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Effect of Risk and Management Strategies on Leafy Vegetable Production in Kwara State, Nigeria

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ABSTRACT— The study analysed the effect of risk and management strategies on vegetable production in Asa Local Government Area, Kwara State, Nigeria. Data were collected from 120 vegetable farmers, and covering 3 communities within Asa Local Government Area in the State using a well-structured questionnaire. Descriptive statistics, Gross margin, Discriminant analysis and Regression analysis were used in the study. The study revealed that the mean age of the vegetable respondent was 46 years, with the male vegetable farmers (77.5%) outnumbering the female (22.5%) vegetable farmers in the State. Majority of the respondents had primary education with the average farming experience of 14 years. An average area of 0.30 ha was cultivated by the vegetable farmers. The sources of risks identified among the respondents were natural risks, social risks, economic risks, production risks and marketing risks. The study further revealed that vegetable production is profitable in the study area. The strategies employed at combating the risks and management skills in vegetable production by the farmers were diversification of the system, non farm business, crop planning and time security, adoption of new technology. It is recommended that introduction of a more comprehensive agricultural insurance scheme and introduction of improved technology can ameliorate the effect of risks on vegetable farmers. Also, public intervention can facilitate better risk management through improved information system.

KEYWORDS: Discriminant, Risks, Risk Management, Vegetable Production

1. INTRODUCTION

Agricultural production is greatly characterized by risk. In particular, production decisions are generally made in the environment of risk and uncertainties. Yield, product prices, and to a more limited scope, input prices and quantities are usually not known with certainty when investment decisions are being made. In many cases, farmers are confronted with risk of diseases and pests which may cause product prices to decline. Such characteristics result in returns displaying high variability. Returns vary with the farming system, and climate, policy institutional setting amongst others; these in turn affect production decisions [3]. Nigeria's abundant land resources and wide variety of climate variations allows it to produce several varieties of food and cash crops. These food crops include maize, beans sweet potato, cassava, yam, rice, sorghum, millet and a variety of vegetables and fruits. The leading cash crops are groundnut, palm oil, cocoa and rubber. These crops were also Nigeria's major exports in the 1960s and early 1970s. Despite various programs and initiatives meant to improving the agricultural sector which includes the horticultural sub-sector, the sector still remains comparatively under-developed. The horticultural sub-sector also reflects the problems in the agricultural sub-sector. These problems include insufficient processing and storage or post-harvest facilities, inadequate

knowledge and technology of production, land tenure, insufficient planting materials, poor extension services. Horticultural crop production in Nigeria has been held back by the policy and fiscal constraints of the governments. It has received very little attention in the national perspective plan for agricultural development. Moreover, there is only one horticultural research Institute in Nigeria, namely National Horticultural Research Institute (NIHORT) established in 1975 for all horticultural crops. Horticultural crop farming is associated with negative outcomes stemming from imperfect predictable biological, climatic and price variables. Those variables include natural adversities e.g. diseases and pests, climate and weather factors not within the control of agricultural producers and adverse fluctuations in input and output prices, [8].

The high level of production, market, and financial risk that producers have to face is a typically characteristic of agriculture [22]. Risk is the uncertainty that could lead to changes in an individual's welfare such as losing money, potential harm to human health, and events that affect availability of resources, among others. In general agriculture risk typically is correlated with the chance of a negative outcome (e.g., financial loss or yield decrease) and the uncertainty in the decision making process due to incomplete information such as market prices [18]. Risk varied within different agricultural sectors and supply chains. In the production and marketing of vegetables, risk includes bad weather, disease and pest infestations, quality inconsistencies, liability risk, and market fluctuations [15]. In 2020, vegetables primary production for Nigeria was 15.7 million tonnes. Between 1971 and 2020, vegetables primary production of Nigeria grew substantially from 3.11 million to 15.7 million tonnes (15,706,483) rising at an increasing annual rate that reached a maximum of 20.77% in 2014 and then decreased to -0.46% in 2020, [23]. Vegetable production is a risky farming business either because of its rapid perishable nature, short supply period or its inelastic demand nature. Consequently, planned result and outcome continually swerve from the actual outcome. On the other hand, as vegetables are highly perishable, they start to lose their quality right after harvest and continued throughout the process until it is consumed. Hence, vegetables productions are risky investment activities. Riskiness of vegetable production may be attributed to several factors that are beyond the control of producers.

Due to perishable nature and biological nature of production process there is a difficulty of scheduling the supply of vegetables to market demand. The crops are subjected to high price and quantity risks with changing consumer demands and production conditions. Unusual production or harvesting weather or a major crop disease can influence badly the marketing system. While food-marketing system demands stable price and supply, a number of marketing arrangements like contract farming provide stability. Hence, knowledge of risks and management strategies by vegetable farmers is important in designing strategies and formulating policies for agricultural development [3]. Perceptions steer decisions about the acceptability of risks and have a core influence on behaviours before, during and after a disaster. To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome. People normally evaluate risk and make decisions in relation to their whole life situation. Risk perceptions play a key role in the production and investment behaviour of farmers in vegetable production decisions [2]. Furthermore, better understanding of farmers' risk perceptions facilitates rational resource allocation decision in the farming system, rural financing and policy formulation. In this context, understanding risk is a key element in helping producers make better decisions in risky situations, and also provides useful information to policy makers in assessing the effectiveness of different types of risk protection tools. Within the context of efforts to achieve safe, sound and sustainable production of vegetables, identification of risk sources plays a crucial role.

In vegetable farming, production risk comes with the business and protecting your agricultural business investments by making an informed risk management decision is a bigger factor today than ever before. Fortunately though, vegetable growers today have more and better tools to help them manage risks or, at least, to manage certain kinds of production risks. Crop insurance cannot guarantee that unfavourable weather will

not damage or destroy a vegetable producer's crop, but it can guarantee if they lose a crop, he/she will not stand to lose the money invested in the crop. Conservation, new technology practices, varied farm production methods (organic, sustainable) and chemicals to combat crop-eating insects are other examples of some of the present-day tools to manage risks. Successful farm management depends on taking risks consistent with the goals and financial position of the business. Vegetable growers are aware that agriculture is a business where they stand to lose more money in a bad year than they stand to make in a good year. Accordingly, producers recognize that in order to manage production risks, they must increasingly use all the different management tools available to them.

Vegetable production in Nigeria, though practiced as backyard farming by some farmers who seldom use high-input technology, is faced with large capital and a considerable investment on lands, watering and equipment soil amendments. Most often, farmers are confronted with risk despite their short and long-term production and marketing decisions. Vegetable productions are risk-prone with high degree of uncertainty especially in pest and diseases attack with total crop failures. This explains why the cost of vegetable production poses a challenge to expected profits [12]. Farm enterprises usually adopt a number of strategies to avoid risk or rather to reduce its adverse effect upon occurrence. Risk management is choosing among alternatives, that which reduces the effects of risk. Risk management is a process of measuring or assessing risk and then developing strategies to manage the risk. However, in ideal risk management priority, the processes that follow each other whereby the risk with the greatest loss and its probability of occurring are handled first while risks with lower probability of occurrence are handled later. This is an element of farm business management that deals with making decision that aimed at eliminating or avoiding the incidence of risk or rather minimizing its adverse effects. Therefore, vegetable crop farmers should assess management strategies that aim at minimizing adverse risk effects such as; choosing a reliable enterprise, enterprise diversification, intercropping, irrigation, flood control, sales of assets, etc. [10].

In addition, risk management strategies in vegetable crop production aims at identification, assessment, and prioritization of risk followed by coordination, economical application of resources to minimize, monitor, and control the probability and/ or impact of unfortunate events or to maximize the realization of opportunities. On the other hand, government has also provided a range of risk management programs for farmers, which includes; crop insurance, price stabilization, livestock feed subsidies and emergency relief [4]. These strategies despite its good intentions have failed to effectively manage risk that farmers face due to its poor implementation. Consequently, the inability of most farmers to achieve planned output depends on the management of risk factors facing them such as land tenure problems, insufficient capital to purchase farming inputs, climate change challenges and weather variations, unstable government policies and global markets influences. Studies on risk and risk management strategies abound in the body of the literature. Some of these studies included [8], [6], [11], [14], [17]. Nevertheless, none of them has combined risk and risk management strategies on leafy vegetable production, most especially in Asa Local Government Area, Kwara State, thereby creating a gap that this study intends to fill. Specifically, this study examined the socio-economic characteristics of leafy vegetable farmer in the study area, examined their cost and returns, identified the risk sources and management attitudes, examined the factors influencing the farmer's attitude towards the risks and examined the farmer's strategies at combating the risks and management skills associated with vegetable production in the study area.

2. Methodology

This study was conducted in Asa Local Government Area (LGA) of Kwara State, Nigeria. Its headquarters is Afon. The LGA is situated in the western part of the State. It has an area of 1,286km^2 and a population of 126,435 at the 2006 census (Federal Republic of Nigeria, Official Gazette, 2009). It is often estimated that

Asa Local Government Area has one of the largest number of rural settlements in the State and most of them are domiciled farmers. The area stretches from the peri-urban fringes of Ilorin city to the northern boundary of Oyo State. Most inhabitants in the area are predominantly farmers and are involved in small scale/subsistence agriculture. Afon district is characterized by tropical wet and dry seasons, with a monthly average temperature of about 29^0C. The month of March has the highest monthly average temperature of about 32^0C while the annual average rainfall record is estimated between 1200 and 1400mm (Ajibade, 2002). The major food crops planted are cassava, yam, maize, rice, soyabeans, cowpea, guinea-corn and millet. Arable crops and vegetables like *amaranthus* (tete), pepper, tomato, okra, melon, *Corchorusolitorus* (ewedu), spinach among others are widely grown. The main tribe in the local government area is the Yoruba ethnic group.

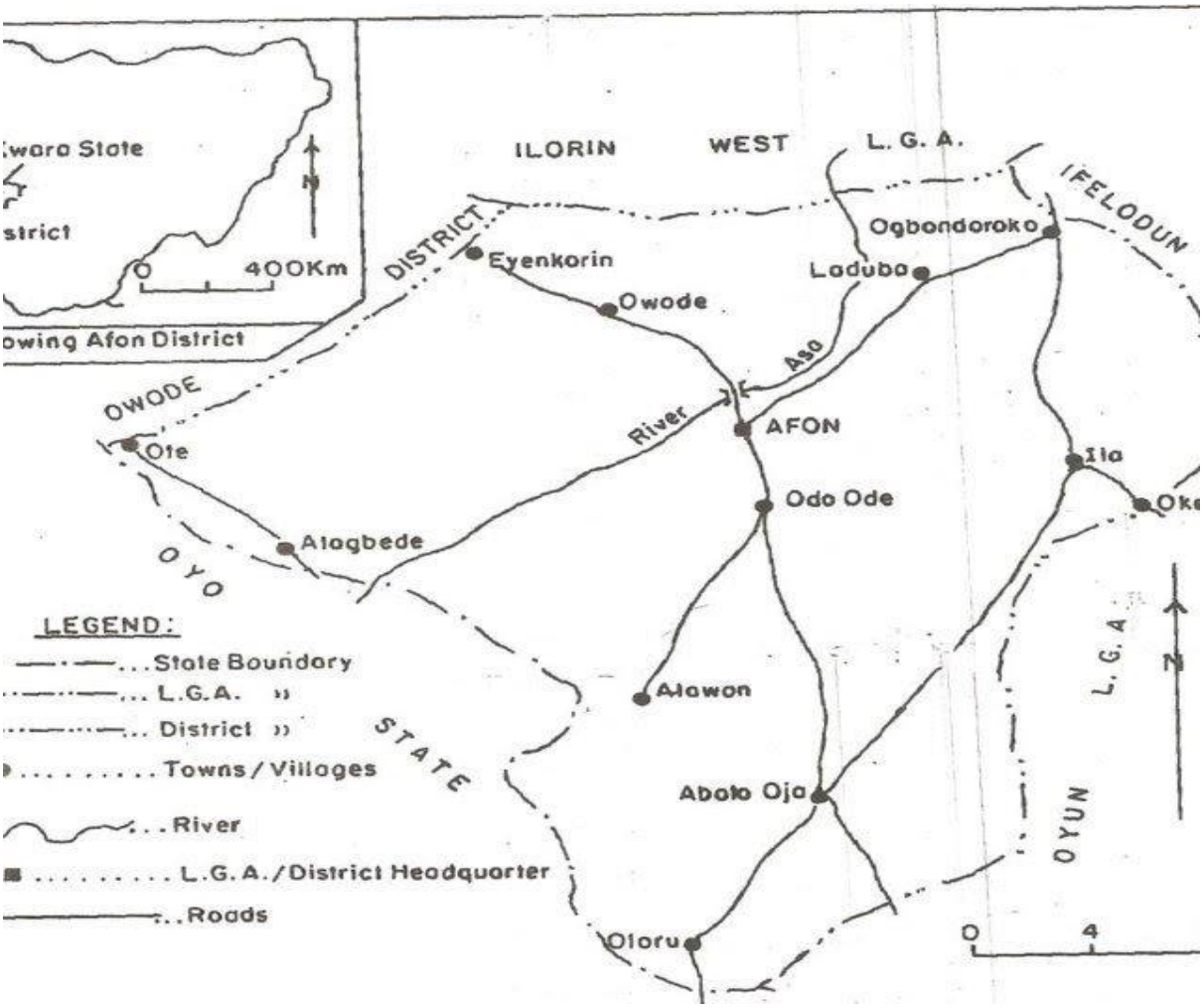

Figure 1. Map showing Asa Local Government Area, kwara State Nigeria

The population of the study includes all vegetable farmer involved vegetable production in Asa Local Government Area of Kwara State. Multistage sampling techniques was used. The first stage involved a purposive selection of Asa Local Government; this is because vegetable production is prominent in the area. It is the only agrarian Local Government in the State. Second stage involved random sampling of 3 villages in the Local Government Area. The list was gotten from the information unit in the Local Government Area. The third and final stage involved the random and representative sample of 40 vegetable farmers from each of the villages earlier selected. In all, a total list of 120 respondent/farmers was interviewed. The three villages that were later selected are; Afon, Laduba and Tafa

3. Method of Data Analysis

3.1 Discriminant analysis

Discriminant analysis is a statistical technique to classify objects or individuals into mutually exclusive and exhaustive groups based on a set of measurable features that describe the objects or individuals. In general, an object was assigned to one of a number of pre-determine groups based on observations made on the object [20]. Discriminant analysis requires a nominal dependent variable and independent variables that could be nominal, ordinal, interval or ratio [13]. Therefore, discriminant analysis was conducted to explore quantitatively the relationship between leafy vegetable farmer's attitude towards risk and factors influencing this attitude. [7] discriminant analysis to determine the factors influencing farmers' attitude towards the risks in fruit and vegetable farming

For the nominal dependent variables, farmers will be classified into 3 groups as follows:

- Group 1 – Risk Averse
- Group 2 – Risk Neutral
- Group 3 – Risk Taker

The independent variables, which consist of socio-economic and farm characteristics, are defined as follows:

X_1 – Gender (Male/Female)
X_2 – Farming Experience (Years)
X_3 – Household size
X_4 – Farm Size (ha)
X_5 – Membership of cooperative association (yes or no)
X_6 – Main Occupation

In this study, Discriminant analysis was used to determine the risk attitude of vegetable farmer and examine the factors influencing the farmer's attitude towards the risks in vegetable farming.

3.2 Gross margin Analysis

Gross margin analysis is an analytical tool used in determining the profitability accruing from the sales from farm produces or an enterprise. Gross margin (GM) for a farm enterprise is the measure of profitability that is a useful aid to enterprise planning. The calculation of Gross Margin can be the starting point for construction of cash flow budgets and assessment of whole profitability. They can also be used to assist in assessing the opportunity to develop new farm enterprises. Gross margin profit is the difference between the annual gross income for the enterprise and the variable costs directly associated with the enterprise. In this study, the gross margin, (GM) is the difference between the Gross Farm Income (GFI) and the Total Variable Cost (TVC) incurred in vegetable production, while the net farm profit (NFI) is the difference between the gross margin and the total fixed cost (TFC).

The gross margin is specified below:

$$GM = GFI - TVC$$

3.3 Ordinary Least Squares Regression (OLS)

Regression modelling examine the specific effects variables have on one another, while simultaneously controlling for the effects that other variables may also have. Although many types of regression frameworks exist, the most frequently used are logistic regression techniques (e.g., binary logistic regression and ordinal logistic regression) and Ordinary Least Squares (OLS) regression. The latter, OLS, is the focus of this study. The least squares method used in OLS regression is relatively straightforward. An OLS linear regression

procedure builds a line of best fit that would serve as the most accurate way of depicting the spread of the data points with a single line. The least squares property states that the line fit in the OLS method will have the smallest value of the summed squared deviations of each data point from the line. The OLS regression method of analysis fits a regression plane onto a "cloud" of data that is assumed to have a linear trend [9]. Although the regression plane does not touch every point in the data cloud, it does model the partial relationships between each slope (i.e., each regression coefficient " ") and the outcome variable, while holding constant the effects of the remaining variables [9]. Thus, regression coefficients in OLS are estimated by minimizing the sum of squares of the differences between values fitted into the regression plane and the observed values in the data.

Determinant of perceived risk intensity of vegetable crop farmers was isolated, using the Ordinary Least Squares Regression models. The perceived risk intensity and their determinants were fitted into four functional forms (Linear, Double Log – Cobb Douglass, semi-log, Exponential). These models are explicitly specified as follows:

$$Y = \alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7 + \beta_8 + \mu$$

Where Y = Perceived risk intensity index
β_1= age of the farmers in years
β_2= gender (Male is "1" and "0" otherwise)
β_3= Level of formal education attainment
β_4= farming experience in years
β_5= household size
β_6= access to credit
β_7= farming as a major occupation
μ = stochastic error variable

4. Results and Discussion

4.1 Socio-economic characteristics of vegetable farmers

The result of the socio-economic characteristics in Table 1 showed that about 24.99% of the respondents are within the age range of 24 – 40, 71.66% are within the age range of 41 – 60, while 3.33% are in the age bracket of 61 – 63%. The mean age of the respondents is 46 years. The implication of this is that majority of the respondents were in their productive age and are able to use their energy to the maximum. This is in agreement with the findings of [1] in their study on effects of financial capital on welfare status of cassava processors in Oyo and Ogun States, Nigeria. Moreover, about 77.50% of vegetable farmers were male while 22.50% were female. This implies that male farmers are more involved in vegetable production than the female farmers. This could be associated with the energy and labour expended on large farm of vegetable for efficient management and production. This support the findings of [8] who carried out a study on fruit and vegetable farming in Osun State, found out that more males are into vegetable farming than females. The result further showed that 84.17% of the vegetable farmers were married, 6.67% were single, 5.0% were divorced and 4.17% were widowed. The implication of this is that majority of the farmers were married and this will lead to increase in production and total output of vegetable in the study area as a result of large household. This will also give them additional opportunity of reduced cost of labour, as supported by [17]. In addition, 44.16% of the leafy vegetable farmers had farming experience of less or equal to 10 years of experience, 34.15% of them had farming experience between 11 – 20 years, 19.99% of the farmers have been farming for between 21 – 30 years, while 1.66% of the farmers have been farming for 31 –40 years. The mean of the farming

experience of the vegetable farmers was 14 years. This implies that majority of the farmers in the study area are still in their active years and engage in secondary occupation. This support the findings of [5] who carried out a survey on vegetable farmers in South west, Nigeria and found out that large percentage of vegetable farmers have less than 10 years and engage in secondary occupation. The result of years of education of the respondents showed that 65.83% had primary education, 31.67% had post primary education, and 2.50% had tertiary education. From the table, it can be seen that the level of literacy is low, the farmers need to be educated and sensitized on the technical know-how on vegetable production, how to use improved seeds, agrochemicals and other farm machineries. The results implies that the productivity levels of the farmers could have increase if most had more formal education to understand proper and full use of resources. This is line with the research of [19] on risk analysis of maize production in Kwara State, which revealed that production of the farmers would have increase if the respondents had more formal education. The size of the household size affect the amount of farm labour, determines the food and nutritional requirement of the household and often affect the food security. The result of the household size in the Table revealed that 26.67% of the farmers had an average household size of 7 (seven). This will invariably affect the output. This implies that the larger the household that are involved in farming activities, the larger the output of the farmer. This supports the findings of [16], on assessing the impact of fresh vegetable growers' risk aversion levels and risk preferences. This revealed that large household size increases farming output. Finally, vegetable farmers in the study, cultivated an average 0.3 hectares of farm land. This implies that large percentage of the farmers cultivated less quantity of farm size due to risk involve in vegetable production and inadequate finance. This is in agreement with the findings of [21], on prospects and problems of vegetable production under irrigation in the Fadama areas of Bauchi State, revealed that many of the vegetable farmers cultivate small quantity of farm size because of risks involved in vegetable production.

Table 1. Distribution of the respondents by their age

	Frequency	Percentage
Age		
24 – 40	30	24.99
41 – 60	86	71.66
61 – 63	4	3.33
Total	120	100
Mean	46.00	
Sex		
Male	93	77.50
Female	27	22.50
Marital Status		
Single	8	6.67
Married	101	84.17
Divorced	6	5.00
Widowed	5	4.17
Experience		
< =10	53	44.16
11 – 20	41	34.15
21 – 30	24	19.99
31 – 40	2	1.66
Education		
Primary education	79	65.83
Post primary education	38	31.67
Tertiary education	3	2.50
Household Size		

< = 5	32	26.67
6 –10	79	65.83
11– 15	9	7.50
Farm size		
< =0.3	87	72.5
0.4 – 0.5	33	27.5
Mean	0.30	

Source: Field Survey, 2019

4.2 Gross margin Analysis

The result of the Gross margin showed that the farmer made a profit of ₦15771.791

Total Fixed (Land) = ₦35570

Total variable cost= (cost of hoe+ cutlass + basket/bag+ vegetable seed + Fertilizer + herbicide + insecticide)
= ₦16275.709

Revenue = ₦67617.5

Gross Margin = Revenue – TVC
= ₦67617.5 - ₦16275.709

Gross margin= ₦51341.791

Profit = GM – TFC
= ₦51341.791 - ₦35570
= ₦15771.791

4.3 Risk sources and management attitude of the vegetable farmers in the study area

The sources of risks perceived by the vegetable farmers as threats to leafy vegetable production are presented in Table 2 Natural risks; drought (3.33%), flood (1.67%), wind (0.83), excessive rainfall (5.83%), plant diseases (41.67%), insects (35.83%) and pests (10.83%). Social risk; embezzlement (16.67%) while theft of the crop (83.33%). Economic risk; interest on borrowed capitals (39.17%) while low market demand (60.83%). Production risks; erosion (0.83), effect of chemicals (12.50%), credit facilities (31.67%), labour supply (32.50%), storage facilities (20.83%) and processing (1.67%).Marketing risks; lack of information (20.00%), instability of price (60.83%) and change of government policies (19.17%).All the assessed natural risks associated with vegetable production, plant diseases have the highest percentage (41.67%) and this is in line with work of [8] on socio-economic analysis of risks in fruit and vegetable farming in Osun State, Nigeria, in their findings that majority of the natural risk face by the respondents is plant diseases and pest damages, also all the assessed social risks associated with vegetable production, theft of the crop have the highest percentage (83.33%) and of all assessed economic risks associated with vegetable production, low market demand have the highest percentage (60.83%), also among production risk associated with vegetable production, labour supply have the highest percentage (32.50%) and finally all the assessed marketing risks associated with vegetable production, instability of price have the highest percentage (60.83%).

Table 2. Identified risks sources that posed threats to vegetable production

		Frequency	Percent
Natural risk	Drought	4	3.33
	Flood	2	1.67
	Wind	1	0.83
	Excessive rainfall	7	5.83
	Plant diseases	50	41.67
	Insects	43	35.83

	Pest	13	10.83
	Total	120	100
Social risk	Embezzlement	20	16.67
	Theft of the crop	100	83.33
	Total	120	100
Economic risk	Interest on borrowed capital	47	39.17
	Low market demand	73	60.83
	Total	120	100
Production risk	Erosion	1	0.83
	Effect of chemicals	15	12.50
	Credit facilities	38	31.67
	Labour supply	39	32.50
	Storage facilities	25	20.83
	Processing	2	1.67
	Total	120	100
Marketing risk	Lack of information	24	20.00
	Instability of price	73	60.83
	Change of government policies	23	19.17
	Total	120	100

Source: Field Survey, 2019.

4.4 Management strategies employed for the risk sources in the study area

The management strategies perceived by the vegetable farmers are presented in Table 3. The result was highlighted as follows: Preventive; training (43.33%), education (17.50%) and access to extension services (39.17%). Mitigation; mixed farming (21.67%), disease resistant and drought tolerant crop (26.67%), farm insurance (19.17%) and Price support cooperative society (32.50%). Coping; reduce consumption (0.83%), borrowing (20.00%), sales of personal belonging (7.50%), off farm work (71.67%). This result implies that the respondents used more than one coping strategies and this is in agreement with the findings of [11] who worked on farmers' perception on risks in fruits and vegetables production, which reveal that vegetable farmers uses more than one management / coping strategies.

Table 3: Distribution of respondents base management strateges in the study area

		Frequency	Percent
Preventive	Training	52	43.33
	Education	21	17.50
	Access to extension services	47	39.17
	Total	120	100
Mitigation	Mixed farming	26	21.67
	Disease resistant and drought tolerant	32	26.67
Coping	Reduce consumption	1	0.83
	Borrowing	24	20.00
	Sales of personal belonging	9	7.50
	Off farm work	86	71.67

	Total	120	100

Source: Field Survey, 2019.

4.5 Discriminant Analysis

Discriminant analysis is used to describe the differences between groups and to exploit those differences in allocating (classifying) observations of unknown group membership to the groups. Discriminant analysis is also called classification in many references. However, several sources use the word classification to mean cluster analysis. The diagonal elements in the main body of the Table 4 and 5 showed the number and percentage correctly classified into each group. The result in Table 5 showed the classification of leafy vegetable farmers into true and classified categories based on their attitude to risk, (risk averse, risk neutral and risk preferred). By using discriminant analysis, we were able to classify farmers based on their attitude to risk, that is, classified category given the true category. Among the vegetable farmers, 46 respondents were risk averse, 39 respondents were risk neutral while the remaining 35 respondents were risk preferred.

Table 4. Result of the Discriminant Analysis (Classification Table)

True risk category	**Classified**			
	Risk averse	Risk neutral	Risk preferred	Total
Risk averse	21 47.73	11 25.00	12 27.27	44 100.00
Risk neutral	11 35.48	14 45.16	6 19.35	31 100.00
Risk preferred	14 31.11	14 31.11	17 37.78	45 100.00
Total	46 38.3	39 32.50	35 29.17	120 100.00
Prior	0.3333	0.3333	0.3333	

Source: Field Survey, 2019

Table 5. Result of the Discriminant Analysis (LOO Classified)

True risk category	**LOO Classified**			
	Risk averse	Risk neutral	Risk preferred	Total
Risk averse	20 45.45	11 25.00	12 27.27	44 100.00
Risk neutral	12 38.71	10 32.26	9 29.03	31 100.00
Risk preferred	15 33.33	15 33.33	15 33.33	45 100.00
Total	47 39.17	37 30.83	36 30.00	120 100

Source: Field Survey, 2019

4.6 Factors influencing the Farmer's attitude towards the risks in vegetables production

The result in Table 6 showed that 3 out of the 7 discriminating variables influence farmers' attitude towards risk in vegetable farming. These variables include main occupation, how long have you been into farming activities and total farm size. While gender, farming experience, and cooperative association had negative influence on farmers' attitude towards risk.

Table 6. Linear Discriminant function for risk categories in vegetable production

Discriminating Variables	Pooled	Risk Averse	Risk Neutral	Risk Preferred
Gender	0.3940121	-0.3087557	0.1.38393*	-1.597375
Main occupation	-1.10361	0.3206466	-0.6812329	0.1935493
Farming experience	-0.2840841	0.2582412	-0.6118335	0.146399***
Household size	-0.4459435	-0.2522406	0.109354	0.2836888
Farm size	6.28506	4.719709**	-0.7.293594	1.851448
Cooperative association	0.6830147	-0.1669231	-0.8058117	-0.0537692
Constant	74.28939	72.0469	81.54334	65.59318
Number of observation	120	44	31	45

*, **, *** represents 10%, 5% and 1% significant levels

4.7 Farmer's strategies at combating the risks and management skills

The result in Table 7 revealed that (45.00%) of the vegetable farmers engage in crop diversification as a way of minimizing risk, (26.67%) engage in non farm business, (20.00%) engage in crop planning and time security. However only few vegetable farmers (8.33%) engage in adoption of new farming techniques. This may be due to lack of adequate technical know-how and techniques required for the adoption of new technologies. It may also be due to lack of funds necessary to purchase appropriate equipment for farming and production.

Table 7. Risk management strategies in vegetable production

Strategies	Frequency	Percentage
Diversification of the system	55	45.00
Non farm business	32	26.67
Crop planning and time security	24	20.00
Adoption of new technology	9	8.33
Total	120	100

Source: Field Survey, 2019

5. Hypothesis Testing

H_0: The hypothesis stated that there is no significant relationship between relationship between risk and management strategy. From Table 6, it can be seen that there exist a significant relationship between risk and management strategy. Therefore, the null hypothesis (H_O) is hereby rejected, and we accepted the alternative hypothesis (H_A) that there is significant relationship between risk and management strategy.

6. Conclusion and Recommendation

Risk is inevitable for a profitable production or farming. From this study it can be concluded based on the findings that leafy vegetable farmers in the study area have not attained their best use in terms of taking risks and management strategies in production. This has been verified from this research through the low level of profit obtained from vegetable production in the study area. Of all the assessed natural risks associated with vegetable production, plant diseases have the highest percentage, among all the assessed social risks associated with vegetable production, theft of the crop have the highest percentage, in all assessed economic risks associated with vegetable production, low market demand have the highest percentage, also among production risk associated with vegetable production, labour supply have the highest percentage and finally all the assessed marketing risks associated with vegetable production, instability of price have the highest percentage.

It is therefore recommended that efforts should be stepped up by government to introduce farmers to relevant improved technologies in order to reduce risks in all forms, enhance management strategies and improve farmer's profit. The private sector in partnership with the government should set up more accessible financial institution and comprehensive agricultural insurance scheme which can provide credits and insurance to rural farmers to minimize risks and uncertainties in vegetable production. Finally, public intervention can facilitate better risk management through improved information system.

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