adoption of new farm technologies and the success of rural development programmes (Wik and Holden, 1998; Grisley and Kellog, 1987).

Farmers' choice between the binary hypothetical outcomes was taken as an indication of their risk attitudes behaviour. The two hypothetical questions consisted of two possible outcomes with given objective probabilities, and the respondents were asked to state which of the two options they preferred. It was mentioned that there was no right or wrong answers to these questions. It is assumed that by answering the hypothetical questions farmers exhibited their true preferences.

As the Table 3 portrays, majority (67.5%) of the farmers had risk-averse attitude and few (10.0%) had risk-taking attitude. Also almost one-fourth of the food crop farmers had risk-neutral decision behaviour. In production decision under risk, most of the farmers decision behaviour is inconsistent with allocative efficiency on production value such that if that value occurs, the largest possible profit could be

obtained and if otherwise, a substantial loss would be incurred (Ellis, 2000). Thus most food crop farmers interviewed either would not prefer to take a chance at the possible profit though it may have a probability of happening than taking a safer position with a lesser possibility of incurring a large loss; or would prefer to operate in position consistent with the average outcome of 'good' and 'bad' happening together.

Table 3. Distribution of Food Crop Farmers by their Attitudes towards Risk

Risk attitudes	Frequency	Percent
Risk-Preferring/loving	4	10.0
Risk-Neutral	9	22.5
Risk-Averse	27	67.5
Total	40	100.0

Source: survey data, 2009

5.3. Effect of Socio-Economic Variables on Farmer Risk Attitude

Regression analysis was estimated to investigate the effect of income status of food crop farmers and other socioeconomic variables on farmers' attitude towards risk in the study area. Result of the analysis in Table 4 indicates that Nagelkerke R Square was 0.473. This implies that about 47% of the variation in farmer risk attitude was explained by the independent variables. The chi-square test of the regression model was significant at alpha level of 0.01 and this means that income status and the other socioeconomic variables have significant composite effect in explaining food crop farmers risk attitudes.

From the table, the test of beta coefficients of the predicting variables in the model shows that, household size, educational level, and access to credit were significant at 0.01 alpha level in explaining the probability of farmer risk-averse attitude. Age and income status were also significant at 0.05 alpha level. Age was found to be inversely related to risk-averse attitude. This implies that the lower the age of the farmer, the more risk averse he/she will be. According to Aye and Oji (2007), older farmers are more likely to have accumulated more wealth than younger farmers. Also older farmers are more likely to have greater social capital and incentives which can serve as some form of traditional insurance or fall-back strategies in the process of decision making.

The larger the household size, the greater will be the total consumption needs of the farm family and hence, the more risk-averse behaviour a food crop farmer would put up. The study revealed a negative relationship between household size and risk averse attitude. This implies that majority of the households might get household members assisting on the farm by supplementing its labour supply especially during peak periods (e.g. weeding and harvest times) of labour requirement.

Average number of years of schooling amongst the respondents was 4.5 years (about primary 5). The Table 4 shows that education had an inverse relationship with

farmer risk-averse attitude and was statistically significant. This result conforms to the apriori expectation that the more educated respondents would be more willing to bear risk than the less educated ones. This buttresses the findings that at low game levels education variable had little influence on risk aversion, but at higher game levels, it generally reduced the level of risk aversion and was often statistically significant (Binswanger, 1980). The result is consistent with that report that schooling has a positive impact on risk taking (Moscardi and de Janvry, 1977).

Access to microcredit also comes out as a significant determinant of risk attitude. From the table, access to microcredit is inversely related to risk attitudes. This stands to imply that the more microcredit support is given to farmers, the less risk averse the farmers will become. This is because the financial support will enhance farmers' access to technological learning and improved production inputs that will lead to increased productivity. Thus depriving farmers of access to microfinancial services will make them prone to being more risk averse. In the table, the Odd ratio of 9.483 for access to microcredit implies that a food crop farmer without access to financial assistance is about 9 times more likely to becoming risk averse when operating in a risky decision-making environment than taking risk to invest using owned poor resources.

The income-poor status of the food crop farmer depicts statistically significant and positive relationship with risk-

averse attitude of food crop farmers. This stands to reason that the lower a household's income or poorer the household, the more risk averse it will be. Hence, all other things being equal, households whose incomes fall below the poverty line would be less willing to take risk than those whose incomes are higher. The study result is consistent with the findings that poorer farmers are more risk averse than wealthy ones and as such avoid prospects in which the probability of failure looms large (Mosley and Verschoor, 2003; and Lamb 2003).

Table 4. Logistic regression – Farmer Risk Attitude * Socio-economic Variables

Explanatory variables	β coefficient	Wald	Exp(B)/ Odd ratio
(Constant)	-0.709	2.284	0.067
Farmer's age	-0.249	2.482 [*]	9.353
Sex	-0.007	0.075	0.993
Level of education	-0.351	5.285**	7.421
Household size	0.951	3.604**	10.117
Land under control	0.214	0.634	1.239
Access to microcredit	-0.480	4.935**	5.619
Income-poor farm household	0.230	1.496*	7.022
Model summary			
-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Chi-square
103.176	0.301	0.473	38.99**

*:significant at 0.05 alpha level **:significant at 0.01 alpha level Source: survey data, 2009.

Table 5. Food Crop Farmers Coping Strategies to Deal with Risk in the Study Area

Coping Strategies	Use		Do Not Use	
	Frequency	Percent	Frequency	Percent
Strategies For Production Risk				
Crop insurance	-	-	40	100.0
Mixed farming	34	85.0	6	15.0
Mixed cropping	32	80.0	8	20.0
Crop rotation	29	72.5	11	27.5
Geographical diversification	31	77.5	9	22.5
Irrigation	11	27.5	29	72.5
Labour supply for non-farm wage income	37	92.5	3	7.5
Strategies For Marketing Risk				
Contract sales	9	22.5	31	77.5
Hedging	12	30.0	28	70.0
Credit sale	33	82.5	7	17.5
Adequate market information search	16	40.0	24	60.0
Frequent and reliable transport	15	37.5	25	62.5
Strategies For Human Risk				
Health insurance	9	22.5	31	77.5
First aid	12	30.0	28	70.0
Provide other incentives for labour	21	52.5	19	47.5
Attendance of training	15	37.7	25	62.5
Break during working hours	34	85.0	6	15.0
Day-off without work	25	62.5	15	37.5

Source: survey data, 2009

5.4. Food Crop Farmers Coping Strategies to Deal with Risk

Farm households have developed various mechanisms for coping with risk. Most of these mechanisms offer short-term protection. Food crop farmers in the study area managed risk by implementing practices that would reduce their exposure to risk. Various risk management practices were identified with the farmers; and further investigation was done to find out those adopted by the farmers. These coping responses were grouped as production, marketing and human risk related coping strategies. These strategies generally act to reduce variability of cultivation in food crop farming business.

Production risk management strategies: From the table of result (Table 5), though it was identified with the farmers as appropriate, all the farmers interviewed do not use crop insurance policy as a shock absorbing mechanism to deal with production risk. The farmers explained that they did not know of any insurance package from any source, which they could patronize to assist them in situation of 'bad' uncertain occurrence such as adverse weather effects, drastic low price hicks, theft, and high incidence of disease and pest infestation. 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). This lack of confidence would perhaps, compelled farmers to take risk adverse measures in food crop production which is a threat to food security; as these farmers as a result could be trapped in Little Opportunity Cycle (LOC) (Owusu-Acheampong, 1996). Again, the result shows that few (27.5%) of the farmers use irrigation and drainage as a management strategy to deal with risk of drought, erratic rainfall, and insufficient amount of rainfall and flood. It was realized that most of the farmers either lack the technical know-how or adequate funds to invest in even simplest irrigation system. Irrigation is not just a risk management strategy but also has a major impact on output through its complementarity with multiple cropping and improved seeds during cultivation (Ellis, 1983). Majority of food crop farmers used enterprise diversification to include mixed farming (85%), mixed cropping (80%), and crop rotation (72.5%). Also as much as 92.5% and 77.5% of the farmers used occupational diversification (i.e. supply of labour for non-farm wage income) and geographical diversification respectively as risk coping mechanisms. These buttress the fact that with inadequate fund to invest coupled with lack of confidence due to fear of risk through past experience in food crop farming business, farmers would only adopt subsistent measures to ensure that their families at least have something to feed on all year round (Owusu-Acheampong, 1996).

Marketing risk strategies: From the Table 5, as much as 77.5% and 70.0% of the farmers respectively, do not use contract sales and hedging to manage marketing risk. These farmers do not even understand how contract sales and hedging work. Perhaps, necessary organizations and individuals to deal with are not available in the study area. The

practice of contract sale and hedging would help prevent incurring debt during financial crisis and also avoid perishability of produce problems. Contract sale is when producer and consumer or intermediaries enter into agreement to produce after the producer has accepted financial assistance from his partners (Collins, 2006). Hedging solve the problem of ready market and perishability of produce because producer cultivate according to specifications of the consumer or intermediaries demand after going into an agreement (Mann and Dickinson, 2001). Most (60.0%) of food crop farmers do not gather adequate information about prices of produce and inputs before going into production. This might lead to low supply of farm produce at high prices in low yield and or excess supply at low prices in high yield which in turn, affect market enterprise and also threaten net income (Jodha, 1981). Also, about 63% of the farmers used frequent transportation to convey farm produce while about 38% rather carried their produce on head to market. This might be the result of unaffordable transport charges due to bad road network. As high as about 82.5% of the farmers, due to lack of ready market in cash and fear of perishability of produce, sold their produce on credit to market queens who paid them after they had successfully sold to consumers on retailing.

Human risk management strategies: It can be seen from the Table 5 that only 22.5% of food crop farmers use health insurance as a management strategy to deal with human risk. Farmers explained that they usually have low financial capital and thus, further investment into health insurance (premium payment) would reduce their capital investment in production which would affect their produce and gross margins. Again, few (30.0%) of the farmers used first aid to manage risk of ill health. It was noticed that most of the farmers' first aid provided only pain killers, and had nothing like methylated spirits, gentian violet, and bandages which are the necessary solutions for attending to wounds, cuts, burns, and bruises that could occurred on the farm. It is hoped that a well-resourced first aid would help reduce labour absenteeism when accidents occurred, and thus threat to labour supply due to labour confidence in the care of their welfare. Most farmers (52.5%) provided incentives in the form of cultivated produce to labourers. Farmers believed that this would motivate their labourers to work efficiently to increase output and also to reduce theft. Majority (85.0%) of farmers scheduled between 1-2 hour interval break their workers to rest; and further 63% had been given on or two day-off to reduce labour workload and make them refreshed and more active during working days to increase labour efficiency work. However, only little above one-third (37.5%) of the farmers either attend training themselves or send their farm assistants for training whenever necessary.

6. Conclusions

Depending on the results obtained from the survey data as presented and discussed above, the following conclusions

can be drawn from the study:

Farmers are mainly engaged in production of the following food crops: (80% into cassava production, 73% into production of maize, and 69% into vegetables such as garden eggs, tomatoes and pepper). More females were found to involve in food crop farming than males; and education level of most of the farmer-respondents is low. Over 50% of the food crop farmers are between the ages of 31 years and 50 years. The study also revealed that food crop farmers have diverse income sources with an average annual income of about GH¢426.32. The income status of most farms household was below national poverty line. Thus average food crop farm household was income-poor

Although some food crop farmers were found to be risk-neutral and risk-preferring, majority (67.5%) of them are risk-averse. Farmer risk-averse attitude was found to be significantly influenced by access to microcredit, income status, age, education and household size. The study revealed that income-poor status and household size positively relate to farmer risk-averse attitude; whereas access to microcredit, level of education, and age inversely relate to farmer risk-averse attitude

Most food crop farmers use enterprise diversification, geographical diversification, and labour supply for non-farm wage to manage risk of loss in yield. None of the food crop farmers understudied used crop insurance mainly due to its non-existence; and few of them use health insurance to cope with risk of ill health. Contract sales, hedging and adequate market information search as risks coping strategies are not common with food crop farmers in the study area.

7. Recommendations

The study makes the following recommendations based on the findings and conclusions drawn:

- Financial institutions are encouraged to collaborate with insurance companies to insure agricultural credit facilities to indirectly insure crop farms due to inevitable risk involve in food crop farming business.

- Government and private insurance companies should consider developing insurance product for food crop farmers to patronize and use as shock absorbers against uncertain events.

- Banks and financial NGOs as well as government's Poverty Alleviation Fund programme are encouraged to strengthen the provision of credit assistance to food crop farmers to enable them to adopt the most efficient practices to increase produce beyond subsistent level.

- Farmers are encouraged to form formidable cooperatives to help manage marketing related problems.

- Government must provide food storage and warehouses in food production areas and ready guarantee market for food produce in such areas.

- It is also suggested that studies into analyzing predicting factors influencing farmers' attitudes towards patro-

nizing insurance product should be done and outcome taken serious by government and private insurers developing products for food crop farmers.

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